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EXHIBIT

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NSC-361

PROCEEDINGS
OF THE
**National Safety
Council**

ELEVENTH ANNUAL
SAFETY CONGRESS

Held at the
New Cass Technical High School
Detroit, Michigan
August 28—September 1,
1922

National Safety Council

168 North Michigan Avenue, Chicago

HONORARY MEMBERS

Association of Iron and Steel Electrical Engineers
Elbert H. Gary, Robert W. Campbell, Ralph C. Richards

OFFICERS (1922-1923)

Marcus A. Dow, President
C. B. Auel, Vice-President in Charge of Industrial Safety
George T. Fonda, Vice-President in Charge of Sectional Activities
L. A. DeBlois, Vice-President in Charge of Local Councils
David Van Schaack, Vice-President in Charge of Public Safety
Homer E. Neisz, Treasurer and Chairman Finance Committee
W. H. Cameron, Managing Director and Secretary

EXECUTIVE COMMITTEE (1922-23)

C. B. Auel, Westinghouse Electric & Manufacturing Company
L. G. Bentley, Steam Railroad Section
David S. Beyer, Liberty Mutual Insurance Company
J. W. Costley, Tri-City Safety Council
A. E. Davidson, Chesebro, Whitman Company
L. A. DeBlois, Delaware Safety Council
Marcus A. Dow, New York Police Department
Ralph W. Elliott, Health Section
George T. Fonda, Engineering Section
H. W. Forster, Brown, Crosby & Company
Walter G. King, Julius King Optical Company
S. C. Mumford, Detroit Safety Council
William Otter, Chicago Safety Council
Lew R. Palmer, Equitable Life Assurance Society
Dr. E. George Payne, Education Section
C. E. Pettibone, American Mutual Liability Insurance Company
H. A. Reninger, Cement Section
A. W. Robertson, Western Pennsylvania Safety Council
G. E. Sanford, General Electric Company
Charles B. Scott, Bureau of Safety
C. M. Talbert, St. Louis Safety Council
C. H. Thompson, Rochester Safety Council
B. F. Tillson, Mining Section
C. P. Tolman, Past President National Safety Council
J. H. Truett, Electric Railway Section
David Van Schaack, Aetna Life Insurance Company
H. M. Webber, Illinois Bell Telephone Company
A. W. Whitney, National Bureau of Casualty and Surety Underwriters
W. E. Worth, International Harvester Company
Arthur H. Young, Past President National Safety Council.

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THE complete stenographic report of the 55 meetings which made up the Eleventh Annual Safety Congress would fill more than 2,000 printed pages. These Proceedings have been reduced to less than one-half of their original volume, partly to keep the cost within a reasonable limit, and also for the convenience of the average reader who desires only a condensation of what was said and done at the Congress. The prepared papers which occupy the greater part of this book are reproduced in full or very slightly condensed. It is on the extemporaneous discussions that the editorial blue pencil has been used most freely, compressing pages into sentences and cutting out irrelevant matter entirely.

To the chairmen of meetings a special apology is due, for the ruthless elimination of their graceful introductions and their skillful drawing out of discussion and debate, which added so much life and color to the meetings themselves.

National Safety Council

Annual Meeting of Members

Detroit, Michigan

August 28, 1922

CHAIRMAN, MR. A. H. YOUNG, President, National Safety Council

PRESIDENT YOUNG: All will please rise while we open the meeting with an invocation.

REV. DR. M. S. RICE: Our Heavenly Father, we pause at the beginning of this very important meeting to pray for Thy approval upon everything that shall be done and said, in the great plans that are being made, and that we are now to make for the advancement of the welfare of human life.

In this great, stirring day of ours, when we have learned the value of so many, many things, we have been somewhat careless of the real fundamental value of the whole world. Help us, as we hurry along our crowding streets, help us as we hurry from our great prolific factories, help us constantly to know that there is just one great, significant, intrinsic thing that gives value to it all; that makes the street worth while, that makes the factory worth while, that makes the Nation worth while; it is the life of our men and our women, our boys and our girls.

We ask today that Thou shalt give us appreciation in everything we do, in everything we have to say, and all the plans that we have to make for the advancement of the appreciation of human life. How careless we have gotten of these things, and what multitudes of men we have seen march away into a strange thing we call death, for that strange thing we call war.

God help us, that out of these strange days of ours, we shall come, with death on every hand, to see the value of the preservation of life. And, may we keep life sacredly, and may we watch with the greatest of care for the safety of all, and may all be for the safety of all for all, for Christ's sake. Amen.

REPORT OF INSPECTORS AND TELLERS OF ELECTION

PRESIDENT YOUNG: Mr. John R. Brownell, Chairman of the Committee of Inspectors and Tellers of Election, will make his report.

MR. BROWNELL: The number of proxies, properly signed and submitted, together with the number of delegates with voting powers, attending this convention, are in excess of the number required by the constitution.

PRESIDENT YOUNG: It is eminently fitting that Detroit should have chosen as her spokesman, to voice the welcome that she is showing in so many ways, Mr. Samuel Mumford, president of the Detroit Board of Education.

ADDRESS OF WELCOME

SAMUEL C. MUMFORD, PRESIDENT, DETROIT SAFETY COUNCIL

More than one hundred and fifty years ago the industrial revolution brought to society the problem of maintaining public safety. Before that time safety had been a personal matter. Industry was chiefly agricultural, or carried on about the family hearth, with tools few and simple. The workman himself controlled the physical conditions under which he worked and if accidents occurred he had only his own carelessness to blame.

But with the drift, in the late eighteenth and early nineteenth centuries, from farming to manufacture, from homestead to factory methods, a growing proportion of the population was placed in a new environment which they could neither understand nor control.

They toiled now upon premises not of their own choice, and owned not by them, but by an employer. Instead of working in isolation or in small groups, hundreds were thrown together under one roof, where the error or illness of one might affect all. New methods and new machinery, new chemical processes, new forces such as electricity and compressed air, new modes of transportation and communication were introduced one after another, and with each came additional dangers. Above all, speed, the ruling spirit of the machine age, imposed its exactions. Accidents, of course, increased under such conditions.

THE ADVENT OF SAFETY AS A COMMUNITY PROBLEM

With these changes safety became a community problem. Individuals could no longer prevent accident through their own effort and it was not safe to allow the matter to remain in the hands of individual employers.

Great as was the need for social action for the purpose of maintaining safety, little was actually done for many years. Then safety work was taken up by a few industrial plants and so successfully carried on that its possibilities were seen in other fields. Organizations, such as the schools, civic departments, women's clubs and fraternal organizations became interested in the activity, and began a systematic selling of safety to the public. They soon won the co-operation not only of many other

civic organizations, whose numbers gave the movement power, but of all wideawake industrial managers and employee associations in industry.

This splendid co-operation has continued and increased as the purpose of safety campaigning began to be better understood. Definite organizations were established to handle the safety problem as it applied to them. As the work grew and the field widened, a national organization was formed to more effectively administer and co-ordinate the safety activities all over the country. This nation-wide co-operation has resulted in the gathering of thousands of delegates at this Eleventh Annual Safety Congress which we, of the Detroit Council, are proud to welcome to our city.

SAFETY CONGRESS A LIVING FORCE

A convention of these proportions will mean much to the country in the cause of safety. In industry it will mean the establishment of better relations between employers and employees, from the knowledge of the interest taken by employers in the safety of their workmen. In other activities the interest aroused by the convention will mean a great boon to safety, resulting in more effective execution of the program, and an attendant saving in lives, health, happiness and money.

In Detroit, we are glad of the opportunity to show you the advance we have made in making safety a reality. The work here was inaugurated many years ago by wise managers who saw the value of safety not only from an humanitarian standpoint, but from the standpoint of increased efficiency. Much was done by them in the way of developing industrial safety to a point well above the legal requirements, and on an equality with any industrial safety program in the country.

EXCELLENT PROGRESS BEING MADE

This was not the only phase of safety that was developed in Detroit. In a city the size of this one, where there is as much traffic as there is here, street accidents are sure to be numerous. The co-operation of the Detroit Automobile Club, the public schools, the Detroit police department, the courts and other civic departments and organizations has succeeded in cutting traffic accidents to a small per cent of what they were, or even of what they might be expected to be.

All the organizations represented continuously in Detroit's safety program feel that they owe much to the encouragement and assistance of the National Safety Council. We feel that the success of our work depends upon the co-operation of all, and to that end this eleventh Congress has been convened. As spokesman for the Detroit Automobile Club, the Board of Education, the Public Safety Bureau of the Detroit police department, the Safety Council and the Safety First Committee, I bid you welcome.

ADDRESS OF PRESIDENT

ARTHUR H. YOUNG

Mr. Mumford and Gentlemen of the Detroit Joint Committee: It is not easy to respond to such a welcome, given under such auspices and in such a place.

As we stand, newly come within your friendly gates, the temptation is to tell you, our hosts, all that is in our hearts—our gladness to be with you, our vivid first impressions of your hospitable city with all its beauties and wonders, our keenly pleasurable anticipation of the four halcyon days to come—but if we did tell it all we should run the double risk of seeming over-effusive and of leaving ourselves little to add when, all too soon, the hour will come for us to cross your threshold again on our way out and home. A certain economy of utterance will, therefore, be advisable at this moment, but I suspect that you and the good people of Detroit will hear enough of our appreciation before this Convention is adjourned to let you know how we feel about you, about your city and about your hospitality.

There are other special reasons for our appreciation of this opportunity, on which there can be no division of sentiment. It is not exaggeration to say that in all the noble sisterhood of American commonwealths none can point to such achievement and progress in the last generation as stand to the credit of Detroit. There is no disloyalty in that remark to my own home town of Chicago, nor to any of the proud cities from which we, your guests, have come. Neither is there envy. We admire your magical prosperity and we rejoice in it.

DETROIT DISCOVERED THE THING MANKIND WANTED

No city in America or anywhere else is so well and widely advertised as Detroit. Wherever roads run and men travel people pay tribute to the peculiar genius of Detroit; and by "peculiar genius" I do not mean that distinguished citizen of your community whose name it is not necessary to mention. I mean the peculiar and special genius of Detroit which has enabled it to discover the particular thing that mankind wants most and to produce that particular thing in the quantity and of the quality to meet a universal demand—I mean the automobile.

Par excellence, Detroit is the home of the motor car. All over our own broad country and all up and down the world Detroit is heralded and advertised by its products. Everywhere you find the legend "Made in Detroit," and I trust you will not think me overcomplimentary when I say that this legend is a synonym for well made.

If your most excellent city has a motto or a slogan I do not yet know what it is. Therefore, I feel free to suggest one—a motto of two little words, "Honk-honk!" which, being interpreted, means "Let's go!" and, therefore, means advancement, progress, achievement.

The fact that Detroit is so markedly a center of modern industry is one of the special reasons why this Convention should be held in this place. The fact cannot be attributed wholly to your fortunate location with reference to transportation, raw materials and labor supply. Neither did your prosperity result from any accident, any fortuitous concurrence of fortunate circumstances. Detroit is what Detroit is, we may well believe, because of its progressive spirit—because it saw an opportunity and converted it into a reality. And an important part of that progressive

spirit, which has made your city what it is and keeps it in the forefront of commerce and industry, is frank recognition of the human factor in all industry.

MATERIAL EVIDENCE OF THE DETROIT SPIRIT

We need not go far in search of tangible and material evidence of the spirit of Detroit, of this frank recognition of the human factor. This splendid institution in which our Convention is so graciously and acceptably housed is eloquent and enduring testimony to the spirit of Detroit. Most of us, I am sure, had heard of the Cass Technical High School before we came here. We also knew something of how it came into existence. You need not have been quite so modest, Mr. Mumford, for we were pretty well aware that this institution is a monument to yourself, as well as to your city.

Above all reasons why Detroit was deemed the worthiest place offered for this Congress, and why we were so glad to accept its invitation, is the fact that here, in this forward-marching, fast-marching city, the principle and doctrine of safety is exemplified and made practical in a manner and to an extent that gives it a high place in our regard. It seems altogether right and fitting that a convention of this kind and purpose should be held in a city where the theory of safety is rapidly being made a binding condition and a living fact.

Do you want to know, Mr. Mumford, how we all feel about the hospitality of Detroit to our Convention and about your courteous welcome? All right, sir, I'll show you. Up on your feet, men! Up on your feet and give three cheers and a tiger for Detroit!

Now, men of the Congress, let's turn to the business that brought us here. The chief business of an outgoing administration in a body of this kind is to render an account of its stewardship. You men are well accustomed, I would suppose, to getting information out of reports and statements and balance sheets; your eyes doubtless tell you more than your ears when it comes to grasping the details of a concrete proposition. You have in your hands a printed statement covering the essentials of the Councils' work for the year that is now closing. Therefore, I shall not burden you with any repetition of them and shall not undertake to comment upon them other than to call your particular attention to the most important features.

MANY NEW FEATURES ADDED TO COUNCIL'S WORK

First in order of importance I would announce that, through its national board, a group of insurance companies has placed at the disposal of the Council many thousands of dollars as an aid in further extending our work in public safety. A joint committee equally composed of representatives of this group of insurance companies and the National Safety Council will administer the funds particularly in an attempt to solve the automobile accident menace. This timely and generous aid will mean field secretaries and other experts added to our staff; special programs new publications and many other activities we have envisioned in the past

but failed of fruition because of ever-present financial limitations. I cannot help feeling that this practical co-operation on the part of such an important group of insurance companies marks a significant era in our progress and the event is pregnant with future possibilities.

One of the happiest angles of my fortunate year of service as President of the Council has been my intimate relation with the actual doers of the Council's work—I wish I might adequately express the appreciation and praise that is due the officers, committeemen and members responsible for the success of the local councils, the activities of the sections and the special committees. Some measure of their accomplishments may perhaps be had in the various reports you will receive and in your later perusal of the proceedings of the Congress, but I hope you will realize, as I have, the hours and days—aye, even months—of painstaking effort, infinite patience, weighty counsel and unwavering loyalty of the individuals and groups who have thus made possible the splendid record of achievement that stands to the credit of the National Safety Council and to which is due its preeminent position today.

Much progress has been made in awakening the spirit of safety in local committees and among industrial trade groups and the really magnificent work that has been done in this direction through local councils and sectional activities cannot be overestimated. The completion of the programs so well begun will accomplish the solution of one of our greatest national problems.

FEDERAL, STATE AND MUNICIPAL AGENCIES AT WORK

Federal, state and municipal governmental agencies have markedly increased and intensified their safety activities and in this respect the United States stands not alone—by example, our Canadian and British friends are showing a steady progress in these endeavors.

Everyone here present and, indeed, every citizen of this country who is in touch with the throb and hum of our social life, is aware of the gigantic effort being made by the American Railway Association to stem the awful tide of grade-crossing accidents. Their present campaign is but an indication of future activities of the Safety Section of the American Railway Association.

Time permitting, I would glory in calling the roll of safety organizations, committees and individuals who have done so well and so modestly the task in establishing the safety movement as a virtual crusade, second only in its important social aspect to religion itself. I wonder if any of you have ever stopped to realize the bare monetary value of voluntary service so generously placed at the disposal of the Council. For eleven years your Executive Committee has met regularly, its out-of-town members have paid their own traveling expenses, everyone of the hundreds of men who have thus served the cause has contributed of his time and money necessary to attend these meetings. All of our Council committees have contributed as fully and as generously. And I will boldly say that no thanks is due them. They have been amply repaid and their reward is great, in the realization that life and suffering is saved through the work they thus do.

There is another thing that should be said at this time. I want to call to your attention the fact that when this administration took over the affairs of the Council it was confronted with a deficit of \$32,000. That fact is no discredit to any previous administration. On the contrary, it is, in truth, a credit and a compliment. All of you know what kind of times we have been passing through in the last year or two. I say it took wisdom and courage and faith to incur that deficit—faith in the soundness and the need of the principle on which our Council is founded, and faith in the substantial recognition of our work by our members and by the country.

COUNCIL IN EXCELLENT FINANCIAL CONDITION

That faith has been justified. We who are about to give place to another administration are happy to report that this deficit has been completely wiped out. Yes, more than wiped out. Every dollar that this Council owed has been paid—even the bills for the magazine which will be circulated at this Convention have been paid—and we have twelve thousand good dollars in the bank. It is true that our administration has economized to make this showing, but a substantial deficit could not have been converted into an encouraging little surplus without the co-operation of our membership and the general support of the country.

Another thing that none of the official reports, printed or otherwise, can adequately show, is the nature of the service rendered to the Council by its executive and administrative employees. Permit me to say that, as the head of our Council during the past year, I have had what might be called "one bully time." All along I have felt—I have known—that I had the unqualified, ungrudging support of the membership. I have felt behind me the force and the urge of the will and purpose of this powerful organization, and have deemed myself to be but the instrument for the direction and exercise of its vast potential energy.

We members of the Council get together only once a year for the immensely valuable personal contacts of our conventions. But the work of the Council must go on hour by hour, day by day, through the year between our general meetings. Men of distinctive experience and ability must be constantly at work pressing forward the business of our Council, seeing and seizing its opportunities, putting our theories and ideas into practical effect. I only wish I could bring before you today every member of the staff and make you and them better acquainted. Since that is impossible, however, I gladly take this occasion to present to you the heads of the principal departments.

[Mr. Young then introduced various members of the headquarters staff.]

GREETINGS FROM PRESIDENT AND PREMIER

Your officers had looked forward, with ardent hope and with some reasonable expectation, to the presence at this Convention of two men whose attendance would have lent a peculiar zest and enjoyment to this gathering and would have given new emphasis and new impetus to our Council's work. One of these guests was to have been the most honored

and the most burdened citizen of our country—the President of the United States. Later on during the Convention you are to receive a greeting from him that will doubtless refer to some very obvious reasons why he cannot be present with us.

The other distinguished guest was to have been that uplifting thinker and leader in the great work of humanizing industry, that ardent advocate and champion of the principle of safety, the Hon. W. D. MacKenzie King, Premier of Canada. Again we are disappointed, and again the reason is official business. I betray no secret when I say that it is not only the business of Canada that keeps her Premier from being our guest today, but the business of the British Empire. However, I am privileged to deliver to you here a message of greeting and of inspiration from the Canadian Premier. It reads:

Mr. A. H. Young, President, National Safety Council, Detroit, Mich.:

Deeply regretting that official duties prevent my attendance I send cordial greetings to the National Safety Congress. May your deliberations lead you on to still higher aspirations and still nobler achievements in a cause that means much to the well being and happiness of the people of both our countries.

W. L. MACKENZIE KING, Prime Minister.

Though he be regrettably absent from these proceedings, we may believe that this foremost citizen of Canada is with us in spirit and will be with us in all our undertakings. Mr. MacKenzie King's message says to you in a few words very much the same thing that I had planned to say to you in more words. I quote him thus: "Still higher aspirations and still nobler achievements in a cause that means much to the well being and happiness of the people of both our countries." There you have it—truth, fact and inspiration in a nutshell. We shall do well if we carry in our minds throughout this convention that clearcut expression of a worthy and pregnant thought.

DREAMS IN TERMS OF HUMANITY

Let it be for others, for the men of achievement and of eloquence who will address you, to review the results of our past endeavors and to aid us in determining our course for the future. Let it be for others to set forth for you the values of safety as a factor of economic conservation, as a factor in industry and as a factor in the life of the community, of the state and of the whole people. For myself, I must confess that I dream my boldest dreams of this safety cause in terms of humanity. I cannot help looking past the figures—the terrible figures—that tell the extent and the cost of preventable accidents. For myself, I must confess the figures and statistics tell only a little part of the tragic story.

I cannot help picturing these things to myself as my eyes have seen them and my ears have heard them—the unutterable sorrow, the life-long privation, the pity and pathos of the broken home circle and the hearthstone left cold and desolate. From behind these figures all too readily I hear the most pitiful sound there is—the sound of women sobbing out their sorrow, of little children crying.

Thoughts and fancies like these, my friends, bring me to new and stronger determination that I must, and I shall, give more, do more and be more for the cause of safety. And they encourage me to dream—to dream ahead into the future and envision a time when, all preventable accidents shall be prevented; when we shall take as jealous and as watchful care of our lives and limbs as we do of the dollars we have earned and saved and invested; when the prevision and provision that safety demands shall be a fixed and ingrained habit of our nation as a people and as individuals.

War, pestilence and famine may take their occasional toll of humanity, but I dare to look forward to the time, a long way this side of the millennium, when, by virtue of what this association does and inspires and encourages others to do, the fourth dread horseman, whose name is Accident, shall ride no more—when the crimson record of human carelessness and needless, useless waste of human life and limb shall have been bleached white.

And now, gentlemen, for the business of this convention. This is the occasion when we need to learn from one another; to receive the inspiration that comes from friendly association and to lay our various contributions on the altar of safety. Permit me to quote the motto that I have suggested for this city of Detroit—"Honk, honk!"—which, as I have said, means "Let's go!"

Even in this age of gasoline, when good old Dobbin is pretty well off the stage, there must be a good many present that know something about horses—about the job of driving a four-horse or six-horse team. You know that you can change your leaders, you can change your swing team, but how your good teamster does hate to break in new wheel horses! So it is a pleasure and privilege to present to you the "wheel horse" of the National Safety Council, its steady, effective, efficient, dependable Executive Secretary—William H. Cameron.

REPORT OF EXECUTIVE SECRETARY

SECRETARY W. H. CAMERON: Briefly, my annual report is as follows:

1. Loss in membership for the fiscal year
 ending July 31, 1922..... 566
 Present membership..... 3,060

The Treasurer's report will show all debts paid and a cash balance in the bank. Since June 1 there has been a net increase in the number of members, due to the improvement in business conditions.

INDUSTRIAL DIVISION

In addition to supervising and editing six drafts of Safe Practices Articles, three drafts of Safety Codes, various articles for the *National Safety News*, and the preparation of "copy" for the Annual Congress Proceedings, Mr. S. J. Williams, as the Council's Chief Engineer, has also

acted as the Chairman of the Safety Code Correlating Committee of the American Engineering Standards Committee. With the help of his assistants he has also kept in intimate touch with the Sectional officers during the year and has maintained the high standard of work of this division by investigating and reporting to the membership upon technical problems. He has attended meetings and participated in all of the activities of the headquarters' office.

PUBLIC SAFETY DIVISION

Under Mr. F. M. Rosseland's direction an extensive service has been developed during the year for local councils, including the preparation of three charts on "organization," "activities," and "financing"; a monthly news-letter has been sent to the officers with valuable enclosures; a monograph on "safe drivers' clubs" was prepared and distributed; he has prepared the program for and supervised the quarterly meeting of Local Council Secretary-Managers and will guide the preparation of a code on Colors for Traffic Signals. Several new local councils have been organized; correspondence has been maintained with all local councils; visits have been made to some of them and every inquiry for advice and information in conducting public safety work and on the organization and management of "locals" has been carefully followed up. State and municipal authorities have been furnished with copies of the Council's public safety material and inspired to greater activity in accident prevention work. Copies of the pamphlet containing Dr. E. George Payne's address have been sent to school superintendents in every city of 20,000 or more population.

BUSINESS DIVISION

As the outcome of the reorganization of the headquarters' activities, Mr. Keefer has had supervision of the general business problems of the Council, including advertising in the *News*; the membership activities; the relations of the Council with printers, and other tradesmen; the promotion of sales of bulletins; the Annual Congress Exhibit; the pamphlets advertising the Council's service, and direct supervision of the general routine activities of the office.

PUBLICATION SERVICE

A radical change was made Dec. 1 in the character and method of distributing the printed service of the Council. The orders for extra copies of the safety bulletins have proved that the members appreciate the opportunity to make their own selection of bulletins from the samples sent with the monthly issues of the *National Safety News*. Considerably more time and money have been spent upon the bulletins and much of the credit for this improvement is due to Mr. R. T. Solensten, now giving much of his time to this service. Under the guidance of Mr. G. E. Wallis, the Council's new editor, and Mr. F. E. Redmond, his associate, the *National Safety News* has increased in size and broadened in its scope. These editors are also continuing safety publicity service to newspapers and trade magazines.

INFORMATION BUREAU AND LIBRARY

The Library has continued to grow in scope and usefulness to members under the direction of Miss Mary B. Day. During the past twelve months 2,677 research requests were answered; more than 24,000 pieces of literature distributed, and assistance given in the preparation of the revised Safety Slogan booklet; the Annual Congress exhibit; bibliography for a text-book on School Safety; the preparation of twenty portfolios illustrating the National Council's service, and many other such items.

SAFETY CALENDAR

One hundred and twenty thousand copies of the 1922 Safety Calendar were printed and distributed. The 1923 Safety Calendar is now in the hands of the printer. Improvements have been made in the substance and form of this latest calendar.

FILMS AND SLIDES

Moving picture films, stereopticon slides, outlines of lectures, etc., have been furnished members. The Council's collection of stereopticon slides and industrial and public safety subjects has been increased to over 1,200 and albums prepared reproducing photographic prints of every slide to be used by members in selecting those required in their safety educational work.

MISCELLANEOUS

Cordial relations have been maintained with other safety institutions, such as the Safety Institute of America, the United States Chamber of Commerce, the Canadian Safety Council, the Ontario Safety League, and State and Federal Government departments. The Council has taken a prominent part in the development of the American Engineering Standards Committee and the preparation of its Safety Codes and has maintained co-operation with the Boy Scouts of America through a special committee. The headquarters' staff has worked continuously with the major committees of the Council and particularly those under the supervision of its vice-presidents. Preparations have been made for the 1922 Annual Congress and Exhibit. The contract with the Bureau of Mines was renewed, permitting Mr. C. L. Colburn's services to be extended to the members of the Mining Section. Radio safety messages have been broadcasted. As part of its general duties the staff has, of course, collected and disbursed the income of the Council under the direction of the Executive Committee.

STAFF

The following changes have been made in the staff:

Mr. C. W. Price resigned Nov. 1 to become president of the Price-Rasmussen Corporation. Mr. W. H. Frater has allied himself with the Temme Spring Company, Mr. Louis Resnick has established a professional publicity business in New York, and when Messrs. Bready and Bradshaw's contract expired they decided to start a business of their own. Mr. Williams has been appointed chief engineer of the Council and in

charge of the Industrial Safety Division, Mr. Rosseland has been made chief of the Public Safety Division and Mr. Keefer has taken over Mr. Frater's duties. Mr. John M. Sandel was appointed in Mr. Keefer's place as safety engineer, Mr. George Earl Wallis has been appointed editor and Frank E. Redmond associate editor of the *National Safety News*.

PRESIDENT YOUNG: I have the honor of presenting to you Judge Bartlett of Detroit.

ADDRESS BY JUDGE CHARLES L. BARTLETT

I wish to pay my respects to this great organization, as I have watched with interest for several months the splendid work that it is doing.

The preservation of the life and safety of the people in each community is of paramount importance. While property itself is valuable, while men can go into our civil courts and fight out their property rights and be either victor or vanquished, yet when a loved one is suddenly taken away from us by someone's carelessness, by an accident which could have been prevented, it brings home forcibly to us the seriousness of the situation confronting every large city and most of the small cities in the United States.

Some people want to know why I send reckless automobile drivers to the Detroit house of correction, or to jail. I watched with a great deal of interest, for several weeks, the cases that were brought before me. I saw poor, helpless children and pedestrians who had been knocked down on the streets of Detroit. Conditions had become appalling. It seemed that the reckless automobile driver was beginning to believe that almost anything could be done by him, yet he could go into court and could get off, no matter how serious his offense.

LAW VIOLATORS MUST SUFFER FOR MISDEEDS

I found that fines were laughed at by the ordinary and the extraordinary law violator—the man who drives an automobile cares little about a fine. So, finally, after a careful investigation and after weeks of consideration, I determined on a method that I believed would eliminate, to a large extent, accidents in the city of Detroit; I made up my mind to deal drastically with law violators.

Too much time of the courts is taken up with the small violators. I will not speak of them, because they are not wilful offenders as a rule—the small violator is a careless man who sometimes makes a trivial mistake. I am speaking this morning about the man who is a real violator of the law—the man who goes up and down the streets, not only of the City of Detroit, but other cities, wholly disregarding the safety of others.

I have had a great deal of experience with traffic conditions, having heard thousands of cases in the court over which I preside, and have come to the conclusion that selfishness and carelessness go hand in hand. The careless driver is usually a selfish man, wholly unconscious and oblivious of the rights of others. He is like the man who jostles you upon the sidewalk and goes right on. He is a man who wants to

control not only his own family, and the conditions in his own particular local community, but everyone with whom he comes in contact. The result is that when an automobile—you might call it a high-powered locomotive—is placed in his hands, that man begins to realize that he has something in his hands whereby he can go through the streets of any community and can characterize that selfishness in overt acts; that is, he can go through the community driving his machine in a careless manner.

The law enforcing powers are too lenient with this class of men. Putting them on probation, of course, is a reprimand. In cases where the driver is an intelligent man, one who has not committed a serious offense, putting him on probation serves as an important factor in curbing his future impulses. A fine, oftentimes, to one of the small violators, will set him upon the right track. But the only way in which this serious condition of affairs can be eliminated is by making the serious offender realize that he is in a court of law, that he has violated the law, and to compel him to take such punishment as the law should or does impose.

SENDING RECKLESS DRIVERS TO JAIL

So I started to send these men to the house of correction and to the Wayne County jail. It is astonishing the effect a jail sentence has upon a great many men. Out of hundreds who have been sent there in the city of Detroit, there has only been one repeater. I gave that man sixty days for his second offense. That shows a jail sentence does stop the man who comes into court charged with this offense. Of course, new drivers are continually securing licenses; they are not, perhaps, intimidated by a jail sentence until it is brought home to them by their being brought before the court on a charge of this kind. We have, in Detroit, one of the most efficient safety organizations, we believe, in the United States. We have a department that evildoers and law violators fear, and that means everything in the enforcement of the law.

I shall continue in the future, as I have in the past, to enforce the law and send these reckless drivers to the place where they belong, whether they are rich or poor, whether they are men without influence or men with influence. I shall proceed against them all in the same manner.

PRESENTATION OF COMMITTEE REPORTS

PRESIDENT YOUNG: It is my privilege to call upon the officers of the Council for their reports. In doing so I am presenting to you my friends in the organization—men who have labored well and intelligently at the request of the Executive Committee in the interest of our splendid institution. The first is our Treasurer and Chairman of the Finance Committee, to him is due much of the credit for the excellent financial showing we offer you today, Mr. William E. Worth.

REPORT OF FINANCE COMMITTEE

MR. W. E. WORTH: If you will read and analyze the report of the Treasurer you will understand our accomplishments during the past year.

Our assets show that our accounts receivable have been reduced \$22,000 as compared with last year; this is a result of the membership giving us enough money to enable us to catch up—you have indeed done your part. We have set up a reserve fund for the insurance, so to speak, of that service to our members which is paid for in advance; starting with \$1,000, 7 per cent of the membership dues each month hereafter will be held in a reserve fund for the purpose of insuring to you the service for which you have paid.

We have reduced our inventories to their actual cash value and there is no inflation. We have set up a fund of \$3,000 for "bad debt reserve," something that we have never had before.

We have no accounts payable so far as current expenses are concerned. Our notes payable last year were \$21,968.80; this year, nothing.

ASSETS

	Year Ending July 31, 1922	Year Ending July 31, 1921	Increase	Decrease
Current Assets:				
Cash	\$ 6,120.37	\$ 4,309.61	\$1,810.76	.....
Accts. and Notes Rec.....	15,860.63	37,109.77	.....	\$21,249.14
Inventory of Supplies....	3,384.60	6,712.69	.....	3,328.09
Current Account (Local Councils).....	None	157.23	.....	157.23
Advances to Staff.....	286.03	200.00	86.03	.....
Deposit with Postmaster....	484.05	848.93	.....	364.88
			1,896.79	25,099.34
Total Current Assets.....	26,135.68	49,338.23	.....	23,202.55
National Safety Council Re- serve Fund Investment Account (C. & C. Bank, Chicago)	1,000.00	None	1,000.00	.....
Office Furniture & Equipm't	11,327.09	12,130.64	.....	1,103.55
Deferred Charges.....	2,529.56	760.52	1,769.04	.....
	\$40,992.33	\$62,529.39	\$2,769.04	\$24,306.10
				\$21,537.06

LIABILITIES

	Year Ending July 31, 1922	Year Ending July 31, 1921	Increase	Decrease
Current Liabilities:				
Accounts Payable.....	None	\$ 6,222.48	.....	\$ 6,222.48
Current Accounts (Local Councils).....	\$ 1,828.20	3,936.29	.....	2,108.09
Notes Payable.....	None	21,968.80	.....	21,968.80
Total Current Liabilities.	1,828.20	32,127.57	.....	30,299.37
Accrued Expense.....	284.35	244.82	\$ 39.53	.....
Deferred Credits.....	3,060.00	None	3,060.00	.....
Reserve for Future Service to Members.....	1,000.00	None	1,000.00	.....
Surplus	34,819.78	30,157.00	4,662.78	.....
			8,762.31	30,299.37
	\$40,992.33	\$62,529.39		\$21,537.06

STATEMENT OF GROSS REVENUE AND EXPENDITURE

Fiscal Year Ending July 31, 1922.

GROSS REVENUE

Membership Dues:	
Active	\$151,078.23
Associate	7.00
Additional Service.....	1,254.98
	\$152,340.21
Sales of Pamphlets, Bulletins, Chauffeurs' Lessons, and Miscellaneous Receipts.....	9,830.04
Gross Revenue, 1922 Calendars.....	23,358.81
Gross Revenue, National Safety News (Dues from from Council Members not included).....	20,386.24
Interest Earned	81.02
Total Gross Revenue.....	\$205,996.32

GROSS EXPENDITURES

Annual Congress Expense.....	\$ 1,309.09
1921 Annual Congress Proceedings.....	5,446.28
1922 Calendars	16,490.10
Depreciation, Office Furniture and Equipment.....	1,577.15
Exchange	252.65
Expenses of various Local Councils.....	478.29
Field Work, including salaries.....	920.88
General Office Expense.....	2,890.75
Interest on Notes.....	714.50
Library Expense	146.01
Local Council Expense Accounts for Fiscal Year Ending July 31, 1921, now taken up by National Safety Council.....	157.23
Membership Solicitation Expense.....	1,975.05
Miscellaneous Publications Expense.....	501.77
National Safety News.....	24,220.40
Office Printing and Supplies.....	2,499.99
Postage	2,495.80
Provision for Bad Debt Reserve.....	3,000.00
Publicity Department, including salaries.....	6,772.31
Rent of General Offices.....	6,998.58
Safe Practices Pamphlets.....	1,712.11
Salaries of Officers and Staff.....	55,978.81
Sectional Activity Expense, including printing bulletins.....	17,453.02
Sundry Activities	8,824.62
Taxes and Insurance.....	553.92
Telephone and Telegraph	1,285.07
Traveling Expense—Administrative, including National Committee Expense	2,100.03
Safety Bulletin Service.....	6,165.07
Loss on Exchange on Typewriters.....	185.00
Accounts Written Off.....	1,039.15
Publication Service to Members.....	26,734.90
Reserve for Future Service to Members.....	1,000.00
Balance added to Surplus.....	4,662.78
Total Gross Expenditures.....	\$205,996.32

W. E. WORTH, Secretary-Treasurer.

We have examined the above comparative Balance Sheet of the National Safety Council as at July 31, 1922, and July 31, 1921, and the Statement of Revenue and Expenditure for the year ending July 31, 1922, have compared them with the books and vouchers and have found them correct.

Chicago, Ill., August 10, 1922.

ARTHUR YOUNG & COMPANY,

Certified Public Accountants.

PRESIDENT YOUNG: We are next to hear from Mr. Beyer, Vice-President in charge of Service to Members.

REPORT OF SERVICE TO MEMBERS COMMITTEE

MR. DAVID S. BEYER: Your Service to Members Committee has endeavored to work with the staff, and with your officers, to give the members the things they were most interested in and most desired in the way of service during the past year. We have reviewed and made recom-

mendations regarding lantern slides, moving pictures, items in the *Safety News*, and for the bulletins, which everyone agrees are the backbone of the Safety Council service.

One interesting development—to me and perhaps it will be to you—during the year has been the settling once and for all of the question as to what kind of bulletins are interesting to the membership. We have all wondered whether a gruesome bulletin, a comic bulletin, a romantic bulletin had their place; now we know, under the new method of ordering bulletins, a record is kept of those that are favorites each month. In December the famous "Armour Calves" was fourth, 5,000 bulletins being ordered. In January, "Turn Them Over," the nail and little boy bulletin, was third. Another month the girl picture, "Everybody Has One" was second, 6,000 copies being ordered. This proves the popularity of these types of bulletins.

PRESIDENT YOUNG: We are next to hear from Mr. Tillson, Vice-President in charge of Industrial Safety.

REPORT OF COMMITTEE ON INDUSTRIAL SAFETY

MR. B. F. TILLSON: My report is a very short one—to put forward the fact that your membership in the National Safety Council is not a perfunctory matter, that you have only started to perform your duties when you pay your dues to the Council. You are privileged by such payment to take an active part in the development of this world-famous movement, you are paying an admission fee into an organization which requests you to profit by all of the many advantages which you and your industry may obtain from the study and the practice of accident prevention.

During the past year our industries have been under a cloud, due to the financial depression, and some, it seems, have been so foolish as to curtail in the department of accident prevention. The wise ones have realized that such a period is the time to invest most advantageously all of their resources in the prevention of waste of human life and to seek for more efficiency in their industry. Furthermore, they realize that when their organization is low in numbers is the best time to conduct educational work. I trust you will profit by this very elemental advice. I thank you.

PRESIDENT YOUNG: The next man, par excellence, is the Prime Minister of the safety movement, Mr. David Van Schaack, Vice-President in charge of Public Safety.

REPORT OF COMMITTEE ON PUBLIC SAFETY

MR. DAVID VAN SCHAAK: In view of the meetings of the Public Safety Section on Wednesday and Thursday afternoons, I invite you to come and find out what has been done and what is expected may be done in public safety.

PRESIDENT YOUNG: The next speaker is Charles B. Scott, Vice-President in charge of Local Councils.

REPORT OF COMMITTEE ON LOCAL COUNCILS

MR. CHARLES B. SCOTT: During the period in which it has been my privilege to represent you in the development and operation of our Local Councils there has been a marked increase in the number of community safety organizations. These organizations measure the growth of the wave of public interest in public accident prevention that is going over the country. The community safety organization functions successfully in direct proportion to the support given to its activities and finances, and the highest development of a community safety organization is, of course, the active Local Safety Council of the National Safety Council with a salaried staff.

An important development since the last Congress is the organization at headquarters of the Public Safety Division which, despite the general business and financial situation, has functioned actively in the organization and development of Local Safety Councils as well as in other phases of public safety work. Numerous conferences have been held with the officers of the Council and with my special committee on local council work, and quarterly conferences of all the local council secretaries with the officers and committee officers of the Public Safety Section were held in Chicago and Detroit. During the period a series of questionnaires was very carefully drafted and sent to all local council secretaries to obtain the facts which were later presented in four charts on "Organization," "Financing," "Industrial Safety Activities," and "Public Safety Activities." A set of these charts was provided for each local council and are available for the use of a new local council in the organization. A monograph on "Safe Drivers' Clubs" was prepared and distributed.

The Public Safety Division has also inaugurated a new and enlarged local council news letter with which are included as supplements each month special reports and samples of material successfully used elsewhere and suitable for use by any local council, as well as copies of the minutes of important meetings of local council organizations. A special service to local councils has been inaugurated and not only are local council inquiries handled promptly, but new activities are inspired. The Public Safety Division is also in a position to assist in the revision of local council programs, to furnish speakers and, during the coming year, will continue the intensive study of the special problems met with in local council operation. Assistance has been given in the organization of new local councils and a constant and steadily improving service will be given to the existing local councils so that they may do their work the more effectively and may develop their own community service the more quickly.

PROGRESS IN SOCIAL COUNCIL ORGANIZATION WORK

During my stewardship two local safety councils with salaried secretary-managers succumbed to the financial stringency existing in their communities, but four new local councils have been organized, three others have been revived and one has been reorganized on a firmer financial basis. Of the new organizations, one has a salaried secretary-

manager, two have the assistance of part-time secretaries and one, thus far, is operated by purely voluntary workers.

With a few exceptions, local councils of the National Safety Council are conducting a community safety program of activities. Among the activities conducted are safety schools for industrial workers, for safety supervisors, for motorists; a constant campaign to promote and maintain the teaching of safety in the public and parochial schools, active co-operation with the American Railway Association's Careful Crossing Campaign, inspirational meetings and banquets for industrial and commercial executives, and active committee work such as vigilante, legislative (to revise existing laws governing highway and street traffic), statistical, fire prevention and home safety. Several of the local councils successfully operate safe drivers' clubs which not only provide for the definite co-operation of hundreds of motorists, but also furnish a not inconsiderable addition to the local council's income.

I am proud to report that the National Safety Council now has thirty-four reorganized local safety councils, eighteen of which employ salaried staffs, eight are operated with part-time secretary-managers and eight are conducted by voluntary workers. With the development of the work of the Public Safety Division, during the coming year, it will be possible to gather into the fold practically all of the community safety organizations which are not now affiliated with the National Safety Council and to organize and develop many new ones.

ADEQUATE FINANCING AND STANDARDIZED ACTIVITIES

The great and crying need of local safety councils today is for adequate financing and the next most important problem is to secure standardized activities which will insure against the ever-present tendency of such organizations to stray into fields which are foreign to their avowed objects and thus, temporarily at least, slow up the progress of community accident prevention. The experience of the National Safety Council has proved definitely and conclusively that a safety organization is absolutely essential to success in accident prevention work. The local council experience during the last four years has proved definitely that sporadic safety campaigns, no matter how well organized, are largely a waste of time, effort and money and, furthermore, that the same amount of time, effort and money will carry on an effective, constant and energetic program of community safety activities for at least six months' time. We know now that to get the most of the money and time invested in community accident prevention, the work must be carried on—or, at least, followed up—by a permanent local safety organization.

Just a word about the salaried secretary-manager of the local council: His job is not a sinecure—and it is most emphatically not a job for a cake-eating lounge lizard! It is a job for a real man, a trained man, an executive in the truest sense of the word, for he must meet every handicap which his community may provide and, in addition, meet the high standards for locals of the National Safety Council, which has a definite interest in the successful operation of all local councils!

After my own not inconsiderable experience in the work, I appeal to you—I strongly urge—that each interest yourself in community safety problems. Whether your business be in a steel mill, a public utility, a mine, or a retail store, the community in which you live and do your business has a very definite effect on your business. To make your community known as a safe one, a community in which industries look after the safety workers, and the safety of the public is guarded by a community safety organization, is one of the best advertisements from a business standpoint and one of the best investments from the employer's standpoint that can possibly be enjoyed. I say to you that it will pay in dollars and cents as well as in that human satisfaction which we all take in the knowledge of a job well done. If your community has no safety council, it needs one, and if it has a local safety council that organization could do better than it is doing if it had more support—both financial and in the carrying out of its program. In either case you have a large measure of responsibility for you know how to find out what should be done.

PRESIDENT YOUNG: Mr. Fred Davidson, Vice-President in charge of Sectional Activities.

REPORT OF COMMITTEE ON SECTIONAL ACTIVITIES

MR. F. A. DAVIDSON: The past year has been such an unusual one, with the necessity of curtailing so much safety work, that as Vice-President in charge of Sectional Activities it seemed to me the point was very clearly brought out that we should not break up into too many Sections; when dull, hard times come these Sections cannot stand on their own feet. I have observed in some Sections with which I have come in contact that when times were booming there was a tendency to feel: "Here are two interests, they should divide."

After the division was made things went along first-rate, until we came to a difficult period, such as this last one; then it was apparent that the Section should never have divided. In the coming year all of the difficulties that we have had, due to Sections being split up, will be overcome, because the Sections are fast building up to the highest of standards.

APPROVAL OF MINUTES OF ANNUAL MEETING

PRESIDENT YOUNG: The President hears a motion, duly made and seconded, that the minutes of the last annual meeting be approved as printed in the proceedings of the 1921 Congress. Is there discussion on the motion? All in favor will signify the same by saying aye. No, by the same sign. It is carried unanimously.

We will have the report of the Resolutions Committee.

REPORT OF COMMITTEE ON RESOLUTIONS

MR. DAVID VAN SCHAAK: Your committee offers the following resolution:

Whereas, The 80,000 accidental deaths and millions of injuries occurring each year on our streets, in our industries, in homes and elsewhere are a blot on American civilization and the cause of untold suffering and sorrow; and

Whereas, The direct economic cost of industrial accidents alone exceeds one billion dollars annually; and

Whereas, Experience has demonstrated that at least 75 per cent of industrial accidents are preventable and that approximately an equal reduction is possible as regards public accidents; therefore, be it

Resolved, That the National Safety Council in its Eleventh Annual Congress in Detroit assembled advocates:

1. The safeguarding of all dangerous machinery and places according to standard methods of proved value.

2. The development of industrial equipment and processes along lines of inherent safety for the double purpose of eliminating accident hazards and increasing production efficiency.

3. The education of all workmen and their supervisors in safe methods and habits of work.

4. The training in safety of all school children, as well as students in colleges and universities, both for their own protection and as an object lesson in good citizenship.

5. The adoption and strict enforcement of uniform, practicable laws and ordinances for the safeguarding of vehicular traffic and the protection of the multitude of law abiding drivers and pedestrians against the thoughtlessness and recklessness of the few.

6. The mobilization of all community forces through state and city safety councils for securing these ends through the overwhelming force of enlightened public opinion.

On motion the resolutions were adopted.

MR. VAN SCHLAACK: Your committee also offers the following resolution.

Whereas, This Annual Safety Congress is favored by location in a city whose public officials, civic organizations, industries and leading citizens have shown an exceptional interest and ability in overcoming its accident problems both industrial and public; and

Whereas, This demonstration of successful safety work, no less than the courtesies of the same organizations and individuals in arranging for this Congress, form a most valuable contribution to the cause of safety; therefore, be it

Resolved, That a vote of thanks be extended to the City of Detroit, the Hon. James Couzens, Mayor; the Commissioner of Police, and George Walters, Deputy Commissioner of Police; to the Board of Education, for the use of the Cass Technical High School and other courtesies; to the Board of Commerce, the Detroit Automobile Club, the Detroit Fire Department, the Detroit Safety Convention Committee, and to Mr. Samuel C. Mumford, Chairman, and all other members of that committee; to the Detroit Safety Council, its operating board, its Secretary, Captain Jack Robbins, and all its members and committees, and to all others who

have assisted toward the success of the "No-Accident" week and of this Congress.

On motion the resolutions were unanimously adopted by a rising vote.

PRESIDENT YOUNG: The next item of business is the report of the Nominating Committee.

REPORT OF NOMINATING COMMITTEE

MR. C. H. THOMPSON: Your committee has unanimously nominated the following for election as Directors of the National Safety Council, at the annual meeting, at Detroit, Mich., Aug. 28, 1922, to succeed the Directors whose terms of office expire at that time, and to hold office for three years:

David S. Beyer, Vice-President, Liberty Mutual Insurance Company, Boston, Mass.

John T. Broderick, Supervisor of Safety Department, Baltimore & Ohio Railroad, Baltimore, Md.

C. L. Close, Manager, Bureau of Safety, Sanitation and Welfare, United States Steel Corporation, New York City.

J. B. Douglas, Manager, Claim Department, United Improvement Company, Philadelphia, Pa.

Isalah Hale, Safety Superintendent, Atchison, Topeka & Santa Fe Railroad, Topeka, Kan.

J. D. Jones, General Manager, Algoma Steel Corporation, Sault Ste. Marie, Canada.

Homer E. Niesz, Manager, Industrial Relations, Commonwealth Edison Company, Chicago, Ill.

B. W. Nutt, President, The Safety Equipment Service Company, Cleveland, Ohio.

L. R. Palmer, Director, Safety and Personnel, The Equitable Life Assurance Society, New York City.

Dr. E. George Payne, Principal, Harris Teachers College, St. Louis, Mo.

J. T. Ryan, Vice-President, Mine Safety Appliance Company, Pittsburgh, Pa.

G. E. Sanford, Safety Engineer, General Electric Company, West Lynn, Mass.

David Van Schaack, Director, Bureau of Accident Prevention, Aetna Life Insurance Company, Hartford, Conn.

Arthur Williams, President, Safety Institute of America, New York City.

J. M. Woltz, Safety Director, Youngstown Sheet & Tube Company, Youngstown, Ohio.

(Signed)

C. H. THOMPSON, Chairman.

FRANK J. MCGUE,

H. G. WIBERG,

E. H. FIESINGER,

C. M. ANDERSON.

PRESIDENT YOUNG: Under the provisions of our constitution, the Nominating Committee's report has been made public the requisite number of days in advance. Provision is made that if a member desired to enter an opposition thereto his name may be filed under the proper procedure. No such entry having been made, the recommendations of your committee stand unopposed.

Therefore the Secretary is directed to cast the unanimous ballot of this assembly for the election of those members recommended by your Nominating Committee.

(The unanimous vote of the Congress was recorded by the Secretary for the nominees offered by the committee.)

I have a telegraph message from the President of the United States. It reads as follows:

Washington, D. C., Aug. 28, 1922.

A. H. Young, President, National Safety Council, Cass Technical High School, Detroit, Mich.:

Insistent demands of public duties made it impossible for me to accept your generous invitation to attend your National Convention. I want to assure you, however, of my deep interest in your work and in the cause which brought your Council into existence. Anyone at all familiar with its purposes must recognize in the National Safety Council a powerful agency for correcting a widespread evil. What it has already accomplished toward prevention of accidents, and what it is undertaking to do to extend this excellent work throughout the country, clearly establish the need and value of the organization. Accident prevention cannot be left to legislation alone. Federal, State and local governments have set up safeguards, but these are not enough. I believe that extensive education and intensive practice, under definite rules and regulations, will accomplish very much of benefit. I think your Council can confidently anticipate a great usefulness in this respect, which will be reflected in a great reduction of the toll which carelessness takes of the nation each year. I am glad to record my endorsement of your effort and to be enlisted in the cause of safety.

WARREN G. HARDING.

PRESIDENT YOUNG: It has been moved and seconded that a rising vote of thanks be tendered President Harding for his splendid message. [The vote was unanimous.]

There being no further business, the meeting adjourned.

General Session on Public Safety and Education

August 28, 1922

GEORGE A. WALTERS, Chairman
Deputy Commissioner of Police, Detroit, Mich.

THE meeting was called to order by the President, Mr. A. H. Young.
PRESIDENT YOUNG: We are fortunate to have as a leader of the meeting this afternoon not only one of Detroit's foremost citizens, the Secretary of the Police Commission, but one of the city's foremost safety workers. It is with a great deal of pleasure that at this point I turn the meeting over to Mr. George A. Walters.

CHAIRMAN WALTERS: One of the principal speakers of the country will address us this afternoon, Dr. John Wesley Hill.

SAFETY IN THE LAND OF THE FREE

DR. JOHN WESLEY HILL, CHANCELLOR, LINCOLN MEMORIAL UNIVERSITY.
AUTHOR OF "ABRAHAM LINCOLN—MAN OF GOD." NEW YORK CITY

Safety and Liberty—contrary terms on the surface—plant their roots in common soil. Safety is a condition of liberty; liberty is the fruit of safety. Law is the base and bond of both. Liberty under law, and safety through law, are the hinges upon which the door of civilization swings. The door closes upon the tyranny of unabridged freedom and the perils and catastrophes and barbarisms which follow in its wake. Liberty under law marks the difference between anarchy and constitutional government; between natural rights and civil rights.

Robinson Crusoe was monarch of all he surveyed on his lonely island until Friday arrived. Then his rights were modified by Friday and the rights of both merged into community rights, which both were bound to respect. Only through the recognition of that obligation could both dwell together in peace, happiness and prosperity, and it is only through respect for that bond that social, industrial and civil safety are possible anywhere.

MAY NOT IGNORE DANGER SIGNALS OF HISTORY

"Freedom" does not mean freedom to jeopardize the rights of others and discard the laws of social, moral and political restraint; to ignore

the danger signals of history and civilization, to spurn safety regulations and devices, to trample upon the rights of the public, to exalt the interest of the class above the mass, to resort to violence and bloodshed, starvation and murder, in order to permit the selfish ambitions of the few at the expense of the living comfort and safety of the many. Freedom does not mean that. Such is not the liberty which is the final test of efficient government. It is not, if you please, that concept of liberty in which our republican form of government was born.

The American revolution stands in striking contrast with the French revolution, which came about a little later. Ours was not ushered in with high-sounding phrases, but simply to enforce our rights under the law. That was all that was demanded. We fought in that great struggle, as George Washington said, because our rights under the British constitution had been violated. The French revolution was born under the battlecry of liberty, equality and fraternity—a glittering aphorism. It faded in a short time to the adulation of a memory and it disappeared at Waterloo; while the American revolution, born in the concept of law, under the inspiration of law, rose higher and higher, advanced step by step until, at last, it swelled into the keynote of the "Battle Hymn of the Republic." Today it stands four-square as the very incarnation of law, as the embodiment of the principle of liberty under law, as the rights restrained by constitutional provisions and freedom guaranteed by the same—the grandest system of government of, for and by the people in the history of the world,—a system of which liberty is the cornerstone, while law is the keystone in the royal arch.

DESPOTIC DICTATION NOT PERMITTED IN AMERICA

Today the rights of the American people are safeguarded by a constitution which provides for the protection of individuals and minorities against the oppression of the majority, and for the protection of the majority against the despotic dictations of an encroaching minority.

Ours, as Lincoln declared at Gettysburg, is government of the people. The people constitute the reservoir of political power, which may be likened to the reservoir of a great lake, which furnishes the water that pours over a Niagara. The contents of the reservoir are made up of an infinite number of raindrops, which fall in due season upon the earth's surface and are gathered by the power of gravitation into a great body. In their quiescent state they represent potency; falling over a Niagara they become an irresistible force which may yet be harnessed and utilized for generating the electric power that energizes the wheels of industry and illumines great cities. If suddenly and unexpectedly released from confinement the water of the reservoir becomes a destructive force and we have a Johnstown in irreparable ruin.

The individual citizens constituting society are America's civic raindrops. They are drawn together into political units through the power of sociological gravitation; thus constituting a vast reservoir of political power. In the quiescent state, held within the restraints of law, they represent potency; stirred by the winds of passion, driven by the forces

of envy and hatred, they may foam and threaten like the raging main. Let loose from the barriers of constitutional restraint, as in the French revolution, and today in terror-stricken, starving Russia, they may pour forth and roll out into a veritable flood of revolution and destruction, but with these mighty forces confined within constitutional limits, organized and directed by practical wisdom for the common good, they become the beneficent forces of civilization, moving the productive energies of the country laying by the waste places, and guaranteeing safety and rational freedom to all.

ETERNAL VIGILANCE THE PRICE OF LIBERTY

But the question which today thrusts itself upon us, in its civic field, basic to the industry, basic to the entire industrial and commercial superstructure of our government and of our civilization, the question in this civic field involves the safety of our free institutions and the permanence of our government itself.

The truth is, no form of government known to history is so destructive and perilous as so-called free government. One of our revolutionary heroes, Richard Henry Lee of Virginia, stated in a striking, memorable way an old truism when he declared eternal vigilance is the price of liberty. The same truth was put in a more personal way when it was said: "No man is worthy of freedom who will not win it anew, day by day."

Licence and tyranny unite in opposition to liberty, whose pathway leads between the pit of anarchy on the one hand and the peace of absolutism upon the other. "Watch your step!" is the adjuration of all the centuries past to our American Republic at the present time. In the face of this solemn warning, what answer shall we make to the indictment presented by our distinguished committee of the American Bar Association but recently?

SHORTCOMINGS OF AMERICAN CRIMINAL CODE

Abraham Lincoln forecast this very indictment when he declared "Only internal dissension and disruption can possibly destroy this republic"; when he declared that no foreign power can successfully invade us; when he announced that if this nation ceased to exist, it must die by its own hands. "If we fall into destruction," continuing, he declared, "it must be by suicide," and that we are today in the initial stage of suicide is indicated in this recent indictment of the American Bar Association to which I have referred. Hear it:

"The criminal situation in the United States, so far as crimes of violence are concerned, is worse than in any other civilized country. During the year 1921 there were committed more than 9,500 homicides; in 1920, not less than 9,000"; if we should be inclined to attribute these almost incredible figures to the reactions of the world war we should be shocked to read further, that "in no year during the last ten did the number of homicides fall below 8,500, and that, during the last ten years, no less than 85,000 of our citizens have perished by poison, by the pistol or the knife, or by some other unlawful and deadly instrument."

The same high authority informs us that a very large proportion of these revolting offenses may be accounted for by the inadequacy and insufficiency of the means provided in the United States for coping with crimes and criminals, and states that among the shortcomings are the parole and probation laws that need amendment and better administration. The ease with which pistols, used in 90 percent of the crimes, may be obtained, and the multitude of subterfuges under cover of legal procedure by which trials are postponed and impeded and convictions made uncertain and new trials and reviews allowed on trivial grounds; the fact that in many states juries are made judges both of the law and facts and the evil effects of the indiscriminate herding of young prisoners and first offenders with old and hardened criminals.

MUST RETURN TO LANDMARKS OF LAW AND JUSTICE

Following this indictment, certain fundamental reforms are proposed, calculated to re-establish law in the respect and reverence of millions of our citizens, in whose minds the faults complained of have gradually spread distrust and darkness and apprehension. Even educated and well-informed men and women, lacking in technical legal training, often feel the effect of these involved conditions, and, unable to trace their causes accurately, are in danger of imputing responsibility indiscriminately. Thus, in considerable degree, their whole concept of law gradually changes. Faults that are due to bad legislation, to ignorant interpretation, or to inefficient execution of the statutes, become the basis of a huge prejudice against the law itself, and while this is occurring to hundreds of thousands of citizens of the better class, a similar but much more extreme, violent and unreasoning reaction in the ranks of the uninformed adds millions to the army in whose minds and hearts has flourished traditional loyalty to law, which, when uprooted, may yield a friendly soil to alien seed.

LINCOLN NEVER TOO SOON NOR TOO LATE

Abraham Lincoln illustrates the attitude which should be taken in the work of reconstruction in this great, national, progressive program which is now at hand. He advanced slowly and cautiously. Charles Dana declared before the Historical Society at Hartford that he never was a step too late, nor was he a step too soon; he moved slowly, deliberately and cautiously forward, while the reactionaries and slave sympathizers and owners were crying, "Not so fast, Mr. Lincoln; if you are not careful, you will break something." While the ultra-extremist, the immediate abolitionists, Wendell Phillips, William Lloyd Garrison, Horace Greeley, and that entire school were crying, "Hurry up, Mr. Lincoln; if you are not careful you will lose something," he came walking along, carrying the greatest burden ever imposed upon man or camel, the hope and treasure of the world, the destiny of the Republic, the destiny of democracy and of world civilization. He came slowly along; he was not a stand-patter, but he was a sure-stepper.

We are standing in the midst of a great crisis. We need to hark back to the advice of Lincoln. We need to turn back to that example which

stands in the light, not only of America, but of the world, and we need to see in the spiritual leadership of Abraham Lincoln today providential leadership. When we think of him we do not look backward, we look forward. We feel the impact of a great spiritual personality and we hear him discussing these problems of safety and liberty, coolly and deliberately and wisely. We hear him saying to organized labor, "You cannot go alone, you depend upon capital exactly as capital depends upon you," and again: "Let not him who is houseless tear down the house of his neighbor, but let him apply himself with diligence to the building of one for himself, that when it is constructed it may have a basis of legal permanency and protection upon which to stand."

KEEP ANARCHY OUT OF COUNTRY

No anarchy should be permitted to enter the United States. We have room beneath our flag for only one type of citizenship, only pure, unalloyed, unadulterated, unmixed Americanism under that flag and no other flag.

The man, native or foreign born, that would lower our flag, who would lift above it any other flag, who would strike the colors of Old Glory for the red flag of anarchy, for the red banner of communism, the man who would make such a proposition or such an attempt should be tried for high treason and punished according to the penalty affixed to that particular crime. In the language of old John Dix, "the time has come for America to declare if any man attempts to haul down the American flag, shoot him on the spot."

Blest, twice blest, the Roman who "saw Rome's brightest day"; twenty thousand times more blest the sons and daughters of America who shall live to see her brightest, grandest, greatest day—that day when the majesty of the law shall be recognized and revered by all; that day when the scales of justice shall be held with even balance between the weak and the strong, the rich and the poor, guaranteeing simple equity and justice to all; that day when reason shall substitute violence, when there shall be a recognized legal remedy for every wrong, when arbitration of industrial differences and controversies shall substitute the resort to force; that day when, in the minds of our citizenship, by their patriotism, intelligence and virtue shall all be united, and when beneath and over and above and about this American Republic shall come the inspiration and power of that divine righteousness, that divine power which works for righteousness, that cloudless day when Americans shall move forward in harmonious procession and stand beneath the sheltering arches of a temple of government founded upon justice, up-reared in intelligence, surrounded with law, vibrant with the music of patriotism, arched with righteousness, and above it shall float our wondrous flag, in the ample folds of which shall be written in letters of living gold: "Safety for all and all for safety, now and forevermore."

CHAIRMAN WALTERS: I have great pleasure at this time to introduce Dr. R. M. Little.

PRESENT STATUS OF INDUSTRIAL SAFETY

R. M. LITTLE, DIRECTOR, BUREAU OF REHABILITATION, STATE DEPARTMENT OF
EDUCATION, NEW YORK.

Safety has become an important factor in the industrial life of our country because of its relationship to sound economics, human welfare, the spirit of good will and to production. The safety idea with its corollaries is one of the most valuable and fruitful that has ever entered into our industrial life. Beginning as a fond wish that something might be done to reduce the accident frequency and prevent some of the frightful occurrences that were overtaking workers in hazardous industries, safety has become a great ideal which has clothed itself with concrete forms, worked out practical methods and is achieving splendid results. The idea of safety has taken hold of the imagination, the conscience and the will of a large number of our industrial leaders and it is becoming deeply embedded in many industrial processes. Results already achieved far surpass the most extravagant expectations of those who started the movement. Nothing more remarkable has occurred in the industrial life of our country, in our day, than the transforming and changing influence of this idea and method of industrial safety. Safety is sound, sane and practicable, beneficial both to the management and men, and of great value to our country as a whole. The first outstanding fact, therefore, to which I wish to call your attention is that safety has become deeply and permanently rooted in the better industries of our country and is destined to exert a transforming influence upon the whole industrial life of our land.

BACKGROUND OF SAFETY

Let us try to evaluate the present status of industrial safety by looking briefly at the background of the movement. In civil life men have always been concerned for safety, but until the development of our modern factory system, it was very largely an individual concern, and if there were any safety rules and methods, they were nearly always of the rule of thumb kind. But with the development of modern factory methods and the application of steam and electricity to all the problems of production and distribution, the necessity of something more systematic and effective than the rule of thumb methods of the past became manifest and imperative.

Although this was true, the safety idea had to deal with a difficult, psychological belief that accidents could not in any considerable measure be prevented. There was also embedded in law the old time-worn defenses of the employer, of the assumption of risk, contributory negligence and fellow servant doctrine which shifted upon the worker the responsibility for his safety and absolved the employer from any particular responsibility in the majority of cases for accidents and distress which were overtaking many employees. The safety movement started from this background to general belief in the inevitability of accidents and the probability of an increasing number of them which was embedded in law, controlled the rights of men, and left the major responsibilities for their occurrences upon the injured individual. There was no corporate respon-

sibility for the worker's safety on the job. It required courage, skill and fine enthusiasm to attack the problem in an effective way.

With the rapid development of our industries, particularly manufacturing, mining and transportation, and the greatly stimulated avidity of the American people to make money, modern industry was rapidly becoming a modern Moloch. There was a savage note in the industry of our country fifteen to twenty years ago. Some are present today who, no doubt, remember going through mines, factories, mills and other places of hazardous employment, when one might just as well have taken his chance of safety on the battlefield as in parts of those industries.

THE AWAKENING

However, along with the stimulation of our industrial life, there naturally came to the conscience of a considerable number of employers and workers the conviction that we could not continue to develop wealth by enlarging our industries and speeding up the processes at a horrible sacrifice of men and their welfare. Quite naturally, workers feeling the conditions in which they were placed, suffering the frightful toll which was being exacted among their numbers, commenced to agitate for protective laws and regulations, especially along the line of safeguarding, in order that there might be fewer injuries and not so much poignant suffering. The workers were joined by some enlightened employers. The press took up the subject and by publishing accounts of accidents, attracted the attention of the independent public which resulted in the enactment of factory laws. It is of interest to note that the first factory inspectors were appointed just fifty-five years ago in the state of Massachusetts but without very much law to enforce, and that the first factory law was enacted in the same state forty-five years ago. Now there are factory laws of varying standards in all the forty-eight states and factory inspection is a part of governmental service.

The idea of safety has also found its expression in the Federal statutes. You may recall the long agitation for the Safety Practice Act by the Federal Congress concerning the operation of railroads, and although legislation was resisted by the carriers for twenty years, the act became operative, and I presume that more of us are here in safety because last night while we traveled, the Federal inspectors were along the lines, particularly at points of transfer, seeing that engines, cars and roads were functioning in a normal and safe way in this time of distress and danger.

The Federal Government has established five bureaus which are functioning for safety. There is the Bureau of Safety and Locomotive Inspection of the Interstate Commerce Commission, to which I have just referred, and the splendid Bureau of Standards which is testing materials, developing codes and is co-operating with the American Standardization Committee in framing standards for all the major lines of industrial activity. There is the Bureau of Labor Statistics which was started in the Bureau of Labor and Commerce under Carol D. Wright, and which has been further enlarged in the Federal Department of Labor, a governmental service which has been indispensable to industry, making careful investigations, keeping accurate statistics and furnishing impartial and reliable

information to the industries and the general public. Shocked by horrible mine disasters, Congress established the Bureau of Mines, which has been growing and becoming more serviceable both in the coal mining industry and also in the metal mines. The Bureau maintains a demonstration mine near Pittsburgh, where experiments are made and the demonstration cars visit all parts of the country. The Bureau of Chemistry in the Department of Agriculture is conducting experiments with gases, dust and chemicals, and endeavoring to keep apace with the development of chemistry in industry and its safe and practical application. The Federal Government has over two hundred employees—well educated, scientific men—in the bureaus, and is spending more than two million dollars a year in this service.

WORKMEN'S COMPENSATION ACTS

But factory laws and inspection, and government service along all these lines, were not sufficient to bring home to all employers and the public the imperative necessity of industrial safety. Conditions demanded that a change should be wrought in the common view as to responsibility for accidents. This could only be done by law. When the principle of compensation for industrial injuries was first broached, it seemed to be a revolutionary idea, but the age-long concept of the common law in respect to responsibility for accidents has been changed from one of mere individual responsibility of the worker to the idea of group responsibility, and that if one member suffers, all members suffer with him. Our individualistic conception of life and industry has been fundamentally and permanently altered by a social concept of justice and right, that man is his brother's keeper and that society must stand by every one of its members. The practical result was the enactment of workmen's compensation laws which place a tax upon industry to pay part of the losses caused by accidents.

In 1908 President Taft issued an executive order putting the arsenals, navy yards, rivers and harbor work, and the Panama Canal under the compensation principle in behalf of the civil servants of the Federal Government for injuries and disability incurred while in the line of duty. How long ago? Only fourteen years—practically yesterday. This beginning was followed by an agitation in the industrial states for compensation legislation and after a few years acts were passed. Several of the first state acts were declared unconstitutional which made necessary constitutional changes before permanent legislation could become effective. Now forty-four states, Hawaii, the Philippines and Alaska have compensation laws which usually cover all but agriculture and domestic service. Congress passed an act in 1916 bringing all the civil servants of the United States Government under a compensation law, in some respects the most liberal and comprehensive that has ever been enacted. The workers of our country, except in four southern states, are now protected by compensation laws and ere long legislation will be enacted in these remaining states.

What is the significance of compensation legislation for safety? Workmen's compensation acts place upon industry an occupational tax for the

injuries incurred in industry. Industry, in turn, adds the cost of the accidents to its products and the public at last pays the bill. These compensation acts, therefore, take up the question of accidents, their frequency and severity, the loss of time, spoiled material, interrupted processes and puts it all in a bill which is pressed home to the pocket book of the American people; not merely to their heart and conscience, but also to their purses and the bill is lodged there until it is paid. It stays there and never can be avoided. Compensation laws have come to stay and the only changes within them will be to make them more liberal and effective in their administration. They rest upon justice and economic right; they rest upon truth and national welfare and they enforce the safety idea. They have greatly stimulated safety because many employers quickly discovered that it is cheaper to prevent accidents than it is to pay for them. The economic motive for safety received its greatest impetus from the compensation acts.

LABOR

Let us turn from governmental action to that of citizens in bringing about and establishing the safety movement. I wish to pay my respects to the workers of America and give them a full meed of praise for the constant agitation and demand that they might have an opportunity to spend their working days in comparative safety and health. They first felt the jaws of the modern Moloch; they first experienced the pain, the loss and the sorrow of accidents. The original labor movement in our country commenced with the development of our factory system. One of the questions which labor first took up was that of safety. They gave potent expression to the necessity of factory laws and inspection and also for compensation acts in behalf of injured workers.

CASUALTY COMPANIES

The casualty companies also have shared in establishing the safety movement. They are entitled to much praise for the work which they have done to forward the idea and to develop methods to make the work effective. Quite naturally, when they first entered the field of accident insurance, they took it up from the individual point of view, for that was the prevailing psychological and business opportunity. They have always encouraged individuals to take out accident policies and perhaps always will, but this experience equipped them to share in workmen's compensation insurance, to establish rates, determine reserves, to work out codes and develop safety service for their clients. It is about twenty-eight years since the president of one of the insurance companies in New York, on his own initiative, engaged an inspector of elevators, much to the chagrin of some of the other directors, because he had conceived the revolutionary idea that the company might save money if it would prevent some of the bad elevator accidents that were taking place. Today the casualty companies have at least two thousand safety inspectors and last year one company made 400,000 inspections among its risks and 500,000 recommendations for changes, and spent one million dollars in its total service. Other companies are rendering a proportionate service. The stock and

mutual companies are spending about three million dollars per annum in this service. The insurance companies developed the schedule and experience rating systems which make known an accurate knowledge of the cost of accidents to the insured. They early experimented with codes, educational literature, bulletin service and various methods for educating workers in safe habits and practices. The insurance companies are entitled to great credit for the fine part which they have taken in establishing the idea and methods of industrial safety.

EMPLOYERS

What part have the employers, themselves, taken in the development of safety? Has safety become deeply and permanently rooted in the industrial structure without the co-operation of industrial leaders? No, it has not. Employers have always had some regard for the safety and welfare of their employees. They were not leaders for workmen's compensation laws and many of them were very reluctant to give up the common law defenses which placed the responsibility for accidents very largely upon the individual worker. It was natural for them to object to the compensation principle because it was a departure from all legal precedents and they were alarmed about the cost, and were not sure that the laws would be beneficial. They were tenacious for the old position in which they felt secure. They did not understand compensation. It was something foreign and seemed socialistic. Group responsibility was contrary to the psychology of America at the beginning of this generation and it is still contrary to the psychology of many Americans, but there were representative employers, forward-looking men, who were just and generous and who wanted to do the fair and the right thing by their employees. These were more concerned that the substance of the laws should be just and the administration of them be impartial and efficient than to defeat the legislation. I feel sure that the majority of employers now are in full accord with the sound, sane and just legislation concerning factory laws and inspection, workmen's compensation, corporate responsibility for injuries, not self-imposed, and that they will stand for anything that will advance the well-being of their employees because they have discovered that these laws conserve their own interests and the welfare of society.

NATIONAL SAFETY COUNCIL

This background made the opportunity for the National Safety Council. A few young men who were identified with the basic industries, who had trained minds, warm hearts and a vision of better conditions, started the Council. This organization which we love so much had its inception with those who had actual experience in industries. The Council has been made by men who knew, and who saw clearly, a great need. It has been kept true to facts but has been inspired by ideals. The Council is a wonderful illustration of the power of practical idealism. It has become the great leader for industrial safety and is also becoming the leader for public safety. The Council floor is the place for the interchange of ideas, and the center for instruction and inspiration, and an occasion for good fellowship and optimism. Wonderful has been its development and bright is its future.

RECESSION

We meet in this Eleventh Congress of the Council after a period of recession in industrial safety. During the past two years there has been a slump in safety because there has been a recession in most all fine activities since the war. The war hurt the world more than any one can ever tell. It struck at the very roots of the meaning of human life and fellowship everywhere. The fact that the safety movement weathered the storm three-fourths and more is a splendid tribute to a movement so recently established. The membership in the Council has shrunk 25 per cent, but if the movement were not so well grounded the loss in membership would have been much larger. We have been passing through trying times. Wood, hay and stubble have been burned up and only the gold, silver and precious stones have survived the refining fire.

When the chief executive officer of one of our largest corporations received from all the subsidiaries and subdivisions of the corporation the annual report of their safety work, and it was pointed out to him that in several of the plants there had been a let-down in accident prevention work, he at once sent a letter to the heads of these various divisions, calling their attention to the fact and urging them to put forth new efforts in behalf of safety, sanitation and welfare. His act stabilized safety in that great organization and caused them quickly to regain lost ground. Another great corporation in the midst of the depression, when many of their mills and factories were closed and a part of their world market gone, and they did not know whether they would recover it or not, assembled together at headquarters the leading executives of the corporation and representatives of all their plants and spent three days going over their safety work, carefully analyzing their methods, checking up the results and perfecting their organizations for more effective accident prevention. These are two illustrations of how many large industries which have made safety an integral part of their business, seized the occasion of industrial depression to plan for more effective accident prevention. These are the companies and the type of men who are the backbone of the safety movement in our country.

Commonly speaking, there are three types of employers concerning safety:

1. The intelligent and far-seeing men who study the whole question of accidents as to costs and lowered morale and who, after they have fully analyzed the subject, have adopted safety as a fundamental part of their industrial policy. They check up their expense month by month and year by year, eliminate weaknesses, correct mistakes and achieve constructive results. They employ good safety leaders, spend money freely and use safety as a vitalizing element to raise the standard of morale in their plants. Consequently, such employers stand fast and are of good courage in a time of industrial depression.
2. There is another type of employer who has taken up safety upon the recommendation of others; who has heard of its fine effect in similar industries to his own, but who does not personally go through the whole subject to determine its value. He accepts a plan

of safety organization and education recommended by some one else, places it in charge of a more or less competent leader but does not keep in close touch with the work. He hopes it will succeed. He is favorable to the undertaking but does not interest himself in it. He may have a year of good experience and then a year of bad experience, but when a wave of depression comes over the country, he loses courage and, wishing to curtail expenses, he cuts down safety work.

3. The third type of employer is in the dark ages as regards safety. If a workman is hurt, it is his own fault. Factory laws and state inspection are an irritation. Compensation laws are a socialistic scheme. They encourage malingering and make it impossible for a man to manage his own business. Compelled by law, he buys insurance and leaves it to the insurance company to pay the losses without making a study of the causes of accidents and their costs. He is busy buying raw materials, managing productive processes and selling in the markets of the world. He does not know very much about insurance except its cost, and it never occurs to him that the losses might be turned into assets and the idea and method of safety be used as a constructive element in his business. There are not many of this type among the larger employers, but during the past year I have met with many of them among the smaller employers in the State of New York.

The recession in the safety movement has taken place among the second and third classes of employers and the movement has been sustained and made stronger by the first type. This is about the present status of the industrial safety movement. It is here to stay, deeply anchored, with a wonderful background and a remarkable development, but still has a great field to conquer.

THE FUTURE

What of the future? It is bright with promise, because of the splendid results already accomplished. This Congress will, in part, determine the future. Your presence assures that.

Permit me to make a few suggestions, however, and one of them is that the problem of industrial safety is now quite largely one of reaching the small employer. The large employer has a well equipped organization and can carry the overhead, does things in a fine, large way, and for the most part has accepted safety and incorporated it as a part of his business. Safety is with him for the rest of his days, but we must recognize that most of the workers of our country are engaged in small industries. Only about 650 manufacturers employ one thousand workers. There are 65,000 factories in the State of New York alone and only a few hundred of them have one thousand employees. It becomes, therefore, a question of reaching the small employer who has from twenty-five to one hundred workers. Those of us who are acquainted with compensation, rehabilitation, and industrial medicine and surgery, know that much of the misfortune and misery comes from the small industries, many of which are poorly equipped, weakly financed and not always well managed.

Small industries are subject to factory laws and inspection and must pay compensation costs, but laws and their enforcement are not sufficient to promote industrial safety. Something more is needed. Perhaps in time the Council may be able to reach more small employers with its educational service and it is gratifying that now there are so many of them members of the Council.

RESPONSIBILITY OF CASUALTY COMPANIES

It seems, however, that the insurance companies should do more to promote safety in small plants because they carry nearly all their insurance. Large corporations are rapidly becoming self-insurers and this tendency no doubt will increase. Small employers naturally turn to the casualty companies and this places upon the carriers both an economic and a moral responsibility to do everything possible to promote safety in these plants. Some insurance companies do give an excellent service and are generous in assisting the insured where the premium is small, but there are many companies which have practically no safety service and it might be improved among the best. Unfortunately, the casualty companies look upon the workmen's compensation field as an economic opportunity without sufficient sense of civic responsibility. Apparently most companies do not recognize the anomalous position which they occupy. The United States Supreme Court has declared that workmen's compensation is an occupational tax and if private companies or groups assume the right or ask for the privilege of collecting public taxes, they owe a serious public responsibility to render a service commensurate with the taxes that they collect. Casualty companies are not participating in compensation insurance by natural right, but by a governmental courtesy. If the business should be taken from them they will not be deprived of natural rights. If they stay in the business, they must justify their participation by the service which they render and a very considerable part of that service must be among the small employers. It is well known that there is a great agitation in the country to deny casualty companies the opportunity of participating in workmen's compensation insurance and to have the whole subject managed either by exclusive state funds or by self insurers giving bond to the state to discharge all liabilities. Indeed, in seven states, the doors have already been closed to the casualty companies. It is a mooted question and much may be said on both sides. Personally, I would much rather see the casualty companies improve their service to the insured and justify their participation in the business by promoting safety and reducing accidents than to place the whole responsibility in the state governments. I am sufficiently well acquainted with government functions—both federal and state—to recognize that it would be very difficult to provide the initiative and flexible management by the government which is necessary for the promotion of industrial safety and sanitation. There is also the danger that if the state were carrying the insurance that both employers and employees would be more disposed to depend upon the state for benefits than they do upon private companies, and safety would not be advanced. On the other hand, private insurance costs too much and there is the prevailing view that the companies are

selfish, that they have only an economic aim to serve, that they are not generous in dealing with claims; too often they manifest the old "claim beating" spirit, particularly as to border-line claims, and they take too many appeals and are too long in settlements. Workers desire more liberal laws, shorter waiting periods, better medical and surgical service and prompter payments, and when they know that nearly 40 cents of every dollar of insurance premium goes to overhead and profit and injured workers receive about 60 cents out of each dollar, they think there is something wrong in the system. They have become irritated and feel that their misfortunes are being exploited for private gain. The compensation laws were enacted primarily for the benefit of the workers but many of them have come to feel that the casualty companies have taken possession of the laws and their administration for their own benefit.

Of course, this is a one-sided statement of the question, not altogether true of any insurance company, but partially true of all of them. In view of this deep feeling among workers, and intelligent citizens, it behooves the casualty companies to improve the service to their clients along the lines of safety, inspection, medical and surgical service, organization, and education, and also to be more generous in the settlement of claims. Many representatives of the insurance companies in the field recognize this necessity. There are no better safety men among the industries than the higher type of representatives of insurance companies who are keen for safety, intelligent, warm-hearted, who go the limit to promote safety and are fair and prompt in adjusting claims, but it is well known that the field representatives of most companies are restricted and sometimes held back by the home offices. When the chief officials are more concerned for dividends than they are for the good reputation of their companies in the field, it is not surprising that there should be a growing agitation against their participation in compensation insurance.

CONCLUSION

All is not well with the safety movement because all is not well with the country, all is not well in industry, all is not well with the world, but the safety movement has within it as much good and potency for better things as anything which we can take hold of in industrial life. We must be true to the cause, be strong and of a good courage, joining hand in hand with the same interest, frankness and co-operation, that has characterized the Council in the past, and the country will go forward in industrial safety, and the time will come when accidents will have been reduced 25, 50 and 75 per cent in practically all our industries. This Council represents a method and process for the gradual diminishing and extinction of accidents in the industries of America.

WHY AND HOW INDUSTRY SHOULD HELP DEVELOP THE HABIT OF SAFETY IN THE COMMUNITY

A. H. LICHTY, VICE-PRESIDENT, THE COLORADO FUEL AND IRON COMPANY,
DENVER, COLO.

[Read by H. W. Forster, in author's absence.]

Safety devices have long since been manufactured and installed; they have prevented many painful and costly accidents. Mr. Arthur

Ridgeway, Chief Safety Director of the Denver and Rio Grande Western Railway, recently voiced what seems to be a very generally accepted opinion of those who are well informed when he said: "Even if our safety appliances were perfected, 90 per cent of our injuries from accidents would continue to occur." This being true, something more than safety appliances is needed.

In the January, 1922, issue of *Safety Engineering*, Harrington Shafer, Safety Director of the Minnequa Steel Works, Pueblo, Colo., said in part: "The writer cannot escape the conviction that we are overlooking three factors which vitally affect our accident records. One of these is the lack of proper education or instruction of children in safety while at home and in school. We can have an unlimited amount of safety devices, but the main part of any safety program must be the early instruction of the children."

That active interest in safety is needed by those outside of industry is clearly evidenced by the following illustration by Mr. Lew R. Palmer of the Equitable Life Assurance Society, New York, who said: "In a large industrial organization, in what is conceded to be a hazardous industry, where a splendid record in accident prevention has been attained, seven out of fifteen fatalities that occurred during 1921 were due to public causes outside the plants included in this organization."

The executive in charge of approximately 3,000 motor vehicles, representing a cash investment of \$6,000,000 by a large corporation, recently told me that 75 per cent of his accidents annually were due to other people carelessly running into his cars. Some way must be found, therefore, to permanently interest all individuals more deeply in the subject of safety in such a way that it will become both a conscious and an unconscious part of their daily lives and habits if the real need is to be adequately met.

WHY BEGIN WITH THE SCHOOL CHILDREN?

Among the reasons mentioned by some who have thought much about the question as to why safety instruction should begin with the children are: 1. The child who is taught safety in the public school as part of his regular educational training, will, when he turns up at the gate, have these fundamental principles and safe habits inculcated in his demeanor. Then, too, the children can often get the parents to do things that would be virtually impossible to accomplish any other way. 2. Habits formed during the plastic period of childhood largely determine one's actions throughout life. It is the best time in life to develop ideals, attitude and knowledge regarding safety. Their minds are more receptive and their impressions more lasting. Such instruction can very properly be included in many of their studies, particularly arithmetic, geography, English and civics. 3. Carefulness is largely a habit of personal conduct and these habits are seldom changed after one is old enough to go to work. Most industrial accidents happen to the individual who, at the time, was working as he chose to work. It takes a comparatively short time to inculcate a habit of conduct when the mind is impressionable, as in a school child. 4. If the children are properly trained

and educated in general safety matters, we will have throughout the country a much better generation within the next few years in the matter of *thinking* safety as well as co-operating with the many agencies which actively support and promote safety. 5. In childhood there is a willingness to receive instruction which is not usually manifest in later years. If safety is taught in school, the child will consider it on a par in importance with other subjects taught there. 6. "In some states, for example, Massachusetts," says Mr. Lewis E. MacBrayne, "accidents to children have shown an increase while accidents to adults have shown a decrease. In Chicago and Cook County 512 children were accidentally killed in 1921; 243 of those fatalities occurred in street accidents." 7. Ultimately the children in school today will be the workmen and managers of industry, railroads and public utilities. In those cases where safety work has not accomplished much it is usually found that the executives of the business have not been thoroughly sold on safety. If we teach the children safety, all the future races will be more likely to be in sympathy with safety. 8. The instinct of self-preservation in childhood has not yet been dulled by contact with many dangerous situations and the child is easily impressed with the value of safety to himself. 9. Dr. E. George Payne informs us that, in 1916, 10,534 children under 10 years of age were killed by accidents in the United States and that 250,000 others were seriously injured. He further says that three-fourths of all accidental deaths are preventable and they occur during the most productive years of life—20 to 50 years.

WHY SHOULD INDUSTRY CO-OPERATE?

There are many good reasons why industry should co-operate more largely with the community, particularly with the public schools, in providing proper instruction along safety lines; among these are: 1. Mr. Cyrus H. McCormick, of the International Harvester Company, says in substance: "No person has a right to live in a community and simply produce and sell selfishly, without taking his or their fair share of responsibility for contributing to the country's highest interests." This position is supported by President George M. Verity of the American Rolling Mill Company, who says: "Every right-minded, sound-hearted individual or group of individuals should contribute in proportion to his or their ability to world-progress and to the advancement of all those things that make for human opportunity, development and ultimate happiness." 2. Oregon's course of safety studies for 1921 says: "To the Nation, accidents mean a loss of man-power, a decrease in production, a lowering of standards of living and an increase of poverty and of the demands for philanthropic aid from killed or severely injured men. Industry has a responsibility for helping reduce accidents as far as possible." 3. "Accident prevention," says Mr. Roger W. Babson, "belongs in the column of business economy and not in charity or welfare enterprises." A practical evidence of this position is illustrated in the fact that the Cutler Hammer plant of Wisconsin decreased compensation for industrial accidents from \$1.55 per person in their employ in 1919, to 53 cents per person in 1921. Just as it is economically sound to add perma-

ment improvements to fulfill future needs of a company, it is economically sound now to train future workmen through educating them as children in the schools in safety principles and practice. 4. T. Alford Fleming, in December, 1921, *National Safety News*, says: "A 1919 survey of all schools in this country revealed the fact that 92 per cent of all the public schools were in worse physical condition from a fire-hazard standpoint than was the Collinwood (Ohio) school when it took fire some years ago and burned 173 children. An average of five schools burn every day during the year." 5. "It has been my experience," says Carl Smith, Secretary-Manager, St. Louis Safety Council, "that where a man has been a professor in school for twenty years, like a number have been in St. Louis, they are not progressive and it is hard to get these old fellows to awaken to the necessity for safety instruction, and it is hard to convince them that by including safety instruction in the curriculum it will not add to their labors. Once they have given the idea a trial they become safety enthusiasts. Every industrial man should make it his business to see that safety is included as a part of the instruction to the children." 6. Managers and employees in industry form a large part of the constituency of the public school and are interested in the safety of their own and their neighbor's children. 7. Schools are supported by taxation; industry pays a large part of this tax and therefore should see that this money is expended to the best advantage of those served by the schools. 8. It is only a question of time until industry will reap much direct benefit from such co-operation. We are told that from one-sixth to one-third of all accidents occur within industry. The coming generation will be more friendly toward safety work. 9. National Safety Headquarters reports that of the 75,000 men, women and children killed by accidents in the United States last year, 23,000 were killed in industry.

HOW CAN INDUSTRY MOST HELPFULLY CO-OPERATE?

The careful studies made of accident-prevention work in recent years have shown that safeguarding and discipline will account for only a small percentage of the reduction in accidents. The larger part of the reduction is due to education, and safety is best taught in the younger years.

Mr. J. C. Townsend, Grand Rapids, expresses what is no doubt the real truth, namely, that the reason there has not already been a larger co-operation on the part of industry is not because of a lack of willingness but rather because of a lack of understanding as to how industry might most helpfully and effectively co-operate.

However, much progress of a very encouraging nature has already been made in enlisting community-wide interest and participation in safety activities. Among those instances which are very fertile in suggestion are the following: In 1920, Mr. Fred L. Lange, Director of Safety for the Ohio State Industrial Commission, reported that 223 of the 245 district superintendents and every city and county superintendent of schools in Ohio promised co-operation in the state-wide educational campaign for safety. He attached much importance to the use of Dr. George E. Payne's book, "Education In Accident Prevention." The Tacoma Rail-

way and Power Company some years ago initiated the Safety Scout idea and has very effectively co-operated with the school authorities in promoting it among the public school children of their city, with very great satisfaction to all concerned. Syracuse and Rochester, New York, have organized Junior Safety Councils among the school children. The children assist the teachers in promoting safety education, report accidents and dangerous conditions, watch the smaller children on the streets, and are pledged to do all they can to help others think first of their safety. The term of office in those organizations is of only three months' duration and re-election is prohibited. Under the auspices of the City Safety Council the delegates from the Junior Council meet monthly, hear inspirational safety talks, receive practical accident-prevention and first-aid training and are supplied with appropriate safety literature. They are required to report back to their respective groups of constituents. Industry can effectively further such useful service by co-operating with the local branch of the National Safety Council.

TWO FACTORS OF FUNDAMENTAL IMPORTANCE

Dr. George E. Payne says that to make safety work most effective among school children two factors are of fundamental importance: 1. That the teachers should be fully convinced as to the merit and practical value of the idea and (2) that some one person should be charged with responsibility for making the undertaking a success. In a large city he recommends an assistant superintendent for such work.

Greater Milwaukee has a safety cadet organization with a charter membership of 1,700. "St. Louis has a similar organization with a membership of probably 20,000 boys enrolled," says Carl Smith. "Of this 20,000, from 3,500 to 4,000 meet once a month. They furnish their own music, have their own officers, board of governors, board of directors, safety films and safety speakers. Reports of these meetings are given to their parents as well as to their respective constituents. They have succeeded in reducing the number of fatal accidents among school children annually from 50 in 1917 to 18 in 1921. Fatal accidents for the city totaled 110 in 1917 and 37 in 1921. They have thus saved, in four years, the lives of a number equivalent to two rooms of school children from death by accident. As a further result of the co-operation between the local Safety Council and the board of education, all teachers have been supplied with a monthly report of accidents in their respective districts. The St. Louis local Safety Council also conducted a safe-drivers' school for men, with an enrollment of 600 and a similar school for women in which 225 were enlisted. Monthly meetings of delivery truck managers for the promotion of safety maintenance and the operation of commercial trucks were conducted. They supplied the public schools with safety motion picture films and slides.

ENCOURAGING CHILDREN IN SAFETY WORK

Among the other large cities that have effectively promoted somewhat similar activities are Grand Rapids, Detroit, Chicago, Boston and Portland, Ore. Mr. C. W. Price, formerly General Manager of the National

Safety Council, is authority for the statement that safety is already being taught in the schools, as a regular course, in more than 100 cities and towns. A large Wisconsin industry (*National Safety News*, Feb. 23, 1920) has successfully co-operated with the school authorities in putting on "Safety Saturdays" in the city auditorium. The program consisted of singing, both en masse and by school groups; appropriate safety talks by the chief of police, the fire chief and others; the film "Careless America" was shown and every person present was given a copy of the pamphlet, "Safety in the Home." I am informed that Wisconsin, with the help of the Milwaukee Safety Council, has prepared a textbook as a guide for every teacher in the state in teaching safety. Oregon has a similar book.

The Department of Labor and Industry at Harrisburg, Pa., has offered and awarded both the Camp Curtin and the Edison schools cash prizes of \$50 each for essays of from 450 to 550 words on the subject "In the Interests of Good Scholarship, of Good Citizenship and of the Prevention of Accidents." The fund was distributed, \$20 to the first, \$15 to the second, \$10 to each the third and fourth, and \$5 to the fifth.

Among the very helpful booklets and pamphlets issued for use among the school children in this connection are: "Ten Safety Stories for Young People," issued by the Massachusetts Safety Council through the Safe Roads Federation for schoolroom use; "The Safety Scout Guide," issued by the Tacoma (Washington) Railway and Power Company; "Sure Pop and the Safety Scouts," which shows that the Safety First movement among children is based upon the same high principles as the Boy Scouts and Camp Fire Girls movements, develops self-reliance, courage, helpfulness and respect for the rights of others; "Harry Hop-the-Train," issued by the E. P. and S. W. R. R., contains the startling statement that during the last twenty-four years 31,000 children under 18 years of age were accidentally killed, maimed, crippled or injured—enough to more than supply one for every mile post around the world.

POPULARIZING SAFETY STUDY IN SCHOOLS

Mr. J. C. Townsend, of Grand Rapids, and Mr. H. E. Hollensbe, of Rochester, suggest that well-guarded and adequately organized industrial concerns might well extend invitations to classes, or representatives of classes, to visit their respective plants and take notes. They believe that such plants would thus provide practical object lessons which would have far reaching influences.

Mr. Harry J. Bell, Chicago, suggests that industry can lend the most helpful co-operation in developing community-wide interest and active participation in the habit of safety by supporting both the National and also the local Safety Council, where one exists, and aid in the development of Local Councils, where they do not now exist, in communities large enough to support and maintain them. Such co-operation should include financial support, volunteer service and supplying such statistics, charts, photographs, films and other information having most value, and in at least those instances where it seems advisable, supply a sufficient number of suitable textbooks to warrant getting the work well under way. With all of these suggestions I heartily agree.

From what has been said thus far in this discussion the following conclusions seem justified: 1. Even though we want in no way to either minimize the importance or lighten the pressure of safety work among adults, the most productive field for additional safety instruction is that among school children. They will be most responsive to such instruction; with them the impressions will be more lasting and many of them will form real habits of safety and thus yield lifelong results.

2. Industry has a responsibility for co-operating, and doubtless in many instances for taking the initiative in making such instruction possible for at least two reasons: (a) As a matter of self-protection; sooner or later many of these boys and girls, as young men and women, will enter industry and yield a very direct return upon the investment or become a corresponding liability if such instruction is neglected. (b) Industry now heavily pays—through medical attention, surgical and hospital care and financial compensation—for the results of the carelessness of its employees. It also contributes generously through outright gifts or through taxation toward the support of those charitable and philanthropic institutions which necessarily exist for the proper care of those unfortunates or their dependents who become seriously injured or who lose their lives outside of industry.

RECOGNIZING A PUBLIC DUTY

3. Men and women investors organized in a group as an industrial company or corporation have a responsibility to society for helping promote the common good, just as they have as individuals. How much more in the way of lasting and satisfying results for themselves, and how much more of happiness to those who would otherwise become unfortunates, can industry secure from the same investment of money and effort if spent upon constructive preventive work among human beings at the most impressionable period of their lives. The dividends upon the investment are so much larger and better, measured by any and every way one may desire.

4. While there may be many instances where industry has a responsibility for taking the initiative in promoting safety education and while there are many very definite, helpful and constructive activities which could be so carried on, it is the opinion of the author of this paper that such provision should be looked upon only as a temporary arrangement wherever there is a community large enough to later warrant an active local branch of the National Safety Council. It would seem that such a local branch, with the backing of the national organization, composed very largely, as it is, of those who have been and are now specializing in safety instruction and work, would, without doubt, be able to enlist the active interest of a far larger percentage of the community than could an industrial organization whose particular effort and first attention must constantly be given to something else. The returns upon the investment would thus, without question, be far larger and the subject of returns upon a given investment is one in which every stockholder or manager is obliged to confess has interest for him.

5. There is already ample evidence to convince any open-minded man that safety instruction, when properly correlated with our other public school instruction, happily dovetails into it; does not necessarily make the work of the teacher more burdensome, affords added interest in his studies for the pupil, and quickly and very naturally enlists the pupil in unselfish service for others. While there are exceptions, as a rule the progressive-spirited educators of our days are ready to take long strides forward in this direction if we will only give them the additional co-operation which they themselves, their pupils—your children and mine—and the cause of safety so well merit. Until such co-operation is tendered in a spirit of sane and genuine sincerity, and the contrary is demonstrated, the burden of proof is surely upon the leaders of industry.

CHAIRMAN WALTERS: The next address is by Dr. John J. Tigert.

THE NEED FOR SAFETY EDUCATION IN OUR PUBLIC SCHOOLS

JNO. J. TIGERT, UNITED STATES COMMISSIONER OF EDUCATION

Among living beings there are none which are more helpless or less likely to survive if put upon their own resources at the beginning of life than man. Nor is there an animal which requires a longer period of care before becoming self-sufficient than man. The period of dependency of the infant is more protracted than that of any other creature whether beast, bird, fish or reptile. Years are required for the boy or girl to learn to cope successfully with natural necessities and dangers, such as hunger, cold, disease, and the elements. In the modern world the difficulties of the young child in its environment have been greatly increased because of the dangers arising from man's own inventions and power over the forces of nature. Steam, electricity, and the manifold application of machinery have enormously complicated the problem of man's survival through infancy, childhood, and even maturity in his environment.

The lower animals have been wondrously supplied with instincts which enable them almost from the beginning to make the proper reactions and adjustments in their environment which will enable them to preserve life and grow. The necessary responses are made by the animal for its preservation and development in a purely mechanical way without consciousness of the ends attained. The chick scarcely flutters from its broken shell and dries before it begins to stagger about and pick up nourishment. A passing shadow is sufficient to send it beneath the wing of the mother hen, into a bush or other protective covering, against danger from the hawk, approaching storm or other impending harm. Certainly, the chick does not understand why it eats or any of the wherefores of its instinctive acts. Similarly, other forms of animal life below the level of man are provided with instincts which from almost the beginning of life adapt the particular species to its environment so that its life and welfare is conserved. In these animals, therefore, there is relatively little need or opportunity for education in the

course of their growth. The mature animal has relatively only a few more instinctive acts than the young one.

EDUCATION AND HUMAN DEVELOPMENT

In the case of man, development is relatively quite different from other animals. Man possesses a few instinctive actions at birth without which it would be impossible for the infant to survive, such as the instinct to suck, but the comparative sufficiency of these instinctive acts in man is much less than in the animals. The long period required for locomotion, speech and adequate reasoning which are of such fundamental importance in the life of man all combine to make him helpless at the outset. As the boy or girl grows reason and habit come more and more to perform the functions which are preferred by instincts in animals. The animal is relatively a creature of instinct. Man is relatively a creature of habit and reason. Education, therefore, comes to have a most significant place in human development. Man has instincts, but a proportionately large part of his behavior is conscious action depending upon his modes of thinking, willing, and feeling. His attitudes and habits are formed largely from instinctive complexes and are the result of training. In the face of danger, the animal usually has one instinctive action which tends to protect it but man must learn how to act amid conflicting impulses.

If the foregoing principles are recognized, then it is evident that children should require very careful training in the early years to insure proper attitudes and reactions in the face of impending dangers. These theoretical hypotheses based upon the facts of psychology are borne out especially in two directions. First, the neglect of proper education along the lines of protection and safety results in many fatalities. Secondly, where systematic instruction and training have been employed, the result has been a great reduction in the percentage of accidents and fatalities upon children.

SAFETY TEACHING IN SCHOOLS OF GREAT VALUE

The experience in a number of cities, among which St. Louis and Detroit are notable examples, shows that proper instruction and training in the schools will prevent annually many thousand deaths and accidents. This statement doubtless requires no proof in an organization like the National Safety Council but I wish to cite some evidences which though familiar to you are perhaps not generally known. Dr. E. George Payne has been a pioneer in the field of education to prevent accidents and death and his statement on the subject incorporated in the Sixty-sixth Annual Report of the Board of Education of the City of St. Louis is the most convincing argument that we have seen for safety instruction in the schools. The experience in St. Louis and the facts reported by Dr. Payne leave no room to doubt that mortality and accidents have been reduced in a most striking way by systematic efforts in the school-room. He reports the widest divergence in the number of accidents among different schools.

In the seven high schools of St. Louis in a period of sixteen months there were eighty-four accidents, of which thirty-four were confined to one school, twenty-four to another, while one school had only one accident. The same kind of discrepancy was found to exist during the same period of time in the number of accidents among the elementary schools. Out of a total of 122 elementary schools, 17 schools had practically one-half of the accidents. A careful analysis set out in detail by Dr. Payne shows that these wide differences in the number of accidents occurring in the schools could not be explained on the ground of street environment or any other variable condition or factor but are plainly explicable only in the home training and school instruction of the children.

In one school district which is unfavorably located to avoid accidents, with three street car lines running through it, intersected with congested streets and automobile thoroughfares and skirted by most of the railroads entering the city, there was naturally a high degree of mortality and many serious accidents. Safety instruction was begun in this school with unmistakable results. During two years of systematic instruction to promote safety, this school has had no accidents either on the ground or going to or from school. Furthermore, not a single accident has occurred to a child living in the district.

FATALITIES AMONG SCHOOL CHILDREN

In Dr. Payne's report we find also the following: "In 1917 there were 123 fatal accidents to persons under twenty. Of these, fifty accidents occurred to children between 6 and 16. The ages, 6 to 16, seem appropriate because between these ages lie most of the elementary school children."

Dr. Payne then reports fatalities among children of school age in St. Louis as follows: 1917, 50 deaths; 1918, 36 deaths; 1919, 49 deaths; 1920, 20 deaths. Commenting upon these figures, he says: "Several points should be noted. In 1917 no systematic work in accident prevention was done, and the number of fatalities was fifty. Nineteen hundred and eighteen shows a decrease to thirty-six when there naturally should have been an increase. This decrease is due to the fact that in September a systematic no-accident campaign was carried on through the schools and was continued rather systematically for the remainder of the year. In 1919 systematic work was done in only one or two schools, and the number again increased to forty-nine. The effect of instruction in 1918 carried over to a certain degree, and this, in addition to some work that was done in 1919, caused the number of accidents to be less than in 1917. The number would perhaps have reached sixty had nothing been done. Toward the end of 1919 a manual authorized by the National Safety Council was put into all the schools and systematic work was begun in most of them. The result is shown in the statistics for 1920. This year shows a decrease of more than 60 per cent from 1919, and 80 per

cent over what might have been, had the conditions of 1917 prevailed, together with the increase of accident opportunity in the city."

DISREGARD OF SAFETY INSTRUCTION AKIN TO MURDER

These figures are conclusive in showing that the number of accidents among school children is variable with systematic instruction. The failure to provide instruction inevitably increases accidents and safety instruction reduces them in a most striking manner even when other variable factors might lead one to expect an increase. Under these circumstances, it would seem that the disregard of proper safety instruction in schools is akin to murder.

Statistics published by the Health Service of the American Red Cross show that deaths among children of school age due to accidents are proportionately much larger than among either younger children or older persons. Out of each 1,000 deaths of children between the ages of 5 and 9, 167 are due to accidents; of children between 10 and 14, 177 are due to accidents. In proportion deaths due to accident among children under five years of age and among adults are quite small.

All who have studied the need and result of safety instruction in the schools agree that such instruction, while having its greatest effect upon the school children, at the same time indirectly operates with good effect upon parents and others.

The mere attention of parents to the facts and figures alone cannot fail to be helpful. When I see from the mortality statistics of the Bureau of the Census that more than 40 per cent of the fatalities of children under 5 years of age are due to burns and over 20 per cent to poisoning, but beyond those years accidents from these causes tend greatly to diminish and that from the ages of 5 to 14 years the most prolific source of death is vehicles, this realization alone is a great assistance in knowing how to protect my own children. The most cursory study of the problem of accident prevention begins to yield salutary effects.

GREAT WORK DONE IN MANY CITIES

The conviction that systematic instruction is a powerful weapon to attack unnecessary accidents is not confined to school men, but is common among police officers and others who have studied the problem.

The following are cited as typical opinions of officials in three leading cities:

Martin O'Brien, chief of police, St. Louis: "Safety education in schools and safety films in motion picture houses, giving instruction both for children and for motorists will aid in reducing accidents."

J. P. Townsend, manager of Safety Council, Grand Rapids, Mich: "Our judgment is that the education of both pedestrians and drivers is necessary."

Peter F. Gilmartin, chief of police, Providence, R. I.: "A campaign of education to teach both children and adults to use proper care, and severe punishment for those who may be inclined to disregard the law are the best means of accident prevention."

Those who have employed safety instruction have everywhere been pleased with results. A great work has been done in many cities. The

results in St. Louis have been mentioned. Detroit is another city which has accomplished wonderful things and is to be congratulated upon the splendid activities and results achieved by Miss Beard, the energetic Supervisor of its Safety Education Department and another great pioneer in the field of safety instruction.

In view of all that is being done in some places and the evidently incalculable value of the safety program in our schools, the lethargy in other places is appalling and appears nothing short of criminal. If only a few lives were saved the value would be immeasurable, for who can estimate the value or put a price on the life of one American boy or girl? Instead a whole harvest of lives may be easily reaped by Life which are now being reaped by Death.

DESTRUCTION MORE INTERESTING THAN CONSTRUCTION

Perhaps the lack of interest of some on this question may be accounted for by the psychological principle that destruction is more interesting to many than construction; a burning house will draw a crowd which one under construction fails to attract, one man killed arouses more interest than a multitude saved; a murder sometimes enlists interest and is given space in the newspaper which a birth or skillful operation to preserve life might not get; Napoleon, the grim destroyer of thousands, yea millions, was once the idol of France and almost the world; Pasteur, the savior of countless lives, was relatively unknown. But the fact that recently Pasteur was voted the greatest of Frenchmen in a national referendum and Napoleon received but a puny vote encourages us to believe that everywhere in America we shall soon find more interest in the preservation of life than in avoidable death.

After a brief discussion the meeting adjourned.

General Session: Engineering

Under the Auspices of Engineering Section

Tuesday, August 29, 1922

H. W. FORSTER, Chairman

Vice-President, Independence Bureau, Philadelphia, Pa.

GEORGE T. FONDA, Vice-Chairman

Fonda-Tolsted, Inc., Washington, D. C.

SIDNEY J. WILLIAMS, Secretary

National Safety Council, Chicago, Ills.

CHAIRMAN FORSTER: I am very happy indeed to welcome you on behalf of the Engineering Section of the National Safety Council. Most of you realize that engineering is a very important aspect to accident prevention. A few years ago it was thought that the educational end of the work was virtually all of it because most accidents can be prevented by educational methods, but when you study the severity of accidents and the fatalities that result, the record is very clear that an astonishingly large number of accidents of a serious type are due to lack of proper engineering. Our various Sections understand that clearly and their individual programs, as you will observe, contain many engineering items. However, there are some engineering questions of a general character and it is to give them a hearing that this Section was created.

Mr. M. F. Crass is the first speaker.

SAFETY IN THE HANDLING AND USE OF ACIDS

M. F. CRASS, GRASSELLI CHEMICAL COMPANY, CLEVELAND, OHIO

Acid may be likened unto fire in that it is a good servant but a dangerous master. There is a good deal of misconception regarding acid plants in the mind of the ordinary citizen who associates it with an evil smelling place, to be heartily avoided. But to the acid man it is one of the healthiest of places and the acid man is seldom sick with a germ disease. As for the smell, well, he won't admit there is any, yet he will—if he stays away from the plant long enough—become homesick for it.

The fire comparison is an apt one, for it is very true acids can be handled with perfect safety by those having knowledge of their char-

acter. The resistance of various materials and metals to the action of the acid must be known, otherwise the element of danger in handling will be increased, to say nothing of excessive deterioration. It is not safe for novices to mix acids or combinations of chemicals, for many acids and chemicals, harmless in themselves, become deadly when mixed as was evidenced recently when a Cleveland highschool lad was fatally burned while experimenting with mixtures of which he had no certain knowledge.

The question of containers is inseparably linked with our subject, for it is only by the use of the best approved types of containers that maximum safety is obtained. Tank cars, drums and carboys may be considered in their turn. In loading tank cars the matter of outage, or free air space, in the tank is important. Sixty-degree acid expands in volume .0312 per cent per 1 degree Fahrenheit. A 20-degree variation in acid temperature on a 100,000-pound tank will require an outage equivalent to 624 pounds acid, otherwise acid will be forced out of the tank through the rupture of the safety disc or if no such vent is provided there is danger of the bursting of the tank. In either case there would be danger present to railroad and industrial employees. We wish also to call attention to a recent explosion where a mixed-acid tank was blown up with extreme violence and two men were killed. Inasmuch as mixed acid does not detonate and is a safe commodity to ship in a proper container, this accident resulted in an investigation which developed that the tank had been previously used for the transportation of spent acid. The mixed acid was not a factor in the explosion.

SAFE PRACTICES APPLIED TO TANK CARS

Several instances have come to my attention of late where instructions governing the pressure applied for the discharging of tank cars were not observed. In one case, in the East, a tank car was reported leaking badly on the road and an investigation developed the fact that the consignee on a prior movement applied at least three times the pressure permitted. Another recent case was reported where the dome cover was blown off the tank and hurled high in the air; the retaining lugs were torn loose, due to the application of double the pressure permitted. Many consignees unload tank cars by hitching the air connection to their air main, which in many instances is kept under a pressure of from 80 to 100 pounds, the only regulatory appliance used being a cock which in known instances was not adequate protection against undue pressure. Thirty-pound pressure should be sufficient to discharge any tank car and if it will not a pump should be used.

Careful attention should be given to the proper placement and condition of dome gaskets. If leakage results under pressure the pressure should be released and the gasket reset before continuing with the unloading.

Accidents more or less serious have been caused by a lack of protection to men loading and unloading tank cars. The rounded surface of the tank affords insecure footing for a workman taking off and replacing a dome cover during the course of loading a tank. This danger

is intensified during wet and frosty weather—the presence of snow or ice on the tank sheets, etc. Even when weather conditions are good a little sloppage of some kinds of acids makes a slippery base and the best protection to the workman is none too good for this work. Some concerns have adopted a stationary platform around the dome; this has its advantages and disadvantages. Another contrivance in the form of a lift platform which, when lowered into place rests on the tank sheet, serves as a walkway from the loading rack to the open dome of tank car, it also gives the required platform protection. I have some prints of types I would be glad to show to any interested. The observance of these precautions both in the loading and unloading of tank cars will go a long way toward reducing accidents from this operation to the minimum.

DRUMS

The standard twelve-gauge 110-gallon drum approved by the Bureau of Explosives can be handled and shipped with entire safety. Expansion of acid in this tight container should always be provided for by leaving at least 3 inches of air space under the drum plug. The plug should be loosened sufficiently at destination to release any pressure which may be present—a half-turn is usually sufficient. Cases have been known where drums have been stored in hot working rooms, without this precaution being exercised, resulting in the blowing up of the container with more or less disastrous results. Drums in the ammonia and other services carrying liquor of a more or less high volatility require careful attention in this respect.

Before repairing acid drums they should be carefully washed out with water or, better still, with an alkali solution. No open flame should be used in connection with repairs until all acid contained is thoroughly neutralized, otherwise the generation of hydrogen gas within the drum is likely to cause an explosion.

CARBOYS AND ACID STORAGE TANKS

There is now a porous earthenware stopper on the market which releases pressure as fast as it accumulates and thus the danger of the blowing up of a carboy with a sulphated seal is avoided. A hand-operated syphon can now be procured which is entirely safe for drawing off small quantities of acid from carboys. All carboys when emptied should be carefully drained. The non-observance of this rule has caused many accidents.

All sulphuric acid storage tanks should be equipped with bottom outlet tapered plugs in addition to the outlet control cock. The latter has been known to give way and if a control plug is not present serious loss of acid may be suffered with the attendant danger to workmen.

Many tanks are equipped with pump connections for drawing off acid to elevations. When repairs to these pumps are necessary care should be exercised to keep naked flames away, for the generation of hydrogen gas in the acid end has been the cause of more than one serious accident.

Stuck cores in acid cocks, whether of earthenware or of duriron, should be opened with great care. The usual procedure is to tap the core; many serious burns have resulted through the first not being equipped with clamp and bib to prevent the core from jumping and spurting acid in the operator's face; the latter should also be equipped in like manner.

NITRIC ACID FUMES

When a carboy is broken, brown fumes are liberated; workmen should keep out of this gas zone. Let the acid go to waste but keep the workmen away. If water in quantity is available, turn a hose on the leakage, the more used the better. If a workman is known to have inhaled any of the fumes he should be kept under close observation and, better still, put in charge of a physician for the first twenty-four hours—any danger will pass in this time. Take no chances with such cases. This danger is emphasized for the gassing symptoms may not develop for hours after exposure. The same symptoms should be guarded against if it becomes necessary to enter sulphuric or mixed-acid tanks. It is not safe to permit a workman to enter a tank until it has been thoroughly flushed out with water and even then it is good practice to wear a gas mask with a canister especially suited for the purpose. A volume could be written on the use of respirators and gas masks, some types of which are useful and some are useless, each special case would necessarily have to be treated or considered separately.

All acid lines in plants should be inspected at regular intervals. The overhead line should be as free from sharp bends as possible (swing ells are best) and are preferable to buried lines. They last longer, drain better and no danger need be feared from them if kept in good condition. Weak or badly corroded lines should not be allowed to exist. It is patent that any pressure line in poor condition is dangerous—especially an acid line. All sour or acid-soaked earth should be dug up and replaced with fresh soil or sand. A workman digging in acid-soaked soil may suffer a severe burn on eye case. If soil cannot well be removed—neutralize with milk of lime or soda ash.

Fumes arising from pickling vats are a nuisance but one not dangerous and preparations are on the market which largely reduce this trouble. The question of how a man should be cared for when splashed with acid cannot be answered by a general prescription.

ACID BURNS REQUIRE PROMPT ATTENTION

Muriatic acid can be readily washed off with water. Sulphuric acid, especially the higher concentrated forms, may cause very bad burns. If the contact is slight, wiping off the acid with a rag or piece of clothing can be followed with water application. Where the patient is sprayed over with acid in quantity the excess should be quickly wiped off, tear off the clothing as quickly as possible and use the clean parts for wiping, then follow with a copious supply of water. If the washing is attempted before removing clothing or insufficient water is used, the chemical heat generated by the admixture of acid and water may and in many cases

has produced very severe burns. The washing is promptly followed by the application in liberal measure of some neutralizing healing agent. Nitric acid is in a class by itself and because of the nature of the burns caused—scarring of tissue and difficulty in healing—should receive the most prompt treatment. Washing of the afflicted part with water, followed by the application of a neutralizing and healing ointment, is the accepted procedure, but this is first aid only and such cases should be put under the care of a physician as promptly as possible.

No repairs should ever be made to an acid line without the connecting valves being tightly closed and locked and guards for this purpose should be installed on all controlling valves. Insist on rigid periodic (daily when apparatus is in use) inspections of all acid lines and apparatus. Especially guard against overhead leaks.

This brings us to the goggle proposition and no article on the handling of acids would be complete without emphasizing the necessity of wearing goggles at points where there is any likelihood of the splashing of acid. Men cleaning containers or dipping acid therefrom, mechanics engaged in repairs to lines and other acid-conveying apparatus should be compelled to wear goggles on penalty of discharge. If indeed a man's eyes are the windows of his soul, verily he should guard them zealously—yet one of the hardest rules to enforce in a chemical plant (and I suppose in other plants) is the wearing of goggles when there is a possible hazard present.

(Mr. Crass exhibited several slides illustrating dangers in the use and handling of acids.)

DISCUSSION

CHAIRMAN FORSTER: The paper which Mr. Crass has just presented is to be discussed briefly by two of our good fellow workers in the vineyard, the first of whom is Mr. E. F. Blank, who has experience in handling acids in metal working plants.

MR. E. F. BLANK (Buick Motor Company): The acids used in our plant come to us in carboys—principally hydrochloric, sulphuric and nitric, which are used for pickling, cleaning, tinning and soldering. We receive the acid out of the cars, and both for convenience and safety we use a timber hook—having a handle like a canthook with a pair of tongs which hook into the box. The men carrying the acid carboys are considerably farther away from the carboy than they would be if they were handling it by taking hold of the box by the handles. This has helped us considerably. We used to handle them by hand and if the bottom fell out of a carboy, it was almost sure to splash on the employees' feet and possibly over their bodies. All the men handling acid are warned particularly as to the hazards of the work.

CAUSE OF CARBOY ACCIDENTS

The carboys are loaded onto a platform, where they are stocked. We have not had the bottom fall out of a carboy in two years, but we used to have a lot of trouble from that source—we found it was because of the way we stored our acid when we received it. The acid was unloaded from the cars and stored on the ground, the moisture of the ground rot-

ted the bottom boards in the carboy, and when we went to handle it to ship it to the different plants the bottom boards fell out, letting the glass container drop to the ground. Since we have provided wooden platforms, which protect it from the weather, we have not had this trouble. We have not yet experienced an accident where we thought the bottom fell out because of corrosion of the nails, on account of the acid splashing from the top and leaking down through the bottom of the box.

The carboys are taken to the different plants where they have been requisitioned for use, and stocked there in a place which is specially provided; we pour the acid from the carboys by the aid of inclinators, several types of which are in use. We use the inclinator to pour the acids into copper pails or special copper buckets. In our soldering and sheet metal department we use a bucket eight or ten inches in diameter and a foot to sixteen inches in height. They have bails and a spout. These special containers are made in the sheet metal department and are used for carrying the acids to the men engaged in soldering, tinning, etc. The acid is poured into the crocks and used directly in the operations.

PRECAUTIONS TAKEN TO AVOID ACID BURNS

In our pickling room, where we use acid solutions for cleaning and brushing a casting, the acid is poured directly from the carboy into the tanks. The men handling the acid wear rubber boots, rubber aprons and rubber gloves. There is very little danger in any of our operations from splashes. We have taken particular pains to instruct all of the men engaged in this work to pour the acid very slowly and we have not had a serious acid burn for quite some time.

Wherever we have disagreeable fumes we try to exhaust them with a fan and a hood over the pan—most of the systems exhausting the fumes to the back of the tank, away from the operator, rather than from the top.

Wherever acid is used we have installed first-aid bottles of sodium bicarbonate. We have instructed the men, in case of minor burns, to wipe their hands with a dry, clean cloth before using the first-aid remedies. For other cases we have tanks of water where the men can irrigate the burns and then apply the sodium bicarbonate. A little first-aid container of sheet metal holding about eight ounces, is hung up wherever there are acid operations, and is readily accessible to anyone that might receive a small splash of acid on the hands. Where men are handling the carboys we have larger containers, so if they should be splashed with acid they can get a larger quantity of sodium bicarbonate to neutralize the effects of the burning acid.

CHAIRMAN FORSTER: The next discussion of Mr. Crass' paper is by another well-known worker, Mr. A. P. Costigane, who represents our sister country across the way.

EXTREME CARE NECESSARY IN HANDLING SULPHURIC ACID

MR. A. F. COSTIGANE (Ontario Pulp and Paper Makers' Safety Association, Toronto, Ont.): The acid hazard in the pulp and paper industry used to cause us considerable trouble, but now, I think, we have it pretty well under control. Most of the plans referred to this afternoon—the

wearing of rubber gloves, goggles and other precautions taken in the handling of carboys—we have endeavored to put into effect. I use the word "endeavored" because we are not always successful. The acids, used in a small way in the pulp and paper industry, are nitric and sulphuric. Sulphuric acid, we find, is a little more difficult to deal with than nitric acid, principally for the reason that it is not volatile. To illustrate: In handling sulphuric acid, suppose a drop gets on the edge of the clothing, either the wrist or at other extremities—that acid will not evaporate. Any impurities will evaporate and leave the acid in a more concentrated solution and the edge of the clothing saturated with concentrated acid will set up an operation which, if not taken care of quickly, very often will develop into a septic wound. That we avoid if we possibly can.

USE OF OXYGEN GAS MASKS WILL PREVENT ACCIDENTS

Nitric acid is used in testing paper. It is used in very small quantities taken from small containers. When the container is used employees are instructed, as a precaution, to catch the last drop on the stopper and to replace the stopper carefully in the bottle. We have not had much trouble.

When handling carboys in tilting frames we try to get our men, if possible, before removing the stopper from the carboy, to have the carboy in a position just about ready for pouring. In that way we avoid or reduce to a minimum, we think, the danger of splashing. The methods used in treating acid burns, described by the principal speaker, apply to the pulp and paper industry, as do the precautions taken to secure non-leakage in pipe lines.

Some years ago we had considerable trouble in making repairs in acid lines. Masks and oxygen helmets were not generally used and men rushed into an acid-laden chamber and worked as long as they could, then made a hasty exit; sometimes they had to be dragged out. With the oxygen helmet we find that we can make repairs comfortably and without danger. Therefore, we try, wherever possible, to get companies to supply oxygen gas masks, which, if you would only look at it from a proper point of view, is money in your pocket.

When opening up a pumphouse, after the acid has been refined, in preparation for re-loading, I advocate strongly that oxygen helmets and oxygen masks be within easy reach of the employee; he is up at a great height and unless something is within easy reach of him, even though he gives a danger signal, it is some little time before assistance can reach him.

CHAIRMAN FORSTER: The second section of our program deals with the enclosed switch as a safety device. We felt that the best presentation of the subject would be under two heads: one by an engineer who understands this type of construction—what he or the manufacturer is trying to get, or can get, in the way of safety elements—and the second a brief address by a man who is using safety switches on a large scale: who knows how they work in industry.

Mr. Dana Pierce of New York City, in charge of the electrical department of Underwriters Laboratories, will be our first speaker. He is well qualified to talk on this subject.

A BRIEF ANALYSIS OF ENCLOSED SWITCH DESIGN

DANA PIERCE, VICE-PRESIDENT, UNDERWRITERS' LABORATORIES,
NEW YORK CITY

The purpose of this paper is to present some of the aspects of the question of enclosed or safety switches by describing in general terms the typical forms of switches and by stating briefly some of the principal arguments advanced for them. No pretense is made for either historical or technical completeness in what follows and no consideration is given to patent rights or to exclusive designs of any manufacturer.

The terms "enclosed switch" and "safety switch" will be used interchangeably as meaning a switch which affords or is at least intended to afford some degree of protection to the passer-by and more particularly to the operator of it from arcing or from shock or both. It is not the purpose of this paper to draw conclusions or to propose rules, or a standard either for the construction of safety switches or for their installation and use.

FUSED AND UNFUSED SWITCHES

Enclosed switches may be either fused or unfused. The fused switch is the more common and also the one involving the greater number of features requiring consideration; naturally it is the one about which there has been and is still the greatest difference of opinion. We may dispose of the unfused switch briefly by remarking that, if it has its terminals and other live or current-carrying parts enclosed in a substantial grounded metal case and has an external operating handle, it presumably is an adequate safety device, of course with the further understanding that access to its interior by unauthorized persons is controlled by the use of a lock of some sort. No one but an inspector or a test man need open the case, so it is assumed, for our present purpose, that the lock will keep others out. However this may be, our further discussion will deal with fused switches only.

We may conveniently develop the several methods and degrees of protection in a fused switch by considering its parts one by one. The case or enclosure should, of course, surround completely all the live parts. Cases are almost always made either of sheet steel or of cast iron. If the wires are brought to them in steel conduits, made up tightly to the cases, the cases are thereby grounded, provided the conduit ground is reliably made. Many conduit-system grounds are none too good, but they are usually depended upon to furnish the ground of appliance housings connected to the piping.

If the wiring to the switch is in open work—that is, cables supported on insulators—each switchbox should be independently grounded by a

permanent wire. The difficulty in arranging for this and in keeping the ground wires in order is one of the chief objections to open wiring for switches.

CASES OF NON-CONDUCTING MATERIAL

Cases of non-conducting material would be better than metal cases from the electrical-accident viewpoint, but they are not easy to make, may lack strength, are heavy and expensive. They do not form an electrically continuous link between the portions of the conduit system on each side of them, so that it is necessary in some cases to provide a separate ground for the conduit on one side of them by bonding around them or otherwise. Some small switches have been made with substantial all-porcelain enclosures but this cannot be done with switches of larger size.

Since the fuses must be accessible there must be a door or cover. There may be two doors, one opening to the switch parts and the other to the fuses in a separate compartment; obviously doors should be hinged so that they cannot be taken away. In most switches there is means for locking the door shut by a padlock or something of the sort. If opening a door exposes live fuse parts or other live parts, it is evident that the degree of protection is dependent on keeping the door locked and in limiting the use of keys to the properly authorized or qualified persons. Even such persons are exposed when they open the door and it can be argued that they are entitled to protection also. To what extent locks and the use and control of them can be or should be depended upon is a question the writer is not ready to define. It is a real question but probably not one confined to enclosed switches only. The protection afforded by a lock depends, in some measure, upon the vigilance and efficiency of the management in regard to safety affairs.

REACHING INTO CASE IS HAZARDOUS

Let us now assume that we have a strong, grounded case for our switch, with a door and, if you choose, a lock and key. The ordinary use of the device is simply to open and close the circuit by the switch. If the operator has to open the box to do this the value of the enclosure vanishes. In fact, operating a switch which is inside a grounded case by reaching into the case is more hazardous than operating an open switch because the hands may touch a live part and the adjacent grounded box at the same time, thereby almost ensuring his getting a shock. There must, therefore, be an exterior operating handle. This handle should be grounded, if of metal or partly of metal, and usually its contact with the metal case accomplishes this well enough. There should be a marking to indicate the open and the closed positions of the switch blades and means for locking the switch in the "off" position. For some few cases locking in the "on" position also is desirable but generally not. We now have an enclosed fused switch which can be normally opened and closed from the outside without opening the case.

WHEN WE OPEN THE CASE TROUBLE BEGINS

It is when we open the case that our troubles begin. The case will be opened for one of two purposes; first, to examine the condition of the

interior parts and observe their action, and, secondly, to test or to replace fuses which have blown, and in either case we have the problem of protecting the user against arcs and still more against shock.

The simplest form of an enclosed, externally operated switch is the one in which the opening of the door can be accomplished without first opening the switch. The switch may be opened first but need not be. The opened door then may expose live terminals, live switch blades and live fuses and the user's safety then depends solely upon his care in handling the parts he must touch to accomplish his purpose. He should, if wise and careful, have opened the switch before opening the door. If he has not done so he is exposed to the arc when he opens the switch to kill the fuses. He may even begin to withdraw the fuses with the switch still closed. The construction of this switch does not compel him to be safe. Furthermore, he can either intentionally or inadvertently touch other live parts and thereby receive a shock. The likelihood of this can be and sometimes is reduced by barriers, cover plates or simply by arranging the dangerous parts deep in the box.

ACCIDENT PROTECTION BUILT INTO SWITCH

An advantage of this construction, in the opinion of some, is its simplicity and the fact that the action of the switch in opening and closing the circuit, the fit of the blades in the contacts, and so forth, are always readily observable because the switch can be opened and closed while the door is open and the parts visible. How far this consideration outweighs the lack of complete built-in protection is a matter of opinion and judgment. It probably varies under differing conditions of maintenance and use. A switch of this general type is the one known as Underwriters' Laboratories, classification B, enclosed switch.

Some of the accident protection is built into the switch, some is dependent upon the lock, and the rest, such as it is, depends upon the way it is used. Some people decline to honor this device with the title of "safety switch" but there are very many of them being made and used. For service-entrance switches, where the supplying company controls the lock, they are very generally used.

We next arrive at the point of doing something to compel opening the switch before opening the door. This is usually some form of interlock between the operating handle and the door and there are many variations of it. The simplest is the one that prevents opening the door till after the switch has been thrown to the off position. Then the door can be opened, with the result that live parts of the switch may be exposed to contact. If the supply and load wires have been properly connected to the marked terminals the fuses are dead and the switch blades also. Of course, these conditions may not have been complied with or there may even be a stray current into the switch from the load side. In the simplest case, after the door is opened it is possible to open and close the switch blades or the blades may accidentally get closed while the fuses are being handled.

USER MUST ALWAYS EXERCISE CARE

Just one more item of safety has been built into the device; the switch must be opened before the door is opened. The user must, thereafter, exercise some care. Switches with only this simplest interlock are also placed under classification B of the Laboratories.

As a variation of this form of interlock is the switch in which there is a latch or other piece which prevents the closing of the switch while the door remains open unless the user intentionally pushes the latch out of the way. This scheme adds another element of protection, but such switches are still classed as classification B.

The next element which may be introduced is to make the interlock complete and positive; that is, such that the case cannot be opened until the switch is opened and then the switch cannot by any means be closed till the door is closed. With this, of course, goes the arrangement by which the fuse terminals are made dead by the opening of the switch and must remain dead at all times when the fuses are exposed for inspection or replacement. The user cannot get at live fuses, neither can he observe the action of the switch and its contacts, because the switch can be operated only when it is shut up in the closed case. This is by some considered a disadvantage of this type of device.

DOOR OPENED ONLY FOR INSPECTION

A variation of this consists of putting the switch in one compartment and the fuses in another. The switch enclosure is controlled by a lock on the door which need never be opened except for inspection or test of the switching parts and the fuse compartment door is positively interlocked with the switch mechanism. The replacing of fuses is made safe and the inspection of the switch action is possible to the authorized inspector. Most, if not all, such switches provide protection against accidental contact with live parts other than fuse terminals but in somewhat varying degree. Both these types of interlocked switches are described by Underwriters' Laboratories as classification A.

It should be carefully noted that in all the arrangements so far described it has been assumed that the wiring will be properly connected to the switch; that is, in such a way that the opening of the switch will disconnect the fuses from the incoming power. If the switch is connected so that the power wires are attached to one end of the fuses the safety feature is lost because the fuses will always be alive. Of course, this mistake in wiring should not be made. Again, some change in the circuits or some accidental cross may result in making the fuses alive even when the switch is open and the safety feature is again destroyed.

DISCONNECTING BOTH ENDS OF FUSES

Such things are probably not very frequent but they are possibilities and guarding against them leads to the last form of switch you are asked to consider. In this the arrangement is such that opening the switch interlocked with the door results in disconnecting *both* ends of the fuses from all wiring, leaving them wholly isolated so long as the switch and

the door are open. A switch incorporating this feature and all the characteristics of a classification A switch and having complete protection against accidental contact with all live parts under all conditions of normal use and fuse replacement is a classification AA switch of Underwriters' Laboratories. In it the design and construction of the device provide all the elements of safety without dependence upon locks, the care of the operator, the correctness of the work of the installer or the continuance of normal circuit arrangements.

There remains but one further item to complete this description of switches. You will note that in what has been said so far our attention has been directed to the fuses and to whether they are dead or alive when exposed. Fuses are the parts which must be handled, but there are other live parts which may be accessible in differing degrees. If these parts are so covered when the door is open that they cannot be touched the hazard from them is removed. In existing types of switches the accessibility of live parts varies quite widely; in some no parts are exposed while in others there are parts exposed more or less.

WIDE DIVERSITY OF OPINION EXISTS

From this brief outline of enclosed switch designs it is quite apparent that a wide diversity exists in the built-in safety available and actually used. All types have their advocates, not only among the makers of switches but also among users of electrical equipment and among safety engineers. The use of an enclosing case, an external operating handle capable of being locked off and an arrangement of the circuit so that the switch will disconnect the fuses from the line except possibly in service switches, these are features on which there are practically no differences of opinion. Beyond these there is at present much difference of opinion as to how much built-in safety it is necessary or reasonable to demand. Whatever requirements there may be in codes or rules existing or proposed it seems a fact that practice is not yet standardized. Reliable statistics on switch accidents are not very extensive so far as the present speaker is informed. Few safety problems can be solved without some consideration of commercial interests, economy of equipment, costs, convenience of operation and other practical viewpoints. The safety switch is no exception. The choice of a switch is seldom made from theoretical safety reasons alone. It is easy to argue that the greatest degree of safety attainable by any means should always be sought and required regardless of all else. It is equally easy to argue that it is unreasonable to demand protection against accidents only remotely possible at the expense of complicating the devices used, increasing their cost and introducing certain operating inconveniences.

EXPERIENCE AND STATISTICS ESTABLISH STANDARDS

As stated at the beginning this is a non-controversial statement of certain facts about enclosed or safety switches, as hitherto developed, and without conclusions. The conclusions to be drawn from it and from the entire discussion of the problems involved must ultimately come from a

widening experience, from more convincing statistics and from such consensus of opinion as they may conceivably establish.

This paper will have accomplished its purpose if it serves as a guide to a clear and fairly complete description of the several physical means used and now available for securing safety in the design and construction of switches.

DISCUSSION

CHAIRMAN FORSTER: We have had a very scholarly presentation of the problem by Mr. Pierce. We will now have a brief discussion by Mr. N. B. Laing.

THE ENCLOSED SWITCH AS A SAFETY DEVICE

N. B. LAING, ELECTRICAL ENGINEERING DEPT., FORD MOTOR CO., DETROIT.

I can hardly hope to advance new arguments for or against the enclosed knife switch as a safety device. The manufacturers of this type of equipment, as the original propagandists, have done their work so well that legislation compels the use of their product in several States. A great deal of literature on this subject has been presented to your Council from time to time, so I did not propose to discuss the question from all angles.

I will limit my remarks to a brief outline of the experience of the Ford Motor Company with the enclosed type of switch. The Ford Motor Company generates and consumes electrical energy at the rate of 35,000 kilowatts at peak load, and except in the winter months the load factor runs between 75 and 80 per cent over the twenty-four-hour day.

At the present time there are 15,000 motors in service, nearly all of which operate on direct current at 230 volts. In most cases each motor is directly connected to a single machine, forming what is called individual drive. There are only a few "group drive" applications in the plant in which the motor drives a number of machines by means of line shafting and belts.

Of the 15,000 motors in service, over 13,000 are in sizes of $7\frac{1}{2}$ horsepower and smaller. All these motors are started by automatic starters with push button control. Each motor and starter unit is connected to the power mains through an enclosed knife switch operated by means of an external hand lever. Each one of these starting devices is equipped with a contactor or circuit breaker which opens the load current in shutting down the motor. It is obvious, then, that ordinarily the enclosed knife switch is not used to open the loaded motor circuit. It is used only as a disconnecting switch, and is opened as a safety measure when work is to be done on the machine or the driving motor. For this reason, our experience with the enclosed switch is limited, and no valuable information has been gained regarding the clearances required to permit arcs to break safely, nor on the volume required in a box to prevent destructive pressure from developing when opening heavy loads. But occasionally a

motor circuit is interrupted by means of the enclosed knife switch, and this makes necessary the quick-break feature which is incorporated in all commercial boxes. A quick break of contact is just as necessary on these knife switches as it is on the ordinary push switches and snap switches used on lighting circuits.

We have found that in our particular plant it is not necessary to have a lock on the door of the sheet metal box enclosing a knife switch. The door is caught shut by a simple latch actuated by gravity, and this latch is not interlocked in any way with the switch operating lever. There are fifty thousand employees, mostly machinists and factory hands, who are constantly operating this equipment, and injury from electric shock is almost unknown. Of course these men have been warned against tampering with the electrical devices, and motor tenders or maintenance men are available on a moment's notice when electrical trouble develops.

No doubt a great deal of our luck in the matter of safety from electric shock can be attributed to the low voltage of distribution, namely, 230 volts. An accidental poke from this source is seldom serious. The electrical men are sometimes burned or have their eyes flashed when accidental short circuits occur during their maintenance work. It is highly important that a switch-box have plenty of room for safe inspection and maintenance, particularly if fuses are enclosed in the same box.

But the chief trouble with the enclosed switch is the tendency of the operating lever to prevaricate. When the mechanism of the switch gets out of order the lever is sometimes thrown without effecting the proper movement of the switch blades. This is not usually dangerous when an attempt is made to close the switch, for everybody stands clear of the machine at that time. But when the lever is thrown to the open position and the switch fails to follow suit, all the trouble in the world is invited. Possibly only one blade remains in the closed position, in which case an electrical maintenance man is in danger of being shocked or burned when going about repair work. Or perhaps all the blades remain in the closed position. This would not be indicated by a continued rotation of the motor, since the automatic starting device has previously stopped the motor. This latter contingency has been the cause of too many accidents at the Ford Motor Co. If an electrical man is very cautious he may open the door and be sure the switch is open before going to work on the circuit. But the machine man, who is changing drills or dies or removing turnings or punchings, is not permitted to open these switch boxes; his only indication is the outside lever.

We have had several cases where a machine has started, with a man working on it, and accidents ranging from the loss of a finger to one fatality have resulted. In fact the only accidents of any seriousness which have occurred at the Ford Motor Company in connection with the use of the enclosed switch, have been due to the failure of the switch to open when the operating lever was thrown into the open position.

This is a serious fault, and it must be overcome. A more rugged mechanism will lessen the chance of failure, or it may be possible to de-

wise some practicable method of indicating the actual position of the switch blades independently of the outer lever.

But in spite of some drawbacks, the enclosed switch should certainly be classed as a safety device. I think it is generally accepted that individual motor drive of machines is safer for the operators than group drive with line shafting and belts. But individual drive means that electric service must be connected to each machine and this would not be safe if an exposed knife switch were placed within reach of every machine-operator.

Furthermore, automatic starting equipment with push button control make the individual drive doubly safe, for push buttons to stop the machine may be placed at any point within easy reach of the operator. But with these installations it is highly desirable to use an enclosed switch to disconnect the entire circuit from the power mains, on account of the danger of the motor starting by accident while workmen are not expecting it.

If there are any questions you would like to ask, gentlemen. I would be glad to submit to a cross-examination.

CHAIRMAN FORSTER: The next speaker was my school teacher, fifteen or sixteen years ago, and it is a particular joy to be in the reversed position. Happily, I am technically in control of the meeting, and it is a great pleasure to call on Professor Rogers.

STATIC ELECTRICITY—WHAT IT IS AND HOW IT BEHAVES

F. A. ROGERS, LEWIS INSTITUTE, CHICAGO

Static electricity means electricity standing still, and if you could get it to stand still there would not be much hazard in static electricity. The trouble with it is, it doesn't stand still, but appears to jump from whatever it happens to touch, and in jumping, if it hits the air and creates a spark, it is liable at times to cause fire.

You will probably recall, from your old textbook on physics, that as long ago as 600 B. C. the Greeks discovered that amber, rubbed with certain substances, such as wool, possessed the property of attracting certain light objects, such as pith of wood or hair. Amber, in the Greek, was called "electrone," and from this name we get the word "electricity."

It was more than 2,000 years afterward, however, that Gilbert, the Englishman—the physician of Queen Elizabeth—found a substance other than amber that possesses this property of picking up certain little objects when rubbed with certain other things. I want to perform one or two of these very simple experiments to start with, to explain by modern theory what causes this effect.

STRUCTURE OF THE ATOM

I have here a suspended wire, a little piece of silk, and I am going to try rubbing a piece of glass with silk and hanging it in this stirrup.

Now I take another piece of glass and rub that with the same piece of silk to see if we can get any effect. (Demonstrating.) You will notice that the one piece pushes the other away.

Now we take a piece of ebonite (hard rubber) and rub it with a piece of catskin. We find in this case that we have an attraction between the glass and the ebonite instead of a repulsion. We apparently have two kinds of electrification; the kind we get on the glass by rubbing with silk we call positive; the kind we get on the ebonite bar by rubbing with catskin we call negative.

To explain, I will call your attention to the structure of the atom. The modern theory is that in the atom we have a central nucleus which contains a positive charge—it contains about 1799/1800 of the mass of the whole atom. Surrounding, or, rather, connected with this central nucleus, but situated some distance from it, we have another small mass called an electron, which contains a negative charge; in some cases we have a good many of these negative charges.

DISCHARGE POWER OF POINTS

When we rub a piece of glass with a piece of silk we rub off some of the electrons; that is, we rub off some of the negative and, of course, that leaves the predominance positive; then the silk contains more electrons than it had before, while the glass contains less electrons than it had before. When we rub a piece of ebonite rod with a piece of fur, we rub some of the electrons off the fur on to the ebonite. Then we have what we call a negative charge, an excess of the negative.

You are familiar with the old, simple experiment that you can perform in the wintertime in almost any house; that is, dragging your feet across the rug or carpet and then touching someone with your finger, the spark jumps off, with many times a little bit of a shock; or you can touch a radiator and get a spark. Those sparks are the dangerous things that may cause fire under certain conditions.

We have here what is called a gold-leaf electroscope. It has a knob on the top and a rod running down into it, and down at the bottom on a little stirrup, some gold leaf which forms two separate leaves. If we charge the glass rod, and bring it near the knob, a charge is induced in the electroscope. That is one of the sensitive detectors. You can try it around a belt or any place where static electricity develops.

The next thing I want to call your attention to is the discharge power of points. I think it was Benjamin Franklin who discovered the discharge power of points and made use of it in lightning rods. (Demonstrating with apparatus.)

On a belt, you know, the electricity is produced by friction and it can be collected by points. The better way to collect it would probably be to construct a series of conductors from the belt; something very flexible, something that will not scratch the belt, because in a good many cases, where belts are running, if you have points you will naturally have a discharge, and you don't want a discharge in this place.

EXPLANATION OF THE CONDENSER

I think, possibly, I could give you a brief explanation of the condenser. (Demonstrating with apparatus and drawing.) Condensers may be used in certain devices. For example, they are used in this little detector. It is used actually in automobile ignition work; it can, however, be used in other places. It consists of a tube which contains neon, one of the atmospheric gases. When the electricity passes through it it gives a spectrum which is very largely red, or, rather, orange. This has a condenser in it, and the current of electricity has to go through the tube and charges the condenser. You test a spark plug or anything you want to test to determine whether it is charged. There are several of these on the market, one made by the Westinghouse Electric and Manufacturing Company and one by the Air Reduction Company. Here is a little detector made by the Minor Light Company of Chicago; I don't know whether they make it now or not. It is on the order of the gold leaf electroscope.

There is one thing that strikes me as being very important that I want to bring out. You know what a thunderstorm is—there has been a great mystery as to what causes the atmospheric electricity—and I want to go into that very briefly, because I think it bears on a hazard in connection with the handling of gasoline.

THE CAUSE OF ATMOSPHERIC ELECTRICITY

During the years 1908 and 1910 Dr. J. C. Simpson, who is connected with the British Meteorological Bureau stationed in India, performed a long series of experiments in order to find out what caused the atmospheric electricity that expresses itself strongly in thunderstorms. He found out several things.

In a thunderstorm the thunder cloud shows a boiling effect on the top. You see them sometimes in the evening, and will always see on the top a boiling, or cauliflower, effect, that seems to be caused by an upward draught of air. Simpson, in his experiments, tried everything he could think of in order to find out what caused the electricity, and he finally discovered that when a drop of water falls through the air at a speed of about twenty-six feet per second it breaks up into a spray; that is, you take a solid drop and when the speed reaches about twenty-six feet per second the drop breaks up, and when it breaks up the fine part of the spray seems to be negatively charged. It looks to me as if the friction of the air, the breaking up of the drop, possibly by friction, separates electrons from the main body of the drop. The electrons, of course, carry the negative charge.

Also, he found that in thunder clouds an upward draught of air carries water up with it; the water breaks up into spray, and this upward draught of air carries the small drops up to the high altitude and the large drops not so high; when it falls as rain the large drops and the heavy downpour are almost invariably positively charged, and the fine rain which comes afterwards is almost always negatively charged, which

would look as if the small drops which were carried higher up contained a negative charge.

It strikes me, as being a plausible thing, that when these tank trucks carrying supplies of gasoline are driven over the roads the splashing of the gasoline on the inside of the tank probably breaks the gasoline up into a spray, and very likely the spray striking the sides will charge the tank. At any rate, there is strong evidence that the tanks are very often charged with electricity and you will find it quite a common practice for tank wagons to drag a chain along the road, attached to the tank, the reason being to keep the tank discharged.

FIRES AND GASOLINE TANK WAGONS

I know of one case which happened a year ago. The tank wagon had three compartments; it traveled twenty-seven miles and started to empty the gasoline. It had emptied one compartment completely and was emptying the other compartments, using a Ford inner tube to conduct the gasoline from the tank into the underground tank, and when the tanks were partly unloaded a fire suddenly took place, apparently from nowhere. The tank blew up, the garage was burned, as were several adjoining buildings, resulting in a very serious accident, and nobody knew what caused it. It might have been static electricity—we do not know; it might have been a cigarette.

There is one other thing I want to show you. I am going to show you two leyden jars, one positive and the other negative. When these condensers are fully charged we bring these ends together and allow them to discharge across here—and you will notice the spark between these points. I am now going to connect the two jars with a wire which is about four feet long. You will notice, after that wire has been stretched across, that the electricity will jump the gap rather than to go around on the crooked wire, which illustrates what might take place if you had a lightning arrester and lightning should strike the arrester and you had a crooked path to the ground. You will find it will rather take a short path through the air than to go around the crooked path. That means you must have your ground wires as straight and short as possible.

CHAIRMAN FORSTER: The next speaker is Dr. Harold H. Brown who has been in the United States Department of Agriculture, associated with a fellow worker, Mr. D. J. Price, and these men have done some exceedingly important fundamental experimental work in connection with the explosion of dust.

HOW TO OVERCOME THE HAZARDS OF STATIC ELECTRICITY

DR. HAROLD H. BROWN, HOLLINGSWORTH & VOSE COMPANY

It is only within the past few years that "static" has been considered as much of a hazard. In connection with some work I was doing, where I had obtained some results which, to me, were very convincing,

I went to an electrical engineer prominent in national fire-protection and insurance circles, and he told me that the ignition of material by means of static electricity was absolutely impossible; that there was not enough heat in a static discharge to ignite anything. I told him that probably was true from his standpoint, but that I would like to prove it to him, and I did.

In the first place it came to our attention that threshing machines in the far Northwest were exploding, literally dozens a day, several hundred during the season. The humidity conditions were exceptional; that is, very low, running down to 8 and 10 per cent. We found immense quantities of static electricity were developed in the threshing machines and the drier the dust in the smut in the wheat the more static electricity was generated, and we further found that this smut dust was very easily ignited. The first time we ignited it we took a machine very similar to the one which you see here, used in generating static electricity, and simply by getting the discharge across these balls and dropping the dust off a spatula we could easily get an ignition or a flash of flame from the dust.

We found that these fires and explosions did not occur in threshing machines except on days of extremely low humidity. They did not often occur in the morning and they did not often occur in the evening when temperatures were down, but they occurred very largely between 10 in the morning and 2 or 3 in the afternoon.

FIRES IN SOUTHERN COTTON GINS

We followed the same thing in the cotton gins of the South and we found a similar condition there; the ginners, in many cases, had discovered that a cure for the fires was to keep the gin wet down and so they wet it down every hour or so. They simply created a higher humidity of the atmosphere and the static which was generated was dispersed into the air. Cotton is very easily ignited by a static discharge, but one of the peculiar things about it is, if you take a machine like the one here, and get the discharge between the two points, and you take a little ball of cotton and hold it at the positive end, it doesn't ignite; but move it gradually toward the negative end and it will become ignited; insert it at the negative ball and it ignites immediately.

Cotton moving through pipes, as it is fanned by air, often gives off lint. Being handled in that manner the cotton will become charged positively, while the pipe through which the cotton is blown will become charged negatively, and if the cotton then is blown against a screen, so that the air will pass through and the cotton drop down, as is the condition in a cotton gin, the charge in the cotton is dissipated upon the screen, and then out of the electrically connected pipe you get practically no charge.

So one of the first principles that we should consider is the type of discharges that are generated, the different materials, and where those charges may be given up. Is there a possibility of connecting up the positive and the negative sources to prevent the jumping of the spark

or the accumulation or the discharge? That is one thing which we did in cotton gins and in threshing machines—also carrying the connecting wires to the ground and being sure that the ground was absolute and complete.

To my knowledge, since 1915 in the Northwest and since 1918 in the South, there has not been a fire or explosion in a threshing machine or cotton gin that could not be explained by some definite spark or source of ignition. Static electricity has been the cause of more explosions in threshing machines and more incipient fires and, I am almost convinced, more actual destructive fires in cotton gins than any other one cause. It has also been the cause of fires in packer-rooms and in cotton looms.

DISTINCT RELATION BETWEEN HUMIDITY AND FIRES

Some few years ago there was public circulation of the message, "Conditioning of Cotton With Relation to Fires." Considerable data was given in that by Mr. Hoxie and he has shown definitely that there is a distinct relation between humidity and fires. It simply means this, that there is a relation between the moisture in the air, by which static electricity may be carried off and the fires due to the generation of static by the cotton being moved through pipes, through pickers, and in one way and another.

Dr. Rudge of England, working in Africa, has found that dust particles moving through the air create charges, and even has gone so far as to state that it is conceivably possible that a coaldust cloud—he was particularly dealing with coal dust at the time—moving through the air might create such a charge upon itself that, coming in contact with a ground it might discharge with such an intense spark as to ignite the dust and start an inward explosion. It seems to me that is conceivable. We have a proper comparison with that in the remarks which Professor Rogers made regarding lightning in connection with a thunderstorm. You have the discharge from an accumulated static in the atmosphere, on the particles of moisture; so you have it in dust clouds.

We have the condition in dry cleaning establishments which is dangerous, due to the generation of static electricity by the handling of clothes which have been immersed and washed in gasoline. Some years ago I was called to a dry cleaning establishment in Pittsburgh where they had had considerable trouble with fires. They had the usual equipment. After the coats had been washed in gasoline they were put in a centrifugal which was operated at a very high rate of speed and the gasoline driven out; the machine was open at the top and the vapor was pouring out from it. This centrifugal was driven by a belt from an overhead shaft, which was operated by a motor located outside of the building and in an entirely separate compartment, so that it was not possible for the gasoline vapors, in any way to come in contact with possible sparks from the motor.

REMOVE STATIC AND PREVENT FIRES

But it had been found, by local people, that static electricity was generated on the belt running from the shaft to the centrifugal, and it

had been suggested by an insurance man that if a picker were placed near that belt the static electricity would be removed and they would have no more fires. Consequently a pipe was driven well into the ground, through the cement floor, and a little connection made to it and copper wire brought up out of the pipe, and three little points put on it, so that the belt, which was only a three-inch one, would run about a half-inch from these points; working on the idea of which Professor Rogers has spoken, that the points will collect the discharge, and they did. They collected it all, but they collected it with an intermittent discharge and as fumes were pouring out of the top of the centrifugal fires were an almost daily occurrence.

In such cases static should not be removed by means of a picker of that type, so that you actually accentuate the hazard, but it should be removed by some other method.

We have found that a possible method is to ground the pulley or the shaft by means of a brush contact. You may think that that is peculiar from some results that we have obtained. In making determinations of the amount of static on the belt we found that we could get no indication of static electricity on the portion of the belt in immediate contact with the pulley, but that we got a charge at a point just where the belt left the pulley, and also a charge just at the point of approaching the pulley. As you approach the other pulley you get a maximum toward the center, and it gradually becomes less as you approach the other pulley. But in some way or other, simply by grounding the shaft, we were able to remove the static electricity from these belts, leaving only a negligible quantity.

THREE WAYS TO GET RID OF STATIC ELECTRICITY

Why does the charge increase toward the center? I do not know, but I think there is friction of the belt with the air developing more static electricity. Therefore we should not have a picker—that is, a few wires—coming down within a small distance of the belt, but we should provide an immediate contact to the belt. That contact should be placed immediately in contact with the belt where it leaves each pulley.

There are three ways of getting rid of the hazard of static electricity. One is by humidifying, so that the static may be dissipated into the air as fast as it is generated. This cannot be used in the flour industry, because you cannot operate under excessive-humid conditions without getting a sticky product. With cotton gins and in other industries you can.

Another method is grounding. That is the simplest method and will work quite well in many conditions, if you are sure that you have a ground; but to be sure that you have a ground you must have more than one connection, preferably three.

The third method is to neutralize the charge as it may be developed by means of counter charges, or by the use of what is called a neutralizer. There is one on the market which has been found to be quite successful and is used largely in the printing and paper industries and in some others. You take an ordinary current, 110 volts; you increase its

voltage tremendously and decrease its amperage and really make a static current from it and dissipate that through points into the atmosphere, so that you electrify the atmosphere first positively and then negatively, and if we have a positive charge being developed in the moving of the material, then the negative charge given off by this neutralizer will neutralize the positive.

Those are the three methods now in vogue. All have their direct application. Static electricity is a hazard. Static electricity will ignite dust, will ignite gases, will ignite solid materials, and it is a thing that we must consider more seriously in the future in connection with the possible causes of fires and destruction of property.

DISCUSSION

CHAIRMAN FORSTER: Lewis De Blois, some ten or twelve years ago, did research work on static electricity and a good deal of what I know about it I got from him. He will present two or three points to close what has proved to be a very interesting afternoon.

MR. L. A. DE BLOIS (E. I. du Pont de Nemours & Co., Wilmington, Del.): It seems to me that possibly static electricity has been made a little too much of a scapegoat. A good many years ago we were all agitated in high explosive manufacturing plants about static electricity. We found we could send an ordinary static spark, without any serious effects, through liquid nitroglycerine, through some dynamites, and through black powder without igniting or exploding those substances. It is perfectly true that the static spark can be made to ignite black powder if the spark is sent through the medium of a wet string, but when you do that you change the character of the spark altogether, and instead of getting the white, snapping discharge, you get practically a flaming arc.

FOREIGN SUBSTANCES MORE DANGEROUS THAN STATIC

However, we know that a static spark readily ignites vapors or suspended dust. It appears to me that the matter of humidity and dust clouds might have a little different relationship from what appears at first sight. When the atmosphere is heavy and humid we do not have static electricity, but at the same time we do not have dust clouds, so if there are sparks present from sources other than static electricity, and dust clouds themselves are not present, perhaps that accounts for the lack of ignition. In the explosive business there is certainly one hundred times more trouble from foreign objects, and sparks struck from them, than there is from static electricity. So that, if you are getting mysterious explosions, I would suggest you look first for foreign materials actually in the material or ingredients that you are handling, and bear in mind that sparks can be struck by contact with, not only iron and steel, but brass and even copper. Foreign materials going through mixing machines, grinders, any revolving machinery, are certainly a source of danger in a dusty atmosphere.

Also you can get a spark very readily from a belt, without having static electricity present, if you happen to have a metal belt lacer or

fastening or belt splicer. You may also get your spark from friction clutches. That, of course, has nothing to do with static electricity.

We ground the shaft and dress the outside of the belt with a half-and-half mixture of glycerine and water. The glycerine simply acts as a medium to gather moisture and to make a sticky, moist surface on the exterior of the belt that makes it conductive, and the static is carried away as it is generated and discharged through the medium of the pulley to the ground. I understand some companies are also using graphite on the exterior of the belt for the same purpose.

A good deal is said against the practice of grounding hangers of shafts, instead of the shaft itself. I only know we have never found it necessary, in our plants, to ground the shafts, and I have a suspicion that the oily film between the shaft and the bearing is not as much of an insulator as we suppose, or else it acts in quite a different manner. It seems to me quite conceivable that the middle of the shaft and the bearings are really a condenser, with a fine high-grade insulating medium between in the shape of a film of oil. I know we do not worry much about getting the shaft grounded; we ground the hangers.

ANY SORT OF MOVEMENT MAY GENERATE STATIC

I do not believe we know whether static results from friction in the case of belts or not. We do know, of course, that static can be generated by concussion. It is a common experiment to strike two lumps of sugar together in the dark, causing a spark; a static may be generated by tearing off a strip of tape from the roll; it seems to be possible to get it from movements of almost any kind. I mention this because I want to warn you against the movement of dry materials. We have found, if the atmosphere is dry and the material is dry and is a non-conductor of electricity, any sort of movement of material at all produces a static discharge. A mere picking up of a pack of your material and letting it down on the floor may, in a dry atmosphere, bring up a charge of more than 500 volts.

It is very hard to get the static off. If the material is poured out on a metal surface and a part of the particles of the material, while they are charged, come in contact with the surface, then it is collected on the surface, and from that surface you can get a heavy discharge, which may easily ignite either fumes or dust.

OIL USED AS AN INSULATOR

DR. BROWN: It is true, some sparks will ignite and others will not ignite. You must have a definite amperage for the varying conditions. I think the use of glycerine on belts is a very good thing. We have had word that certain companies were using other mixtures to dissipate this charge. There is such a thing as this: If two certain types of materials rub against each other, that causes a certain charge. The change of one of those materials will entirely revert that charge. For instance, shortly after the war I heard a French airman discuss static electricity on planes. Sometimes it was so troublesome that the engine would not

operate, and one way in which they overcame that was by coating the plane with different types of materials, so as to have two equal charges, positive and negative, developed. That has been suggested as a possible dressing for belts.

We ran a series of experiments with belts with different degrees of tightness the same day and within a few moments of each other, and found that the looser the belt the higher the charge on the belt; the tighter the belt, the lesser the charge; showing definitely that there is something in the friction of the belts on the pulleys.

The question of oil film: I appreciate the suggestion that has been made and I think it is a possible explanation. I would simply say this, however, that definite experiments have proved that the oil, acting as an insulator, is ten times more effective as an insulator than the same thickness of air. So there may be something to both sides of the question.

CHAIRMAN FORSTER: The meeting will stand adjourned.

General Round Table

August 30, 1922

C. W. PRICE, Chairman

President, Price-Rasmussen Corporation, Chicago, Ill.

CHAIRMAN PRICE. Friend Woodhead and some of the other old comrades were present at the first round table given in New York, in a little room at the Hotel Astor. I remember distinctly, at that meeting, we discussed the subject of safety organizations in plants needing educational work. We felt that we were pioneers, discussing a pioneer subject. That was in 1913.

At this meeting, in discussing the first subject, "Community Safety from the Standpoint of Industry," we are considering a subject that is in its pioneer stage in this country, just as organized educational safety work in industry was in 1913. We are again blazing the way for a great step forward in our efforts along these larger lines.

One of the most inspiring things that has come to me in the last few years in connection with public safety—and it was a surprising thing—was this: The men who were the quickest and keenest, the first to appreciate the value of community safety, were employers. I have never met an employer and discussed this subject with him, but he immediately saw the value of community safety to industry in reaching his workmen. I have never talked before a group of employers on any subject which seemed to get such an immediate and sincere response as in discussing community safety.

ROUND TABLE OF VALUE TO NEW RECRUITS

I believe that a round table of this kind should be considered for its value to new recruits. Having that in mind, it is not improper for the Chairman to take a few minutes to define simply and explicitly what I understand organized community safety to mean.

I find there are four determining factors in organizing a community, and, strange to say, I find those four factors are exactly the same, and have exactly the same place in the community as in industry. You will recognize them instantly. First, influence; start at the top. If you are to organize your home town you want to get twenty-five or fifty outstanding citizens, whose names will instantly command the confidence of

the community; if you have not such a group with an outstanding leader, you cannot expect to make headway.

Second, it goes without saying that you must have an organization and committees; especially one man to serve as manager or secretary—a man who can give his time to directing the work, just as in a plant. You must have someone to conduct your business, to organize your work; that is indispensable.

Third, you must organize a continuous year-round educational campaign through the schools, newspapers, meetings, moving pictures, posters and all the other things; just as you would on the industrial side. In an effort to reach a community of 200,000—every man, woman and child—you will have to interest the Chamber of Commerce, the women's clubs and every other agency that will multiply the number of hands and feet and tongues; the number of persons who have influence, who can help you to reach your 200,000 people.

AN ORGANIZED COMMUNITY IS A SAFE ONE

The last point is discipline. That has a very vital place in every community effort. I think the most striking example of the success of that feature of the program is in Detroit. I know of no city where there has been such a drastic campaign of law enforcement on the part of the police and the courts as in this city, with the result, as you know, of deaths from automobiles being reduced from 240 in 1920 to 134 in 1921—a remarkable record.

Those four factors, to me, are the determining ones in organizing a community, and, as I see it, the fundamental principles of organizing a community are identical with those of organizing an industrial plant. You simply express the ideas to a larger group of people and organize it in a bigger way.

Out of all this community effort, if you are successful, what is finally developed? A new public conscience, a new sentiment in the community! Think of the years it has taken us to develop the present public opinion, the present standards of health—think of the twenty-five years of campaigning! Exactly that sort of thing has to take place in safety, until safety becomes established in the minds of the people of the community and makes them think of safety exactly as they think of health—as one of the things that is absolutely indispensable and must be taken care of. Think of how few communities there are in which safety occupies that kind of a place! Having in mind the development of a new public opinion—so that every man, woman and child will know about safety and will think about it and care about it—we are to discuss this afternoon the effect such a public opinion, such a community effort, would have upon industry. I am going to ask my good friend, Mr. De Blois, to start the discussion.

ONE-HALF ACCIDENTAL DEATHS NOT IN PLANT

MR. L. A. DE BLOIS (E. L. duPont de Nemours & Co., Wilmington, Del.): I am going to make three points: First, in the experience of our company (we carry group insurance), out of fifteen employees—salary

and pay roll—who were killed accidentally, eight were the victims of street, public or home accidents. In their order they were: Automobile deaths, trolley car deaths, accidental discharge of firearms, drowning and a case of burning. In other words, over half the accidental deaths did not happen in our industrial or construction operations.

The second point: While the majority of deaths in our plants occur to new employees or, at least, to those unfamiliar with the occupational hazards, the public and home accidental deaths may remove your principal officials. There is no question of unequal familiarity with public and home accident hazards. The president of your company may be killed by an automobile, although it is unlikely that he will be killed in one of his own industrial plants. In other words, public and home accidents have a tendency to take the more valuable men.

The third point is along an entirely different line. It proves, to my mind, that no matter what you do, you cannot keep your employees out of public safety; you cannot keep them from being interested once public safety is developed in your community. I say that out of our experience with the Delaware Safety Council. After the second year of the work our men came forward and demanded more information on the subject. They said, "We have heard a great deal about industrial safety—now what about public safety? What is the Council doing to prevent public accidents? What is it doing to get into the schools and preach safety to the school children." Those men, ladies and gentlemen, were on the jump. They were almost ahead of the Council in demanding participation in public accident prevention. They will be in it whether you like it or not, sooner or later.

FINANCIAL SUPPORT FOR COMMUNITY WORK

MR. D. DUNKERLEY (Imperial Cotton Company, Ltd., Canada): Do you get any financial support from the city council?

MR. DE BLOIS: Not yet; we have hopes, but they are not educated up to it as yet. A very large part of our money comes out of a state organization called the Service Citizens of Delaware, which is the state welfare organization.

CHAIRMAN PRICE: Mr. Shaw, will you tell us the number of men that were killed outside and inside your plant last year and the year before?

MR. R. A. SHAW (Ford Motor Company, Detroit): Taking the statistics from our superintendent's division I found out that possibly, two years ago, ten or eleven men were killed outside the plant; in the last eight years it ran about twenty. There were no deaths inside this year. It is safer to work inside than out.

CHAIRMAN PRICE: Do you think that thoroughly organized public effort has had a direct effect upon your men that had been rather lukewarm—does it reach them in a way that you do not reach them in the plant?

MR. SHAW: It certainly does. I look forward to a real understanding that the men will have, that will naturally bring a larger reduc-

tion of accidents on the inside, due to the fact that they are now thinking of being careful in a way that we could not have taken up with them.

SUCCESSFUL CAMPAIGN IN MILWAUKEE

CHAIRMAN PRICE: We would like to hear from Mr. Anderson of Milwaukee. I understand that since Milwaukee went dry there has been something happening in accidents. Will you tell us about it?

MR. C. M. ANDERSON (Manager, Safety Division, Milwaukee Association of Commerce): If you expect to leave this meeting and go back to your homes with the idea of developing community organizations I suggest that you spend a month studying it, laying out definite plans, before you go into it, because it is just the same as an organization in an industrial plant. If you don't organize it properly it will go by the boards. We have tried, in Milwaukee, to put in a permanent safety organization. We started in a small way and we have gradually grown until today, they say, the safety division is kicking the slats out of the cradle. In 1919, when there was no community effort, there were 320 fatal automobile accidents; in 1920, 287, and in 1921, 243. So far this year we are holding our own with last year.

PLAN FOR SMALL COMMUNITY

MR. C. B. AUEL (Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.): Could you outline a community program for a small town which does not have the benefit of a local Safety Council? A great many of our large industrial plants draw their labor from outlying towns and when the business day is over the men scatter to their homes. Could you outline, if you please, a simple program that might be used in a small community of that kind?

MR. ANDERSON: You could take the program used in the larger cities and cut it down a little. You would need some outstanding figure as a leader.

CHAIRMAN PRICE: In any town of say 100,000 people, a group of citizens can be organized by the Chamber of Commerce. To lend influence and win the confidence of the community you can do exactly the same work in your schools as is being done in Detroit or any of the cities where they have secured results. One-half of all you can do in your town now, to reach the whole 100,000 people, to reach the total adult population, will be done through your children being instructed in safety in the schools. That one-half you can do in your town just as well as in any other town.

You can get in personal touch, if you haven't done so already, with your police force, and get them really with you; have the chief of police on your committee.

You can get the newspapers to run articles every week, sometimes every day; real articles, such as two-minute talks to mothers, little evening stories for children, instructions to automobile drivers; day by day and week by week, utilizing the accident experience of your town for propaganda purposes.

You can have a few meetings in your town, mass meetings, if you please, with moving pictures and one or two talks, where you would get a large number of the people together.

That much you can do in almost any community. It can be done, and while that is not anything like the program Mr. Anderson has in mind, and would not come anywhere near being 100 per cent successful, it will be enormously better than to do nothing.

MR. ANDERSON: I would suggest that a thorough study of the accidents that occur in a community be made before starting public safety work. An analysis would show what should be done.

MR. MORRIS (Chicago, Ill.): Mr. Anderson is absolutely right when he says that all you need is some outstanding leader to head your movement. That man, naturally, will have a great deal of common sense; he will study conditions and work out plans according to the facts confronting him. It can be done in any town from 1,000 to 100,000.

STARTING SAFETY WORK AT THE TOP

MR. E. R. FARRA (American Car and Foundry Company): We would like to know how to finance a public safety campaign.

MR. JOHN WOODHEAD (Employees' Indemnity Exchange, Kansas City): In Kansas City we have been struggling for several years to finance a Safety Council. We got the presidents of all the clubs and associations together and laid the matter before them. We have raised \$12,000, \$20,000 being our goal, but we secured it by private subscription. Kansas City has what is known as the Associated Charities. They take up one collection a year for all the different charities and the funds are pro rated among them. We are trying to convince people who contribute \$120,000 a year for charity—most of it being for hospitals—that if they will apportion a part of that money for accident prevention they will not have to contribute so much to hospitals. We think, next year, we will get a part of the division.

CHAIRMAN PRICE: In my experience in helping local Councils to finance their budgets I found one thing that always worked. If you can get an outstanding man—one who is recognized as the town's best citizen—on his personal invitation to call together a group of two dozen representative business men as his guests at a luncheon, and if he will vouch for the proposed movement and go right around the table and ask each one what he can do, you will find the ball rolling.

I learned from the Yankees down in Boston last summer that you can get a good many things by a little maneuvering. The insurance companies will contribute printing; they can't contribute money, at least they say they can't, but they will be glad to contribute the printing if you will add a line "Contributed by so-and-so." For instance, in the campaign at New York, which Judge Gary is now organizing, the insurance companies will contribute \$35,000 worth of printing—about seventy-five companies participating, each one furnishing a pro rata share and having its name on the printing.

Another source of revenue is to get together either the employers or drivers of fleets of vehicles. In the larger cities there are associations

such as the Coal Men's Association, the Grocers' Association, Ice Men's Association; get the presidents of those associations together and ask them to be personally responsible for collecting \$1.00 or \$2.00—we are going to charge \$2.00 in New York—from each member who has commercial vehicles on the streets. Ask the men who are financially interested, who would financially gain, to contribute a share to the necessary expenditure.

LAUNCHING SAFETY WEEK CAMPAIGN

MR. L. G. BENTLEY (Chesapeake & Ohio Railway, Richmond, Va.): Is there any particular time of the year that is better adapted to a special community effort than any other time, taking into consideration the after effects?

CHAIRMAN PRICE: I would say, in our experience, not later than Nov. 1, and not earlier than Oct. 1 or Sept. 15, always depending on when your schools open. If in the spring, have it a month before the schools close, because you will find that it will very seriously interfere with the examinations.

MR. BENTLEY: The duration of the campaign; which is most popular?

CHAIRMAN PRICE: Not more than a week.

MR. EDGAR C. DAVIDSON (Safety First Shoe Company, Providence, R. I.): I wonder if any of the Councils have tried the experiment of allotting one day in each week to different civic organizations in their city or town? We tried that in Providence, giving the Advertising Club, called the "Town Criers," one day; the Rotary Club another day, the Kiwanis Club another and so on until we used up the week. There was a certain amount of rivalry between each club on its day; each club financing its own effort. The Advertising Club did very well indeed, so well that the *National Safety News* gave them a very good writeup, with several illustrations. This is a good idea; it brings many minds, from many branches of business, into safety work.

When we were planning the safety week the police department was called upon for suggestions and advice, particularly the sergeant in charge of traffic. Police officers are in constant touch with accidents, and the why of the accident, and they can give you a lot of good advice on what you want to accomplish and what you want to eliminate. If their representative is a good talker, and will let you into the inside of the police department, he can do you a lot of good. In Providence we have had two years of very successful drives and are mighty well pleased with results. We were very successful in getting so wide a diversity of interest in the safety week, both before it started and while it was in effect.

CHAIRMAN PRICE: What was the attitude of your industries toward this drive?

MR. DAVIDSON: They were for it all the time.

TRIBUTE TO C. W. PRICE

CHAIRMAN PRICE: I don't know what we have a President of the National Safety Council for if we cannot use him. I want Mr. Young to tell us about the work in Chicago.

PRESIDENT A. H. YOUNG: I wonder if we realize just how much we are indebted as individuals and as citizens to our chairman, Mr. Price. Do you realize that in say, ten or eleven years, safety as a fact, as a movement, has been inculcated into our social life? Fifteen years ago it did not exist. Price was one of the pioneers who introduced the movement into industry. We all know what has occurred.

Price has expanded and he, as no other individual, as a leader, has inculcated the thought of safety—organized, well-established, sound basically and wholly workable—into our social and community life. I have known him for a long time. I have worked with him; I have worked under him, and I never have known a finer example and better type of manhood in America than C. W. Price.

I once heard a man say during a funeral oration that some men accomplished good in this world because the preponderance of good things which they did was greater than the bad. On that basis he went on to prove that his departed friend might possibly chalk up enough white marks to prove his case when St. Peter was balancing up the books. This I can say: That C. W. Price's contributions to this world of ours, and the marks he is credited with over there, are all on the white side of the ledger; there are no negative values. Everything that Price does, everything he thinks, every helpful act he can do, has no selfishness behind it. If any man in this world is entitled to a halo, it is Charlie Price.

CHAIRMAN PRICE: I certainly put my foot into it. Now, let's go on with our work.

WORK OF THE ST. LOUIS SAFETY COUNCIL

MR. GIRARD VARNUM (St. Louis Safety Council): When the St. Louis Safety Council started work there had been 110 industrial fatalities the year 1917. In 1918 the Safety Council was organized. We picked out 130 representative factories, the most hazardous industries in the city, induced their representatives to serve on our committees and take an interest in our safety organization. At the end of 1918, despite the fact that the World war was on and production was being stressed as never before, fatalities were reduced to 57; in 1919 they were reduced again to 42, in 1920 to 42, and in 1921 to 37. I think we have had 12 to date, this year.

The community effort has had a wonderful effect upon the people of St. Louis, and our city has the reputation of being one of the hardest cities in which to secure publicity of any place in the country. We have expanded until we have ten people on our safety staff at the present time. With the growth of the Council it has been possible for us to have a full-time publicity man, and this has meant a great deal because he has been able to devote all the time necessary to writing articles and setting forth in detail the particular methods we want to get over to the people. Newspaper publicity is one of the biggest things in swinging a community proposition and has been largely instrumental in securing a big decrease in fatalities. It especially reaches the working man.

CHIEF J. C. McDONNELL (Chicago Fire Department): I am a bit disappointed in the very meagre reference made to the fire hazard as it pertains to the question of safety. I have, and possibly Mr. Price had, in

mind the vital community interest, for instance, of the Theatre Men's Association. Put a campaign on for a safety week and use the theaters for four-minute talks. There are several associations you might interest—for instance, the Dry Cleaners and the Garage Owners Associations. These bodies are national in scope and should have representatives here as well as taking a part in community work.

CHAIRMAN PRICE: You have heard the discussion on this idea of organizing the whole community; of reaching a hundred thousand individuals, adults and children, through the schools, through the newspapers, meetings and so on. Do you believe that kind of a campaign, conducted along fire lines, would be as direct a service to the industry as anything that could be done?

MR. McDONNELL: Absolutely, yes. I find from actual experience—I have been twelve years with the fire protection and safety end of our fire department—that it is difficult, if not impossible, to learn an old dog new tricks. If you are to accomplish anything you will have to do it through the rising generation.

MR. WOODHEAD: Captain, if you had been here yesterday, and had attended in the educational session, you would have seen something of what the community is doing for fire prevention. The school children of this city put on a little playlet, which they have given in different parts of the city, and it is worthy to put on the best stage that you have in Chicago. It shows how carelessness breeds fires, how fires are taken care of, and all that sort of thing; it is really worth while. This organization is working to prevent fires as well as other things.

CHAIRMAN PRICE: I want to add a word to the numerous statements that have been made in regard to the attitude of employers—almost the universal attitude of the employers—toward this and other new things of community safety, of reaching the workmen outside of the plant, reaching them as citizens, reaching them as fathers, reaching them through children. I had the great pleasure, about three weeks ago, of having a conference with Judge Gary of the Steel Corporation. As you know, he has taken the real, active leadership in a big public safety movement in New York City; he is going to be the real and not the nominal leader. He has surrounded himself with 100 of the most intelligent and influential men and women in New York City. In all my experience I have never seen a big man give such careful, intelligent and conscientious consideration to a question as Judge Gary gave this question. At the end of the first hour, just before we went into the luncheon-room, he said: "It can be done!" Just before we left the luncheon-room, at the end of the second hour, he said: "I will do it!"

MAKE YOUR WORKMEN SAFE CITIZENS

That is as fine a recognition, on the part of our outstanding industrial leader of this country, of this big movement, which is coming up, bigger, I believe, than anything we have ever dreamed. We industrial men should stop talking about safety as merely a thing inside of the plant. Make it a community affair. It has to do with all of us.

If you can make your workmen safe citizens, if you can get your workmen interested in safety, if you can get them interested because they are citizens, and each one is interested as a citizen, he comes back to your plant not only interested in safety as your employee, because you have asked him to, but interested and believing in it on his own account as a father, because he loves his children; as a citizen, because he wants to make his children model citizens.

This larger thought is coming, it is coming very rapidly from the big employers of this country, and my hope for the financing of this whole thing is that these big industrial men will see this so clearly, the great public utility men will see it so clearly, that they will seize this larger opportunity, if you please, to solve this problem.

We will pass to the next subject on our program.

I don't believe I have ever known of a subject that made as much noise or got as many people on their feet as this next subject: "What is the best safety stunt you have done in your plant. What is the most interesting thing you have tried out this year; what really held the interest of the workmen." You cannot talk on any subject except as to what is the most interesting stunt. Mr. John Oartel.

SAFETY SCHOOLS AND THEIR ACCOMPLISHMENTS

MR. JOHN OARTEL (Carnegie Steel Company, Pittsburgh): During 1920 quite a number of foremen from our own plant attended the Foremen's School at Pittsburgh and became very enthusiastic about it. Along in the summer of that year, in reading over the minutes of the safety committee of that plant, I noticed a sentiment for a safety school at Braddock, where our works are located. They discussed it among themselves and held safety committee meetings at which they said: "We want a school out here, a lecture course such as we had in Pittsburgh, so that more of our foremen may attend, so that we may get the message to a few more men." I conferred with our Council in Pittsburgh, but they did not quite see their way clear to put it on. So I conferred with my boss. I said: "I think we can do this thing ourselves," and he answered: "All right."

We outlined a course of six lectures for foremen and put them on; the National Council awarded our men certificates. Not content to have it just for our own people, we invited all the industries of Braddock. There are dozens of all kinds and for six evenings we had 1,200 foremen crowding the Carnegie Auditorium at Braddock to the door. At the conclusion of the course the superintendent of the plant was so enthusiastic about it that he said: "Can't you put on a course for the men now? We would like to get the message down just a little further." The committee which had the first course got together, but we did not see our way clear to have a lecture course for the men because 60 per cent of the employees are foreigners.

I had in mind something we had done in the Metals Section in the National Congress a few years ago; that was the sketches or little playlets that we put on, typifying and vivifying accidents—how accidents

happened—so I said to the committee: "Can't we do this; can't we work out some little sketches, pick out the dangerous practices that a steel mill man engages in and dramatize it?"

WORKMEN SUPPLIED THEIR OWN STUNTS

So we went at it and we had ten meetings. We gave to separate departments the job of putting on a sketch for an evening. One evening the foundry department had a little foundry right there on the stage. They ran a couple of flasks of molded sand and pictured a man carrying that molten metal in a ladle.

A man who had lost one eye in that foundry because he was not wearing goggles, and received a splash of molten metal, took out his glass eye and told the story during a little intervening lull. Immediately after that a man who had his eyes saved by wearing goggles, which were all covered with molten metal, held them up and told his story. The result was two-fold: The message got to the men as a lecture would not have done, and that department, from the superintendent down—because they were engaged in that thing and demonstrated it—is lined up for safety for evermore.

I used to be a safety engineer. During the month of July, 1916, when I was out there, we used to have 90 and 100 lost-time accidents. This summer they went through a period of sixty-seven days without a lost-time accident. I believe that was all the result of the education which started first with the National Safety Council and which we have tried to take just a little further down along the line. I thank you.

TOWN OF 2,500 HOLDS REMARKABLE MEETING

MR. F. FEEHAN (Department of Labor and Industry, Pennsylvania): For a small community, I think the Ford Collieries Company has pulled off the best safety propaganda that I have seen anywhere. It is a mining locality of about 2,500 people and for the past two years they have had a week of safety, a week of fire protection and a week of health protection. The safety week was particularly interesting. The one evening I was there they not only had the people who lived in the community, but farmers came from miles around to see it. They had an excellent entertainment, some very good speakers and many other things in connection with it, including a ballgame. For a community safety rally it was the best thing I ever witnessed. I don't see why, even in the smallest communities, these meetings cannot be held successfully. It is the best way to send out the message of safety in a general way throughout the country.

CHAIRMAN PRICE: I haven't heard a Canadian speak. We are all one country and we want to hear from you.

F. J. MCGUE (Algoma Steel Company): One of our stunts was to convert a plant of about 3,000 employees into a safety attitude of mind through the power of publicity. Our contention is that the working man on the safety committee is best qualified in every way to handle the safety proposition; that no one from the front office is able to tell the working

man what is safe or what is not, or what he should do to make any condition, in connection with machinery, safe. Our second theory is that safety is not a mechanical proposition, that it is purely an educational and psychological proposition. We have a house organ and bulletin boards. We have a poster board 24 feet long by 12 feet high. Our principal item is general publicity in the form of bulletin and poster boards.

TURNING A KNOCKER INTO A BOOSTER

As to the one individual stunt: I heard some of the speakers refer to hard-boiled superintendents, who would not accept safety. We had one in Algoma, one among many, and he was one of the oldest in the plant. The only way we got him was to get a fine photograph and publish his picture in the house organ. We told everyone what fine work he was going to do for safety. He was in charge of one of the greatest accident-producing plants in our works, but he has run now for six or seven months without a lost-time accident.

CHAIRMAN PRICE: The most serious hazards in the shop, are they not in his department?

MR. MCGUE: Yes.

CHAIRMAN PRICE: The record for last year was a remarkable one. Can you give the reduction in accident cost?

MR. MCGUE: For actual compensation outlay our accident cost used to run from \$95,000 to \$125,000 a year; an average of \$8,000 a month the last two or three years. The legal rate of compensation for temporary disability has gone up one-sixth and for partial permanent and total permanent disability it has increased 25 to 35 per cent, yet our total cost for the year, up to Aug. 10, 1922, was \$5,000, as compared with previous monthly averages of \$8,000.

CHAIRMAN PRICE: That is splendid. Let us hear from Mr. Harry Guilbert.

MR. HARRY GUILBERT (The Pullman Company): I keep in close touch with the Council and I have tried all the stunts I have heard of for safety week. "One week of safety! What about the other fifty-one?" This is the way I have it mapped out in my humble way. I believe the finest stunt for safety is for safety men to go to work.

I thought I was getting away from the old days when I had overalls on in South Chicago, and getting down to mahogany desk work, but I found that the thing that counts in the end, in this work, is the man on the job. It is there my work lies, and I intend to spend the remainder of my days with the workman, where I belong. I say, first, last and all the time, let the safety man go back to work. That is my stunt.

BONUS BASED ON SAFETY EXPERIENCE

MR. E. F. BLANK (Buick Motor Company, Flint, Mich.): If I were to tell the best stunt we have ever done I would have to read you this memorandum, addressed to thirty factory managers, signed by C. B. Jerome, works manager:

"Our accident experience has been such in the past year that the managers have decided that one of the merits upon which the stock bonus

will be awarded is to be safety experience. This means that each factory manager will be responsible for the accident experience of his factory, and each departmental foreman for the accident experience of his department.

"This experience is to be measured in compensation paid for injury, a record of which is kept by factory and department, at the department of personal service. The basis of rating, in the case of the different factories and department risks, will be a manual of standard rates for compensation insurance, which is used by all underwriters over the country. Our idea is to incorporate our safety work into our production, so that it will not be a side show, but a part of the main event.

"We have had to pay compensation to insured employees, in the year 1919, amounting to \$53,720.84, and it is safe to assume that the total cost of our accidents for the year was over \$100,000. It behooves us all, therefore, to put our shoulders to the wheel and work to reduce these accidents, 75 per cent of which, at least, are unnecessary. Lack of education in safety seems to be the chief cause of accidents, and this education can be administered more effectively through supervision than any other way. The safety department has outlined an extensive educational campaign and your co-operation with them will be greatly appreciated."

That memorandum, I think, did more in our plant to put safety on the map than anything that ever happened. As a result, between 1920 and 1921, there was a 22 per cent reduction in frequency of accidents, 64 per cent reduction in severity of accidents and 25 per cent in compensation costs per employee; and the compensation cost, of course, is the thing at which the management is looking. The number of fatalities was cut from 8 to none; eyes lost, from 12 to 5; permanent disabilities, from 36 to 10. That stunt was the thing that put it across.

WHERE SAFETY LESSONS SAVED LIVES

MR. MCBRAYNE (Boston): In July we had five people asphyxiated because the firemen did not know the prone-pressure method of resuscitation. They got the people out of the water in time, but didn't know what to do. They asked us to organize a school for prone-pressure instruction. We did it last week. I gave them not only the prone pressure, but the stretcher made by six men. We also instructed them in various carries on the back. One afternoon, just as the school was about to close, the fire alarm rang and I took along the fellow who was giving the instruction. We went to the fire and had occasion to demonstrate the work—just what we had just been teaching our men.

The men first brought out the lieutenant who had asked the questions for his house at the meeting—he had kept bobbing up to ask for information. They brought him out unconscious and everyone yelled: "Go get a stretcher!" Two or three fellows took him up by the trousers and carried him off—the way we had taught them.

Then they brought out three men—one of them was out, he was blue around the lips—and we could not find any heart action. In one minute we had him on the sidewalk and in seven minutes we had restored respiration by the prone-pressure method.

MR. GEORGE G. BUTTS (Milwaukee): A year ago, in Indianapolis, I had the pleasure of meeting Col. Longfellow and receiving instructions from him at the Indiana fire conference. When I returned home I gave my department, as well as the city fire department, instructions along the same lines. About six weeks afterward a boy of 13 years fell into the St. Joseph River. He had been under water twelve minutes before he was brought out and the city department was called. The chief had received instructions, as well as his lieutenant, on the prone-pressure method from myself. In a few minutes that little fellow was breathing, living, and today is a living testimony as to what has been said of the instructions received from Col. Longfellow.

Shortly after that we had one of Col. Longfellow's lieutenants over from Cleveland, Captain Klein. I arranged for the meeting and our firm stood all the expenses. We called in all the Boy Scouts in our locality, the firemen, police department, and our private fire department, and gave them the same instruction. Some three months afterward, at a resort known as Indian Lake, in Michigan, a man and his wife were out boat sailing. The boat capsized and the lady clung to the boat, but the man, in trying to rescue her, was drowned. They got the body out in about fifteen minutes' time. Several physicians were present and they started to work on that body, but gave it up, stating there was no use. It so happened that a company of Boy Scouts were camped across the lake and when they saw the crowd one of the Boy Scouts and his father rowed across to see what was the trouble. They saw the man lying there, supposed to be dead. The gentleman said to the doctor: "My boy received instructions in Milwaukee on the prone method. Let him try; he may be able to save this man."

The little fellow went to work and while he was at it some more of his comrades came along; they had received the same instructions. In twenty minutes the man started to breathe and is living testimony of the efforts of that boy.

EXPERIENCES IN RESUSCITATION WORK

MR. DONAHUE (Pittsburgh Plate Glass Company): During the spring of this year we had one of the Bureau of Mines' cars call at our plant. We took advantage of this and put on a first-aid course, giving the prone-pressure method a great deal of time. Two weeks after the car left our vicinity we had two cases of gassing on the same day. Both men were knocked out, but inside of five minutes after they had quit breathing both of them were brought back to life. We have saved four men from bleeding to death, due to serious cuts, by men who attended this class applying tourniquets immediately.

MR. E. B. TOLSTED (Chicago): The thing to look out for, in resuscitation, is not to pull them off the job before the man is brought to. I have had five experiences in resuscitating men and in each case they argued with me that we should not muss up that poor dead man. In the first case, the man was dead when we got to him. He had been in carbon monoxide, 27 per cent, as the chemist told us before we started working on him. We worked for two hours and more, but we did not succeed in

bringing him to. All the time that we were working on that poor fellow, his friends argued and argued with us: "Let him alone; he is dead."

All of the other four cases we brought around. The same arguments were used: "Let him alone; he is dead." Don't pay any attention to such talk. It doesn't mean anything. If he is dead you will eventually find it out and if he is not you will succeed if you keep at it. The best way to find out is to keep right at it. People do more harm by trying to pull you off a job than you can possibly do the man.

EVERY POLICEMAN SHOULD KNOW PRONE SYSTEM

MR. A. J. VAN BRUNT (Public Service Company of New Jersey): The prone-pressure method of resuscitation is something that we have been devoting an immense amount of time to for the past year, and with considerable success. I was not present at the beginning of this talk and just how many of you have tried to teach the police department I don't know. If you have not tried it, go to it. We have twenty-eight safety patrols in the municipalities of the State of New Jersey. The teachers would not teach safety, so we put the children on the job. Two months ago I had twelve or fourteen of those municipalities represented in our building by boys, and the police chief, who was in charge of them. I taught resuscitation to those boys that morning. Two days after one of those policeman—he was not on the platform but had watched me—saved the life of a despondent little mother. You know the little mother proposition, the girl 12 or 14 years who is compelled to take care of motherless children. She was tired. She saw nothing in the future but dishwashing, perhaps, so she went into the bedroom, shut the door and turned on the gas. The police chief who had just seen the prone-pressure demonstration, put it into practice and the girl is alive today.

The police of the city of Passaic were also taught by me. About four or five days after their instruction a very excitable Hebrew gentleman rushed down what we call Jewish Street, stopped a passing policeman in uniform and said: "My two boys are dead; the gas has been escaping." The policeman sent for a pulmotor. Why? Because he had not been present at the lessons. Another policeman, in citizens' clothes, called him some things which I won't mention because there are some ladies present, but he was right. He rushed upstairs and kicked in the door and went to work; the two boys are living today.

LINING UP MEN FOR SAFETY WORK

MR. H. J. BELL (Chicago Safety Council): Perhaps I ought to revert back, for the moment, to my old days in railroad service. I recall that we were having a lot of trouble getting men to wear goggles; we settled that issue very easily by getting samples of every goggle on the market. We turned over something like twenty-six different kinds of goggles to a committee appointed by the shopmen and had them determine which was the best to wear. Once they had determined for themselves which was the best goggle, manifestly it was up to them to wear it.

I am reminded also of the hard-boiled individual—the brakeman, conductor or shopmen or whatnot—who said that safety was all bunk, or, in

any event, it didn't amount to anything and he did not much believe in safety anyway. He thought the members of the safety committee were wasting their time, etc. We put that fellow on the safety committee, just because he didn't like it, and it didn't take very long before he came into the fold and was one of the best workers we had. That was tried not in one instance, but many, and it worked out with the same result.

I remember also the difficulty we had on some occasions in getting men who were members of a safety committee to really take any part in the proceedings, to indicate by any action or any word of mouth that they were alive and paying attention to what was going on. We got around that by occasionally picking out Tom or Bill or some one else sitting in the room and making him chairman of the committee without any advance notice of what was going to be done. Mind you, that didn't relieve the chairman at all. He had to stay in the room and had to be, at least in a secondary position, responsible for the meeting, but the psychological factor, of course, was that nobody had a sense of feeling that the meeting belonged to someone else.

We want to make resuscitation a part of our foremen's instruction course, of our safety supervisors' school and even our motor drivers' school, and I do not know of anything else we did that made such an appeal to the men, or developed in them so much interest, as the resuscitation instruction which we had. We had two meetings in one plant, one resuscitation meeting and one first-aid meeting, and the men at the first-aid meeting demanded that a resuscitation demonstration be made.

TWENTY UNIFORMED MEN ON SAFETY TEAM

When the Safety Council started in Chicago there was practically no interest in first aid. I remember that Dr. Gentles of the Chicago Chapter of the American Red Cross gave rather a lengthy address on the subject of first aid. He looked all over town to find a first-aid team that he could use for demonstration purposes and he finally found, at one of the backwoods shops of the railroads, a team of four men. He brought the team down and put on his demonstration and, as a result, I would not attempt to say how many companies in Chicago now have first-aid teams. This year, when we put on another first-aid meeting in our safety school, we had a twenty-man team in uniform to put on the demonstration—all as a result of the instruction of the previous school.

MR. WALTER KING (New York): We tried for years to get the men to wear goggles and couldn't do it. We have quite a stunt and have had great success in putting it across. We had a big fellow, an ex-policeman, talk to the men in their own language on the bulletin service; a man-to-man talk, to make an appeal to the men.

The meeting then adjourned.

General Session: Sanitation and Factory Housekeeping

**Under the Auspices of the Health Service and Women in
Industry Sections**

MISS TRACY COPP, Chairman

Women in Industry Section, National Safety Council.
Special Agent, Industrial Rehabilitation, Federal Board for Vocational
Education, Washington, D. C.

DR. R. S. QUINBY, Chairman

Health Service Section, National Safety Council.
Manager, Service Department, Hood Rubber Company, Watertown, Mass.

THURSDAY AFTERNOON SESSION

CHAIRMAN QUINBY: Ladies and gentlemen, this Section is a joint session of the Health Service and Women in Industry. Miss Tracy Copp is Chairman of the Women in Industry Section and I am going to turn the meeting over to her.

MISS TRACY COPP: Our first speaker is Dr. George Price. He has just returned from Europe, having made a four-months' study of the industrial situation. We have asked him to give you a very practical paper this afternoon, something that I am sure will be very interesting.

HOW TO MAKE A SANITARY SURVEY OF AN INDUSTRIAL PLANT

**DR. GEORGE M. PRICE, JOINT BOARD OF SANITARY CONTROL OF THE LADIES'
CLOTHING INDUSTRY, NEW YORK CITY**

I am afraid you will be disappointed if you expect me to answer the question which has been propounded, "How to make a Sanitary Survey of an Industrial Plant"; in other words, how to be a factory inspector.

To answer this question would be as difficult as if one would ask a professor of medicine how to examine the human body. How can we learn to make a diagnosis of diseases? In other words, how can one practice medicine? It is much the same thing, sanitary inspection and practicing medicine, only they are different professions. The answer he would give you would be: "Learn from books; go and study." The first requirement is knowledge—study.

Just as one is unable to examine the human body and tell the ills that human flesh is heir to without a preliminary knowledge of five years' study of medicine in all the branches and sciences of medicine, just so is it absolutely impossible to make a scientific, thorough diagnosis of what is a factory without a preliminary study of all the elements that go to make up that conglomerate, complex body—an industrial establishment.

FACTORY INSPECTOR MUST BE A MAN OF SOUND JUDGMENT

The time is past when any Tom, Dick or Harry can call himself a physician and start practice. The time is past when anyone can get a license as a medical man without previous study. We are wiser now. The time is also past when the question applying to a factory inspector was not what he had to know, but whom he had to know; when the question of a factory was a small question, and when the factory inspector knew very little of his subject.

Factory sanitation, industrial hygiene, is a science. It is complicated, complex and requires years of study. The reason that the efforts of a great many of our factory inspections were entirely futile—the reason that labor did not get the proper protection—was that factory inspection was not practiced properly. The results to be obtained from labor do not depend upon laws placed by the state on the statute books, but upon proper enforcement, and that cannot be done without proper factory inspection. No employer has respect for a factory inspector if he does not know as much as he does, and much more.

The reason employers were discontented with factory inspection was because of the ignorance of the ordinary inspector of yesterday. The time when an inspector could come into a factory and say, "The fire protection is not perfect, ventilation is not proper, sanitation is bad," is past. Things must be more definite. The inspector must have a thorough knowledge of factory construction and of fire prevention; this is a great study. He must know something about illumination; not only must he know how to measure the amount of illumination in a given space, but he must know more about it than simply the fact that the air is "too close" and so forth—as former inspectors used to say. He must know how to measure the humidity, how to test the air for CO₂ for dust, etc., and something about toxins; not to speak of the immense amount of knowledge that it requires by an inspector to be able to judge whether machinery is properly safeguarded or not. That is a science by itself.

RIGID SYSTEM FORMERLY IN EFFECT IN GERMANY

Twelve years ago I was directing the investigations of the New York State Factory Commission of the various industries of the state and a part of my duty was to examine the chemical plants at Niagara Falls. Although I had taken chemistry in my medical studies and I had, prior to the inspection, read Sadler's book on "Industrial Chemistry," I found when I came to the first factory I was a babe in the woods; I was absolutely ignorant of what a factory contains or should contain or what it

should be. I had to engage Dr. Betani, a professor at the City College, to accompany me from plant to plant for two or three weeks; we jointly made inspections.

Let me tell you about the training which, in certain European countries, the factory inspector is required to take before he rates as competent. In 1913 the United States Department of Labor sent me there to study the administration of labor law and factory inspection. I visited six countries at that time (see Bulletin No. 142) and in the last five months seven. In Germany, England and France a factory inspector must go to college and graduate from a technical school; then he must qualify for a degree in engineering or spend two years studying industrial hygiene and factory sanitation at a special school. After that he files an application and presents a thesis, for which six months' time is given. After the thesis is completed he goes through five days of oral examination; then, and only then, is he deemed worthy of becoming not a factory inspector—not even an assistant factory inspector—he must work in factory inspection departments at least eighteen months (without salary in Germany and a very small salary in France) before his ambition is attained. Do you wonder these factory inspectors know more than ours, do? Study, knowledge, science and theory are the first requisites of surveying an industrial plant in this connection.

The second prerequisite is practice, experience; just as a physician, leaving college after five years' study, is not yet fitted to practice as a physician. Two and one-half years or so of hospital experience and years of experience are required before he really becomes a thoroughly good and practically experienced physician. So it is with factory inspection. The inspector must have wide experience, he must see plants in actual operation and make many examinations before he is fitted to advise managers, engineers and superintendents how best to meet the problems of industry.

OLD PROCESSES OFTEN WASTEFUL AND INEFFICIENT

The German factory inspector is required to serve as an assistant inspector for a year and a half. For the first six months he does nothing except go from one place to another with the inspector and see what he does. For the next six months the assistant goes from one inspection department to another to learn the different branches of industry. His last six months of probation is spent in doing clerical work and making tests. Then he gets an appointment as an assistant and in from three to five years he becomes a real inspector. France and England are not so strict. In England only the university man, the college graduate, is accepted as a factory inspector and perhaps it takes them less time to learn than it does in Germany.

How necessary it is to gain experience by serving in an industrial plant! May I cite one or two examples in my own practice? In one case I was inspecting a sugar refinery, twelve or thirteen years ago, and I came to a place where they washed or laundered the filter bags. The bags were saturated with silt and in order to wash it out and regain the sugar they had a dozen or more large caldrons of steaming hot water

and about 100 people. They put the bags into one caldron after another until they came out fairly clean and free from silt. The men worked in twelve or thirteen hour shifts and the conditions were terrible. I asked the foreman: "Is there any way in which these filter bags could be differently laundered?" He said he did not know. Several weeks later I inspected the refinery of the Federal Sugar Company and there I found a large and splendidly equipped laundry. Instead of 100 there were four or five workers and the filtering bags being carried automatically from one washing machine to another machine and when they came out they were perfectly clean. It was only after I had inspected the third or fourth plant that I returned to the first man and I asked him: "Wouldn't it be better to do it this way?" Experience counts!

I visited the bleaching chambers of a chemical factory which, as many of you know, are worked under the old process—the workers wear muzzles when they rake out the bleach, the chloride of lime. They work ten or fifteen minutes at a time in a terrible temperature and a terrible dust. I asked one of the principal owners of the factory whether he knew of any other process and he said he did not. If he did, he did not want to tell me. In 1913 I inspected chemical factories in Belgium. I came to a place where I found something being done, one man on one side and another man on the other side. I asked what was being done and was told: "We manufacture chloride of lime." I could not understand it. Why, a half a mile from the plant at Niagara Falls I have seen chloride of lime dust. I was told: "This is the process that was adopted in England long ago"—a Parliamentary commission had decided the Hasenklener method or process was the best and it had been adopted. It is practically automatic. These are only a few examples of what a factory inspector has to learn before he really knows how to make a sanitary inspection of an industrial plant.

THE DETECTIVE SYSTEM A THING OF THE PAST

As to the different methods and means: These differ very much, according to national characteristics. During the last five months I made some fifty inspections in France, Switzerland, Austria, Czecho-Slovakia, Germany, Belgium and England. It was interesting to watch the inspectors—of course, I was accompanied by the factory inspector in each country. While the work is practically the same, the methods of the dignified college and university graduates—the English inspectors, the temperamental Frenchmen, the friendly Swiss, the pedantic German—all of them have different forms and methods by which they accomplish practically the same results.

There is one difference in method to which I wish to draw your attention; in olden times we called it the "detective" method. You know, factory inspection began with nothing but child and woman protection and practically the only laws were those prohibiting children from working before a certain age and women to work in excess of certain hours. At that time there was no need for expert inspection; it was mostly a police function and the foundation was laid for what we called the "detective" system. In other words, the inspector used to swoop down

upon the plant at unusual hours and catch the company employing a child under 14 or 15 years, or whatever the age limit was, or find a woman working longer than the law allowed.

This inspection continued and was the custom among factory inspectors for a long time after it became needless and obsolete. When the labor laws began to include sanitation and sanitary measures, the safeguarding of machinery, ventilation, etc.—things which exist at all times and for the detection of which it is not necessary to come running to a factory at special times—there was no need for this old method of inspection. Inspectors became so used to it, however, that even now, in a great many factory departments, you will find the detective method being practiced.

The corollary to this method was what we called punitive enforcement; the inspector was a policeman ready to gloat over the employer when he found a violation. At one time even so progressive a lady as Florence Kelley, the first factory inspector in Illinois, publicly said that the success of a factory inspector was judged by the number of prosecutions instituted during the year. This was in line with the characterization of the best policeman as the one who caught the most thieves instead of the one in whose district there was no stealing.

CO-OPERATION OF EMPLOYERS AND EMPLOYEES HELPFUL

Detective methods of inspection and punitive enforcements have disappeared in most European countries. There every industrial establishment must have a license, which cannot be gotten until the representatives of various departments, from the architects of the city to the medical supervisor and factory inspector, go through the factory and tell the employer what is wrong, how it should be done, and corrections are made, if necessary. This is what I call preventive inspection—the only practical and scientific method of inspection. It is only when the factory is first established that this can be done, the machinery safeguarded, and all the other scientific measures undertaken which later may be so difficult to install.

Another method that is becoming a practice in all European countries is that of consulting the employees, the workers, and endeavoring to receive their co-operation. Unless the worker is willing to use the safeguard, wear the respirator or the goggles, understands the dangers of toxins and so forth, and is willing to protect himself, then all your safety devices and all your various boosting will be of no use.

I was glad to see that other countries had introduced the council system—the Whitley councils in England and various bodies in the other places—and this has become the organic law of labor legislation in most countries that I visited. In every shop and factory I visited the first man we went to see was the councillor, or whatever he is called; as the representative of his shop, he was responsible for a great many of the things which were done in that factory. When the factory inspector in Germany comes to a shop he does not make a report of this and this to be done and send it to the employer; the councillor in each shop determines what is to be done. With the inspector and employer these three

counsel together and a decision is reached. Conferences are being held in practically every country between representatives of the workers and representatives of the employers.

In Czecho-Slovakia, a little country but one destined to be great, I found practically 95 per cent of employees grouped into a very strong and dominating workers' organization. On the other hand, all of the employers were likewise organized into a very strong association. There were constant conferences between these two organizations upon every point, economic as well as sanitary and others. This is much better than strikes, and I am glad to say that strikes there are few and far between.

I would emphasize the features of factory inspection, surveying of establishments and education of the workers; their co-operation is absolutely essential for any successful enforcement of labor laws or of any of the precepts of industrial hygiene and sanitation.

EUROPE NOT KEEPING PACE IN INDUSTRIAL HYGIENE

Nine years ago when I returned from my European trip I was rather despondent. At that time we were only beginning to properly safeguard machinery and progress in industrial hygiene; there was scarcely a college teaching industrial hygiene and factory sanitation and not a book on the subject. At that time I wrote in my bulletin of the great progress which had been made in industrial safety and sanitation in most of the progressive European countries and how far behind we were, but I am happy to say that now, after my last trip abroad, I have had to change my mind, or, rather, my statements.

During the last nine years or ten years Europe has not progressed; in fact, there is a distinct retrogression. Industrial conditions there are horrible beyond description! Human life is of so little account that you cannot expect a German, a Frenchman or anyone else to bother much about a little thing like factory inspection or the safeguarding of machinery. I was surprised to see in England and France conditions which I could not believe would ever be present there and Germany was away behind conditions of nine years ago. Millions of people have been killed and so many more maimed that they say: "What does it matter if a little thing like a machine is not properly protected or the toilets not sanitary?" This spirit of pessimism seems to pervade the whole of Europe and the great progress that had been made in factory inspection has largely been lost—it will take years and years to regain it.

Here in the United States we have made gigantic steps in the progress of our work. We have books galore on factory sanitation and industrial hygiene; we have many colleges giving lessons and courses of study, and, last but not least, the National Safety Council that has done so much and such great work in the last ten years.

CHAIRMAN COFF: We enjoyed the address by Dr. Price and his remarks on inspection and industrial management. When we open our meeting to a general debate, some of our factory inspectors will probably discuss the matter, as I know that there are at least two good factory inspectors in the room. There may be some employer in the audience

who would also like to come to the defense of the factory inspectors of America, as it has been rumored from time to time that strong friendships are being built up between them. Discussion will come later. For the present we will adhere to our program. We will now be favored with a paper by Dr. Barr.

FACTORY HOUSEKEEPING FROM THE STANDPOINT OF THE WORKERS' HEALTH

DR. F. G. BARR, MEDICAL DIRECTOR, NATIONAL CASH REGISTER COMPANY,
DAYTON, OHIO

The National Cash Register Company, with many other companies in this country, have had years of experience in housecleaning from the standpoint of the workers' health, and I will give you briefly some of the important points as we see them.

First of all, we begin before the employee is placed upon our rolls—we give him a thorough physical examination. I was greatly surprised to hear speakers at this Congress mention that they had only begun physical examination work during the past two or three years; we have had it for twenty-one years, and during that time not even a vice-president has been employed by our organization who has not been required to pass a physical examination. We so thoroughly believed in it and felt it to be necessary that, during the war, when we were placing hundreds and hundreds of people upon our payrolls we continued the work. We have never retrenched this work in any way.

Our next step is a health and safety lecture to all new employees. We thoroughly believe in this practice, because when you can have one or two employees, say, that we examined yesterday, taken off their benches, brought to a meeting place, given a health and safety lecture, and, following it, a trip through the factory, those employees immediately begin to see that they are a part of a large organization; that they are not mere bench hands, that their work is not confined to their own department, but are confined only to their own limitation. We point out to them the hazards of their work and the hazards of the other man's work; we want them to feel that each is one of the workers of our institution.

EVERY COMPANY SHOULD HAVE EFFICIENT MEDICAL DEPARTMENT

In cleaning house, you need a housekeeper—a very efficient housekeeper—one who does not do all the work himself, but is able to interest all of the workers in the various classes of the industry. The head of the medical department—not because I happen to be medical director of the National Cash Register Company—should be the housekeeper and have the say about housecleaning. If you have an efficient medical department you will have the interest of all classes, from the president to the foundryman or the trucker.

We believe in interesting the executives first. A few months ago one of the high executives of our company decided he was very sick and he reported to the medical department, just as the ordinary worker would do.

He felt he was so sick that he demanded the services of a certain well-known specialist in our country, so we took him to an eastern city and had him thoroughly examined. The point I want to make is that he first came to the medical department, because he believed in it.

You must have good equipment. Every factory should and can have a medical department and it can be proved that this is not a luxury—it is not a welfare, it is a production department—indirectly. What do I think should be the equipment of a medical department in order to clean this house perfectly from the standpoint of the worker? Keep that in mind all of the time, “from the standpoint of the worker.” You need doctors and nurses and first-aid attendants, but above all, and more important, you need the type of personnel that will gain the confidence of every worker; again appealing not only to one class, for you will find, after a few months, that you will have all employees from one department coming in, but none from other sections of the plant coming to you for service. You will find infections mounting up in certain departments, because they have not followed your instructions regarding first aid, largely because some ill-advised information has been given an employee when he came to the medical department.

WEIGHING EMPLOYEES TO DETERMINE HEALTH CONDITION

You should have X-ray and laboratory equipment; for a factory employing 1,000 men you can prove to the executives that it is worth while.

We do not believe in compulsory orders in our factory; we do not require the men and women to come to the department, but we have a large number of voluntary visits—last year 45,500 visits among 6,000 employees, approximately eight or nine visits per employee.

We have various methods of interesting our employees. It is rather impressive to see the scales brought into the department every six months and all of our employees weighed. Those records are valuable as they extend over a period of five or six years. The last time we weighed, not many months ago, we found five cases of tuberculosis. Wasn't it worth while?

Someone may ask: “If you do such excellent examining work, why did you have tubercular cases in your industry?” Every doctor passes them by occasionally; we do not find all the tubercular cases, and some of them develop after they have entered our service.

Another important value of weighing employees is this: We find a number of employees under the average weight and we believe by examining and re-examining them we can find evidence of some disturbance—most of the abnormal conditions being such that they can be corrected very easily. Those who are markedly under weight are given malted milk; we believe in keeping the factory helper not only healthy but efficient. Last year we distributed thirteen tons of malted milk among our employees; it cost \$9,000.

We estimate our value to the employee. Every employee who receives even the most trivial service is charged for it on our books. The service is gratis to our employees, you understand, but a certain, definite charge, according to the service, is placed upon the books—last year it amounted

to \$76,000. Is that worth anything to show a general manager? We think it is worth a great deal.

MONETARY BENEFIT GAINED THROUGH EXAMINATION

The only reason the National Cash Register Company has a right to discuss factory housekeeping is because of our saving of lost time on account of sickness. Last year, among 6,000 employees, we lost eleven and one-half hours each on this account—it was the best record we have ever made. I realize that last year was the healthiest period, probably, in the history of our company, but eleven and one-half hours per employee is a good record. How many hours did you lose last year on account of sickness? I wrote to thirty different industries asking them for their records, I consulted the Metropolitan Life Insurance Company and the United States Public Health Service, and I found the average lost time per employee in all of the factories which were enlisted was from six to eight days. Show that to your general manager—six to eight days as compared with eleven and one-half hours, or a saving of approximately 50 hours per employee. Total that up, with 6,000 employees, you have a saving of \$120,000.

You must talk to the manager and president in terms of dollars and cents. Take \$76,000, the estimated value to the employees, and the \$120,000 saved, and from the total of those two items subtract the expense of your medical department, and you can show a mighty good balance. You can show such a good balance that the executives will decide immediately that the service is worth while, if you can keep the health up to this standard.

We are going one step further: We believe in interesting the children of employees, because many children lead the parents in the right direction. Every Saturday morning a body of from 2,000 to 3,000 children—not only our employees' children but children from the community and city—are given an educational program of health talks, health pictures, health slides, pageants, and playlets of various kinds, and here is an illustration of the result: Some of the children were being shown through the factory not many weeks ago and as they came through I spoke to one little boy about 10 years old, asking: "What are you going to do when you grow up?" He said: "I am going to be a toolmaker for the National Cash Register Company." He was not the son of one of our employees, but he is being trained, first of all, to think of health as the most important part of his daily program and he sees that it is.

FOREMEN, SUPERINTENDENTS AND EXECUTIVES EXAMINED

We have a monitor system in which a foreman and a supervisor or the head of a department checks or rates every employee under his supervision according to one of a number of different headings. Health, of course, comes first again; then appearance, lost time, etc.; he is rated either A, B, C or D. All the D men are asked to report to the medical department; they are not compelled to come, but they are asked to appear

for re-examination. It is a very good method because in this way you obtain co-operation.

As Dr. Price mentioned, one of the most important essentials in doing health and safety work is to obtain the co-operation of the foreman and his employees; then comes the medical department. We carry our work one step further: We examine 550 foremen, supervisors and executives, as they are all anxious to come in for examination.

CHAIRMAN COFF: We are very glad to have had this fine address by Mr. Barr. We will hear now from Dr. Nelson Black, one of the best friends Wisconsin employees ever had

THE PROBLEM OF EYESTRAIN IN INDUSTRIAL OCCUPATIONS

BY NELSON M. BLACK, M.D., MILWAUKEE, WIS.

Efficiency is one of the side bars of the ladder to success and visual efficiency is of the utmost importance in all industrial occupations. The fact that many totally blind individuals are economically efficient does not tend to mitigate the above statement. The real problem therefore is: What is the effect of eyestrain on efficiency in industrial occupations?

VISION

Generally speaking vision may be considered as that process whereby light, color and form are recognized, and is conceded to be the result of the physiological action of light in decomposing a photo-chemical substance contained within the retina or nerve-bearing coat of the eyeball. Hence light or illumination is of prime importance in visual efficiency.

The ability of the normal eye to distinguish the form of an object depends upon three factors: 1. The size of the image received upon the background of the eye. 2. The amount of light reflected from the object. 3. The contrast of the object with its background.

An object can be recognized by the so-called normal eye if the angle subtended by it upon the retina equals 5 minutes and its component parts, as for instance a letter, subtend a 1-minute angle. The amount of light reflected from the object must be sufficient to decompose the photo-chemical substance within the eye and cause a stimulation of the optic nerve endings. The coefficient of reflection between the object viewed and its background must differ sufficiently to make a contrast, otherwise the object will be invisible.

ACCOMMODATION

All rays of light reflected or emanating from objects twenty feet or farther away are practically parallel. The normal eye when at rest is in focus for a distance of from twenty feet to infinity. When an object is closer to the eye, say at the reading or working distance of fourteen inches, the rays of light emanating from the print or object worked upon are divergent and must be converged or be brought to a focus upon the retina to produce a clear image.

In order to obtain a clear picture with a camera it is necessary to have the plate or film at the focal point of the lens. With the eye it is necessary to have the retina at the focal point of the lens. With the camera, the lens is moved forward or backward from the plate; such a movement is manifestly impossible in the eye. What does take place is called the act of accommodation and is a physiological process of the lens substance. The lens of the eye is enveloped by a capsule; attached to the margin of this capsule is a delicate circular ligament which in turn is attached to a muscle in the anterior segment of the eye. The lens substance within its capsule is an elastic material which constantly tends to take the form of a sphere. When the controlling muscle is at rest the ligament attached to the capsule holds the lens substance in a flattened form and the eye is accommodated for parallel rays. When the rays become divergent the muscle contracts; this relieves the tension on the ligament and capsule and the lens takes on a more spherical form and focuses the divergent rays on the retina.

CAUSES OF EYESTRAIN

The constant use of the muscle controlling the mechanism of accommodation in normal eyes for any near work is fatiguing and productive of strain which can only be relieved by short intervals of rest.

In normal eyes strain is induced by improper illumination and by lack of contrast in the color and background of the materials worked upon.

Under proper illumination eyestrain results from: 1. Substandard vision due to congenital deformities of the eyeballs. 2. Lack of perfect harmony in the action of the muscles controlling the movements of the eyeballs. 3. Some defect in or disease of the eye itself.

The subject of illumination as a factor in eyestrain is important. Sufficient here to quote from the chapter on "Eye Conservation" in "Waste in Industry" by Dr. Earle B. Fowler: "The simple requirements on which efficient illumination is based are: 1. Light enough to see by to do work—too little or too much producing discomfort. 2. Diffusion to avoid sharp contrasts and deep shadows. 3. Elimination of glare."

SUBSTANDARD VISION

There are various factors which exist in the eye itself which reduce the ability to see distinctly and therefore interfere with visual efficiency. These are known as farsightedness, nearsightedness and astigmatism, and are due to deformities of the eyeball, which in most instances are congenital.

FARSIGHT

Farsightedness is the name applied to a condition of the eyes in which the rays of light entering the pupil are brought to a focus back of the retina because of the eyeball being too short. Consequently there is a blurred vision. Where the eyeball is not too short the accommodation power may be forced to the point where it will converge the rays and focus them on the retina; this causes, after a short time, headaches, pain in the eyes, and red lid margins and inflamed eyeballs. This defect can

readily be overcome by placing the proper strength of convex lenses before the eyes to converge the rays of light upon the retina and thus relieve the muscles of accommodation of the work.

NEARSIGHT

Nearsightedness is the condition in which the eyeballs are too long, so that parallel rays of light entering the pupil are brought to a focus in front of the retina. These eyes see clearly when the object is close to them, as the reflected rays of light are then divergent and can be focused on the retina. The complaint made by shortsighted individuals is inability to distinguish objects in the distance, vision being blurred even at the ordinary working distance in nearsight of the higher degrees. The defect is corrected by placing the proper strength of concave lenses before the eyes to bring the rays of light to a focus on the retina.

ASTIGMATISM

When the cornea, or clear anterior segment of the eyeball, is not the true segment of a sphere the result is astigmatism; in other words, the curvature is greater in one meridian of the front of the eye than it is in the other, so that rays of light entering the eye in the plane of one meridian will not be brought to a focus at the same point as those entering the plane of the opposite meridian, resulting in an irregularly shaped retinal image. This condition is also found associated with either farsight or nearsight and may be corrected by properly adjusted lenses.

PRESBYOPIA

At or slightly after the age of 40 the ability to read or distinguish details at or within a distance of 14-16 inches is diminished. This is the result of loss of the power of accommodation due to hardening of the lens substance. Such a loss of vision can be brought to normal with glasses which make up the loss of accommodative power.

MUSCULAR INSUFFICIENCY

When an object is regarded (say at 14-16 inches distance, which is the proper reading and working distance), the two eyes must turn toward each other so that both eyes will look at the same point. If the muscles which pull the two eyes together are weak there will be blurred vision after a short period of close work and an eyestrain which will cause a headache, frequently not apparent until the next morning. If the muscles which move the eyes up and down are not perfectly balanced in power one eye will not be brought to the same level as the other, consequently more nervous energy must be sent to the weaker muscle, which results after a short time in pain and discomfort and inability to use the eyes.

EFFECTS OF EYESTRAIN ON VISUAL EFFICIENCY

Prolonged use of normal eyes under the best hygienic conditions induces fatigue, general and local, with lowered visual efficiency. The rapidity with which the fatigue makes itself manifest is greatly increased

under bad hygienic conditions. If, in addition, there is defective vision or imperfect muscle balance further loss in efficiency results from inability to see details and mistakes are made, with consequent reduction in quality and quantity production.

The effect upon the eyes of strain due to the above mentioned deformities of the eyeballs, known as "refractive errors," are many and varied, depending upon the degree of error and amount the eyes are used in close work. Congestion or redness of the eyeballs with itching and burning of the lids, the formation of a sticky secretion that dries and forms scale at the roots of the lashes, which tend to fall out, and the formation of abscesses in the lid margins, or sties, are common symptoms.

Use of eyes having defective vision from uncorrected refractive errors for any close work produces blurred vision and usually results in headaches, which may appear in the forehead, back of the eyes, the temples or top of the head; all of which tend to interfere with the general efficiency of the individual. Pain in the back of the head, with occasional dizziness and nausea, the result of using the eyes in the near, is usually due to some lack of power or insufficiency of the muscles which control the motion of the eyeballs and is frequently found in conjunction with refractive errors.

FREQUENCY OF SUBSTANDARD VISION

The study made by the Federated American Engineering Societies of industrial operations shows that more than 25,000,000 men and women are employed in the United States with substandard vision requiring correction. This is an astonishing statement but corresponds with the result of the visual tests made in public schools throughout the United States. These examinations show 20 to 25 per cent of school children have substandard vision. Newton Fuesle of the *Outlook* attributes this large percentage of defective vision to the fact that evolution has been unable to keep pace with the change in environment and use of the eyes.

CHAIRMAN COPP: This subject is to be further considered by Mr. Elliott, Consulting Engineer, of Boston.

FACTORY LIGHTING AND INDUSTRIAL ACCIDENTS

E. LEAVENWORTH ELLIOTT, COOPER HEWITT ELECTRIC COMPANY,
HOBOKEN, N. J.

The unexpected sometimes happens—in fact, will inevitably happen—with as much certainty as the best-regulated natural phenomenon. When it happens we call it an "accident." An accident is as much the result of that definite combination of conditions which we call a "cause" as is the production of heat when oxygen and carbon unite. The difference is that the particular combination of events and conditions which result in the unexpected occurrence are not clearly foreseen. When we strike a match and kindle a fire, we expect combustion to follow. When an oil-soaked rag takes fire spontaneously it is an accident, because unexpected.

We are at present interested only in accidents which result in injury to the human machine. In this class of unexpected events there are

necessarily two general conditions which combine to produce the unforeseen result: A physical source of injury, and a condition which for the moment renders the human machine incapable of avoiding the source of danger. It is impossible to entirely remove the physical sources of injury under any condition of human life. Those which are due to the pursuit of any given kind of labor constitute the necessary hazards of that industry.

HOW THE HUMAN MACHINE IS PROTECTED AGAINST INJURY

Self-preservation is said, erroneously, to be the first law of nature. It is the second law of nature—the preservation of the species being the first. The human machine is provided with a very elaborate system of controls for preventing injury from external sources. These controls are partly automatic, or involuntary, and partly operated by the conscious action of willpower. The instinct of preservation tends to bring all of these controls into action when the body is threatened with danger. Warning of danger is received through the several “senses”—sight, hearing, muscular, temperature, touch, smell and taste. Protective action by the body, in response to danger signals given by the senses, depends upon the acuteness of the senses, and the efficiency with which the body responds to the signals, as the safety of a railroad train depends upon how clearly the engineer can see the signal and how quickly he can operate the control levers when danger is indicated.

The efficiency of the control system of the human machine depends upon its physical condition; *i. e.*, the general health, and upon that inscrutable thing which we call “mental attitude,” or “psychological condition.” “You never can tell what a man will do” is the common and very accurate statement of the chief contingency in accident prevention.

“Familiarity breeds contempt.” In this maxim lies the explanation of a majority of industrial accidents—just how large a majority cannot be definitely stated. Even the imminent and ghastly dangers of war soon lose their terror on intimate acquaintance. This contempt, bred of familiarity, is the psychological condition known as “carelessness.” It is a deterioration of the instinct of self-preservation resulting from the natural tendency to reduce action to habit. The majority of accidents that are not directly due to carelessness are due to ignorance. The remaining small minority are due to causes entirely beyond human control and are therefore unpreventable.

The consideration of a special case will help to make the preceding analysis clear. Let us take the case of a saw table in a woodworking shop. The revolving saw constitutes the chief source of danger and the special hazard of the trade. Warning of the danger is received through the senses of sight and hearing, the former being the most important. If the vision of the operator is interfered with—either through defective eyesight, insufficient light, a dazzling light source or a confusing shadow—the chance of his coming in contact with the saw will be increased in proportion to the extent of the interference. A deaf workman might come in contact with the saw or the driving pulleys and belting for lack of warning of the danger. The inexperienced apprentice will naturally keep as far

away from the saw as possible and will be much less liable to injury than the workman who has become thoroughly familiar with its use. On the other hand, he will run a much greater chance of injury by reason of ignorance; for example, having a stick thrown back at him, because he does not know this particular trick of a buzzsaw. The care which the operator takes to avoid the known dangers will depend upon his habit of thought, of constantly keeping in mind the possibility of accident—and also upon the alertness of his mind. Anything which lowers his vitality, such as fatigue or sickness, will increase the liability to injury.

CONDITIONS OF MAXIMUM SAFETY

The minimum liability to accidental injury will be attained under the following conditions:

When the immediate source of danger is surrounded to the utmost with physical means of protection.

When the operative has full knowledge of all the sources of danger.

When all his senses function normally.

When he is habitually careful.

When his body and mind are in a condition to act with maximum efficiency.

BODILY ACTION DIRECTED BY SENSE OF SIGHT

We are now ready to discuss the relation of factory lighting to industrial accidents. From the foregoing analysis it will be seen that the relation is a direct and theoretically, at least, a very important one. Psychologists estimate that 70 per cent of all bodily action is directed by the sense of sight. On first thought it would seem a logical conclusion that 70 per cent of industrial accidents should be chargeable to visual delinquencies. An accident, however, is generally the result of a combination of causes and cannot be so simply classified. In all cases the mental attitude is a very weighty if not actually controlling factor. The number of railroad accidents that have occurred from the engineer running past plainly visible signals is a convincing proof of this fact. Vision cannot be charged with casualties resulting from the failure of the mind to act upon the warning given. It would seem safe to say that 70 per cent of the warnings of danger are given through the sense of sight, and this furnishes a sufficient incentive for providing all the facilities necessary to maintain this invaluable function at maximum operative efficiency.

In order to secure normal visual efficiency two things must be considered: The eyes and the light—and the eye comes first. A defective eye will give defective vision under any conditions of illumination, but a normal eye will give normal, *i. e.*, undistorted, vision under a very wide range of illumination conditions. The importance of examining the eyes and furnishing corrective glasses for such as are found defective is only beginning to be appreciated by manufacturers. The economic advantage arising from bringing the efficiency of the organ which controls 70 per cent of all muscular motions up to 100 per cent at a cost of a few dollars is too obvious to need discussion.

PREVALENCE OF DEFECTIVE VISION

It is only recently that the extent of defective vision has become known. While it was common knowledge that those past middle life generally needed the aid of glasses, the prevalence of defective vision among the younger portion of humanity was not suspected. The Eyesight Conservation Council of America has given out the following startling information: "Statistics covering many years show that nine out of every ten persons over 21 usually have imperfect sight; at 31 the proportion is larger; above 40 it is almost impossible to find a man or woman with perfect sight. It was learned some years ago by the examination of several thousand school children in one of our large cities that 66 per cent of them had defective vision of such a degree as to warrant the wearing of glasses. Quite recently the examination of more than 10,000 employees in factories and commercial houses showed that 53 per cent had uncorrected faulty vision and 13 per cent had defects which were corrected, making a total of 66 per cent with defective eyes. These two surveys were made under different auspices several years apart. The figures are startling. They mean that a very large majority of the public have eyes defective to such a degree as to require glasses to conserve vision and make the individual a happier and more efficient member of society."

Whenever a fault is discovered a cause is sure to be assigned. It often happens that the blame is placed on suspicion rather than on established facts. The science of ophthalmology, like all other sciences, has made rapid progress within the past forty years, during which time the electric light has come into general use. The discovery of the prevalence of defective vision has thus been coincident with the development of electric illumination. One of the most common fallacies of reasoning is to assume that what is coincident with a given phenomenon must be the cause of that phenomenon. Thus it is that we have heard the electric light charged with ruining the eyes of the people, particularly of school pupils and workmen. Convincing proof of this is conspicuously lacking. We have no means of knowing whether defective eyes are more prevalent than formerly among civilized peoples, because there were no general examinations made even a generation ago. If defective eyes are more common than formerly, particularly among the younger, it is far more reasonable to ascribe the condition to the vastly greater amount of close eyework, particularly in reading and studying, that is done by the youth of today. When we stop to compare the illumination provided for work, study and reading at the present with that furnished by the candles, lamps and fluttering gas jets in our fathers' time, we will be inclined to hail the electric light as a preserver rather than a destroyer of eyesight—which is undoubtedly the truth of the matter.

THE CAUSE AND PREVENTION OF EYESTRAIN

The dangers of eyestrain, both directly and as an inciting or aggravating cause of other organic disorders, have also been discovered coincidentally with the progress of ophthalmology and artificial illumination, and the resultant evils have accordingly been charged impartially upon

defective eyesight and improper illumination. While there is no doubt about the guilt of both parties, there is the important question of the proportion which each should bear. I have no hesitation in saying that defective eyes are the more common and by far the more aggravated cause of eyestrain than improper illumination.

Many states have statutory codes for the regulation of factory lighting. While these are desirable, if properly drawn, much greater benefits would accrue to the working classes from a statutory requirement for the examination and correction of defects of the eyes of all factory employees. As an illuminating engineer, I would say to the workman who discovers that he is subject to eyestrain: "See your oculist first, then consider the light you work by." I wish to lay particular stress upon this point because I can do so without being suspected of ulterior motives. The discovery and treatment of defective vision of necessity devolves upon the oculist. All efforts directed toward the amelioration of this universal deficiency must therefore ultimately contribute to the pecuniary advantage of this profession. It is human nature to suspect the motives of advice offered by those who will directly benefit by its acceptance. The irreproachable attitude of the medical profession in regard to propaganda for profit should entirely acquit the oculists of any selfish motives in the present case in the minds of thinking people, but unfortunately all people are not of this class. It is to be hoped that the Eyesight Conservation Council can carry on its important work entirely free from any handicap of this kind.

CONDITIONS OF LIGHTING THAT INCREASE ACCIDENT HAZARD

The artificial lighting of a factory may be the sole or contributing cause of accidents under the following conditions:

1. When there is not sufficient light to enable the operative to see the source of danger.
2. When the light is of such kind as to temporarily blind or incapacitate the eyes, so that they cannot give warning of danger.
3. When shadows are such as to hide sources of danger or confuse objects with shadows.
4. When the illumination is such as to produce constant eyestrain and thus lower the general nervous tone.

Before proceeding to the discussion of these four topics it will be well to consider their relation to the physical means of preventing accidents. "Safety First" means first removing to the utmost the physical sources of danger. If there is a pit into which a workman may stumble the first thing to do is to fill it up or put a guard rail around it. This entirely removes the source of danger, while the best of illumination still leaves all the contingencies of human fallibility in full operation. We often hear it said of a machine or apparatus that it is "fool proof." We are all fools at times and in the work of accident prevention we should go upon the theory that all people are fools all of the time. Physical means of securing safety take precedence over all other methods. However, no amount of human ingenuity or foresight can wholly remove the

dangers of industry, so we may proceed with our discussion of factory lighting, taking up the topics in order.

INSUFFICIENT LIGHT

That sufficient light should be supplied in all places where workmen may be required to go, to plainly reveal all sources of danger, is of course obvious. The question is: How much is necessary? The general answer can only be the one so often made under similar circumstances: "That depends." It is well known that the eye can function through a range of one million times the minimum condition. There are two very important provisos to this statement, however: The eye must be "adapted" to the particular intensity by which it is to function, and there must be no excessive contrasts in brightness within the visual field.

That the eye is temporarily blinded on suddenly going from darkness into the light, or *vice versa*, is a familiar fact. Such variations in the intensity automatically produce two adjustments in the visual apparatus: The diameter of the pupil changes through a ratio of about one to four, thus regulating the amount of light that enters, an action which is comparatively rapid, requiring from a few seconds to as many minutes; and a change in the sensitivity of the retina, which results from certain chemical and physical changes in this marvelously delicate organ, which requires a much longer time. The highest degree of sensitiveness or ability to "see in the dark," may require as much as an hour's exposure to the dim light. This is simply a brief explanation of the familiar fact that sudden wide variations of intensity of light temporarily incapacitate the eyes and therefore increase the accident hazard.

The amount of light required for safety thus depends upon the constancy with which it is used. A hall or stairway which would be sufficiently lighted for those who were continuously using it might be dangerous for those going into it directly from a brilliantly lighted room or from outdoor sunshine. Similarly, a mill yard lighted by high-power lamps at long intervals might easily have danger spots between the lamps, where the intensity would be quite sufficient for eyes adapted to it. Storerooms into which workmen pass from brightly lighted shops furnish another example.

EXCESSIVE CONTRASTS

An excessively brilliant spot in the field of vision will prevent the eye from seeing clearly in the other parts of the field, which may be sufficiently light for good vision in the absence of the bright spot. This is the condition commonly called "glare", of which so much is heard in discussions of lighting. The most familiar case, and one which is prolific of accidents, is the automobile headlight. This represents the extreme of conditions. Only the central portion of the visual field is illuminated, and that with only a very moderate intensity, so that the eye is adapted to comparative darkness. When the intense beam of an approaching headlight meets the eye it produces total obliteration of all detail in the field surrounding the bright spot. This is true to a greater or less extent in all similar cases, depending upon the degree of contrast. The brightest street

lamp produces no glare in the daytime, in fact, is hardly distinguishable, and comparatively little at night if the street is brilliantly lighted, but when standing a considerable distance from other lamps it is impossible to see objects beyond it. As the distance of the lamp from the eye increases, and its apparent size diminishes, the glare becomes less, until it entirely disappears when the light becomes only a bright point. This illustrates the two principal characteristics of glare: Its dependence upon the degree of contrast in brightness, and upon the size of the brilliant spot. It is obvious that glare may result from the direct reflection of a brilliant spot as well as from a luminous source. It is sufficiently evident that glare in factory lighting increases the accident hazard and should therefore be avoided. This is one of the chief objects sought in the lighting codes provided in a number of the states.

EXCESSIVE QUALITY OF LIGHT

An effect usually included under the term glare is produced by an excessive quantity of light entering the eye. This effect differs from glare in being cumulative rather than instantaneous. Facing a window will gradually blur the vision, although objects may be seen through it with perfect distinctness for a time. So it is possible to look past a high-power electric lamp enclosed in a diffusing globe and see objects clearly for a certain space of time but if continued the vision will be blurred.

Glare is most commonly ascribed to "bright light-sources in the line of vision." It is not necessary, however, that light-sources be in the line of vision or even within 23 degrees about this line, as set down by some writers as the limit of range, in order to produce a cumulative effect interfering with vision. Brilliant light-sources entirely out of the visual field, if near enough the eyes, are exceedingly troublesome; they give "scattered light in the eye," *i. e.*, light that is not directed by the lens and which fogs the retinal image, just as a hole in the bellows will fog the plate in a camera. Small units hung close together from a fairly low ceiling afford the maximum condition for this effect. As in the case of excessive volume of light, the results of scattered light in the eye are accumulative rather than immediate.

SHADOWS

Shadows may increase the accident hazard in two ways: By hiding or obscuring physical sources of danger, and by confusing an object with its shadows. The eye adapts itself to the brightness of the field which it sees. In shop lighting the brightest light is thrown upon the places where the most important operations are taking place. The eyes of the workmen adapt themselves to this intensity and hence the places which are in shadow appear darker than they would if the eyes were regularly working in them. The greater this contrast the less clearly will the objects in shadow be seen. It is familiar knowledge that small light-sources produce sharply defined shadows, while large sources give shadows with blended outlines. Light from a small and powerful source may produce a shadow with such sharp outlines as to give it the appearance of a real object. The shadows produced by several such sources in different

positions, especially if the object itself is complicated, may become very confusing. On the other hand, there are many cases in industry where visual discrimination is greatly enhanced by throwing the outlines into silhouette by a strong light from one direction, thus utilizing the sharpness and density of the shadow to increase visual acuity.

LIGHTING A CONTRIBUTORY CAUSE OF ACCIDENTS

Such, briefly stated, are the cases in which shop lighting may be the direct cause of industrial accidents. There remains to be considered the conditions under which the lighting may be an indirect, or contributory, cause of injuries. This brings us to the much-discussed subject of eyestrain as a result of improper illumination. Let us begin by getting a clear idea of what eyestrain really is: Eyestrain is muscular strain, resulting from overexertion of the two sets of muscles which operate the optical apparatus of the eye, the one adjusting the focus, the other turning the eyeball so as to bring the objects into the visual field. The light-sensitive surface, or retina, is insensitive to pain and so is not subject to strain in the common meaning of the word.

Since the muscles are controlled by the nerves and their common centers, muscular strain results in nervous strain; in fact, the sensations of pain and fatigue, which are the indications of muscle strain, are directly caused by nerve strain or stimuli. And because the nerves controlling the different muscles and organs have common centers to a greater or less extent, disturbances of one set of nerves sympathetically react upon other sets, producing disorders in the systems which they control. The extent to which such reaction takes place is much greater than was formerly supposed. Thus the nerves of the visual system readily affect the digestive system so that eyestrain frequently causes nausea and other digestive disturbances. Well-authenticated cases show that eyestrain may be the ultimate cause of disorders ranging in severity from headache and nausea to insanity. The severity of the effects, of course, depends upon the severity of the strain.

ACUTE EYESTRAIN DUE ONLY TO DEFECTIVE VISION

Faulty illumination is rarely, if ever, responsible for pathological results more severe than headache and nausea. An unusually brilliant illumination will sometimes produce the latter, though such cases are rare. In 1915 a Parliamentary investigation was made of industrial lighting conditions in England. The evidence on this point failed to disclose a single authentic case of a pathological condition of either the visual or other organs arising from improper illumination. In a recent hearing on a proposed state lighting code, held before the Commissioner of Labor of Massachusetts, several ophthalmologists who have had especially wide opportunities for observation in this field testified that no such cases had ever come to their professional attention. There are, however, a few cases on record where injury to the eyes has been attributed to faulty lighting, but the rarity of such cases, and the fact that they have sometimes been charged to directly opposite conditions, throws much doubt upon their validity. It is a safe proposition to assert that pathological conditions

other than headache and nausea resulting from eyestrain are due only to defective visual organs.

Fatigue which does not become permanent is not to be regarded as a pathological condition. The nerves and muscles may be compared to a spring, which may be flexed to a certain extent and held in this condition for a certain length of time and fully recover its original position when released, but beyond a certain limit it will take a permanent set. That eyestrain resulting from faulty lighting produces both nervous and muscular fatigue there is the most abundant evidence. The fact that the output of labor is less under bad lighting is strong evidence in itself. The experience of a large silk mill is highly significant and interesting. Under the old system of lighting with improper equipment the production curve tipped down at both ends, but after installing the most approved system of illumination the two ends of the curve actually turned up; in other words, the operatives turned out more work at the beginning and end of the day, while artificial lighting was used, than during the interval between when natural light was available. The same results have been observed in other industries.

THE INFLUENCE OF FATIGUE

It is, no doubt, a common opinion that fatigue is an important contributory cause of accidents, but even so plausible a supposition as this fails to square with the records in all cases. In one of the largest rubber factories, where the causes of accidents and the circumstances of their occurrence are recorded and investigated with unusual thoroughness, it is found that the periods of greatest accident frequency are the first hour in the morning and the mid-afternoon hour. Fatigue cannot possibly be the contributing cause in the first period nor a factor to be reckoned with in the second. After a night's sleep the human machine has to run awhile before it operates with its full efficiency. Many accidents of the preventable class are due to what the psychologists call "lack of co-ordination," the motions miss the mark. Co-ordination is largely a result of practice and even a night's cessation of work reduces the acquired skill, so that a certain amount of practice is necessary to bring the co-ordination up to its maximum.

The increased accident frequency during the mid-afternoon hour is most probably due to the drowsiness resulting from the digestion of the lunch. A case which supports this theory is furnished by a cotton mill in which 80 per cent of all accidents occurred in one department during the afternoon. There were no extra physical hazards in this department. But in this department the operatives were allowed an hour at midday, during which most of them could go home and get a full meal, while in the other departments the operatives took a light lunch while on duty. The "pneumogastric nerve," as 'Gene Field would have put it, was undoubtedly the culprit in this case.

STATISTICS NOT AN INFALLIBLE GUIDE

It is manifestly impossible to determine the exact responsibility of any contributory cause in the production of an accident. Statistics pur-

porting to give the proportion of accidents due to faulty illumination must, therefore, not be taken too literally. One of the earliest attempts to determine this relation was made by Mr. John Calder in 1910. He showed that the number of accidents per month followed pretty closely the length of time when artificial light must be used. This coincidence has since been generally accepted as a true indication of the part that lighting plays in the production of industrial accidents. It is only recently that another investigator of the subject compared the curve of accidents plotted against months with the curve of absences caused by sickness and found the two curves to run substantially parallel. What inference is to be drawn from this coincidence? Is the sickness also caused by the greater use of artificial light? And if not, to what extent is the lowered vitality invariably attendant upon sickness responsible for the higher accident rate?

The English investigation before referred to included an effort to discover the influence of lighting upon the accident rate. The data available consisted in the number of accidents reported by months and by industries. Using a number of assumptions, a set of figures was arrived at which purported to give the relation of lighting to accidents—but the assumptions were subject to such wide inaccuracies and so many conditions having more or less influence upon the results were omitted that the conclusions were valueless.

Mr. R. E. Simpson of the Travelers' Insurance Company has probably made the most careful analysis of accident statistics for the purpose of determining the influence of lighting as a sole or contributing cause. In a paper presented to the Illuminating Engineering Society in 1915 he comes to the conclusion, from a consideration of 91,000 accidents occurring in and about industrial plants in the previous year, that 23.8 per cent were due to improper illumination, of which 10 per cent were directly due to insufficient light. He admits that there might easily be a difference of opinion as to the extent to which improper lighting was responsible in many instances, but believes in such cases the arguments on either side would be equally convincing. Referring to this analysis he says: "Under the heading 'Direct Cause' were included all accidents on stairways, in passageways or in the shop, where it was shown that there was no light in the immediate vicinity. It is true that many persons have been injured by falling down stairways that were well lighted, and therefore the illumination could have had no bearing upon the accident. It is likewise true that if none of the stairways were provided with light the accident rate from this cause would be vastly increased."

The concluding statement has no bearing upon the correctness of his method of analysis, but his admission furnishes the grain of salt with which all statistical conclusions should be taken. He cites several cases as examples of the way in which improper lighting causes accidents. In one case a bar of iron projected into a passageway, but was in the shadow of a column. Workmen pulling a truck stumbled over this and were injured and this was charged directly to "inadequate lighting." The most interesting point in this case is not mentioned by Mr. Simpson, viz.: That

the room was lighted with 100-watt incandescent lamps, spaced sixteen feet apart, which is considered fairly good shop lighting even at the present time and is many times greater than that specified in the various lighting codes for aisles or "traversed spaces." It is a good example of the danger of dark, confusing shadows in general. Mr. Simpson recognizes the difficulties of arriving at fully trustworthy results from the data available.

BETTER METHODS OF LIGHTING REDUCE ACCIDENTS

In another paper presented to the same society in 1918 Mr. Simpson states that "There is some foundation for assuming that 18 per cent are due to defects in the lighting installation," and attributes the reduction from 23.8 per cent reported in 1915 to progress in the art of lighting. In a still later paper, presented in 1920, the same author says: "A complete survey of accident reports for the past year, such as was made for the year 1910, has not been made, but a rather limited observation of reports, coupled with personal investigation and study, leads to the conclusion that at the present time approximately 15 per cent of our industrial accidents may be attributed to improper illumination. Even a cursory study of the subject will reveal the fact that of late years only a minor percentage of what we may term lighting accidents are due to insufficient illumination. We find instead that accidents charged to faulty illumination are mostly caused (1) by continued eyestrain, with its general detrimental effect on our physical wellbeing and this is recognized as a distinct moral hazard; (2) by sporadic but more acute eyestrain and (3) by glare, all brought about by improper use of light-sources. From this we may fairly conclude that the increase in the knowledge of the general public concerning proper illumination has by no means kept pace with the development of the art." With this last conclusion drawn by Mr. Simpson no one having a general knowledge of industrial lighting conditions as they exist today will disagree.

The foregoing discussion goes to show that it is unwise to depend too much upon "laws" drawn from statistics. If "figures don't lie" it may be because, like Mark Twain, they "can get others to lie for them."

I am not trying to make out an alibi for bad lighting as a possible cause of industrial accidents. I am simply putting in a word of caution against making artificial lighting the goat carrying the burden of otherwise unassignable accidents. Such a tendency would be most unfortunate and detrimental to the progress of industry. The development of the electric light is the greatest boon to industry that has appeared since the invention of the steam engine and is comparable in importance with that epoch-making discovery.

CONTINUOUS OPERATION OF FACTORIES

Electric light has made possible the continuous operation of factories with results equal in every respect to those obtainable under the best daylight conditions. The full significance of this statement cannot be comprehended at a glance. The results of the simple fact stated reach to the heart of the economic, industrial and social problems of the day. Under

the single eight-hour shift, which is the goal of present labor sentiment, all the vast investment in buildings and machinery is idle two-thirds of the time. The capital invested must therefore earn its dividends by working one-third of the time. This very materially increases the cost of manufactured products. There is no condition necessary for the efficiency, health and general well being of the factory worker which cannot be supplied as completely by night as by day. Night labor insures daylight leisure, which is a unique and distinct gain for the workman, enabling him to enjoy all the advantages of outdoor recreation. Of all the sources of waste, which Mr. Hoover has so impressively brought to public attention, the idle manufacturing plant is the most common and prolific. Waste is a direct tax upon industry and whatever reduces it adds to the general wealth and comfort of the common people. Poverty breeds unrest and revolution. These statements, which are commonplace truths, are sufficient to show the extent to which modern lighting effects the whole fabric of our civilization. Anything which tends to prejudice the public against the use of this facility to the full extent of its possibilities is, therefore, an obstacle to progress. It is for this reason that I wish to positively affirm and vigorously maintain that artificial lighting by no means involves a necessary increase in the accident hazard. Since this is contrary to the general belief a brief exposition of the thesis will be in order.

To recapitulate, the sources of danger due to lighting are: 1. Insufficient light. 2. Excessive volume of light. 3. Glaring contrasts of intensity. 4. Numerous light-sources in the field of vision. 5. Dark and confusing shadows.

LABOR CAN BE CARRIED ON AS EFFICIENTLY AND SAFELY UNDER ARTIFICIAL
LIGHT AS BY DAYLIGHT

The opinion is wellnigh universal that artificial light can never equal daylight for industrial illumination. The belief in this opinion often amounts almost to a religious dogma. One of the reasons for this belief is that "sunlight is so much brighter." It is true that sunshine in the open is enormously brighter than artificial light supplied for regular use in factory lighting, but it is also true that direct sunlight is enormously brighter than is necessary or desirable for the maximum efficiency of vision. Furthermore, manufacturing is not carried on in the open but within doors and the average intensity of daylight illumination, even in the modern factory building, is easily obtainable by the use of electric light. And finally, it has been clearly proven that there is nothing to be gained and possibly something to be lost in exceeding a certain intensity that is common practice in the most approved lighting installations. Thus, for reading ordinary print (such as this page) experiments have conclusively shown that 20-foot candles is the extreme limit of intensity required and 10-foot candles is so nearly equal to 20-foot candles as to make it a practical standard. For ordinary purposes, where sharp vision is not necessary, a much lower intensity will fully satisfy the conditions. In exceptional cases, such as working on dark-colored materials, it is a very simple matter to supply 25 or 50-foot candles, if necessary.

Thanks to the genius of our scientists and inventors, electric light can be produced so cheaply, especially for industrial use, that it is actually cheaper than daylight, paradoxical as this statement may sound. The largest of the automobile plants spends more on keeping the windows cleaned and repaired than it does for electric light—and the plant runs twenty-four hours a day. Not only can artificial light be provided in ample volume, but the quantity can be maintained with perfect uniformity, while sunlight is the most variable thing in nature. Also, a uniform distribution can be obtained in any kind of a room, while a uniform distribution of daylight can be secured only by the most expensive type of construction—the single story building with saw-tooth roof.

THE PROBLEM OF GLARE

The term "glare" has been made to cover a number of different defects common to artificial lighting, as previously noted. Only one of these defects pertains to daylight, viz: excessive volume of light. This occurs when workmen are required to face windows of large area, particularly when they are glazed with ribbed or prism glass. The state lighting codes take cognizance of this fact in prescribing the use of shades under specified conditions. High power incandescent lamps, even when enclosed in diffusing globes, will produce this cumulative eye-strain when placed too near the eyes.

Excessive contrast in brightness, which produces the instantaneous effect familiarly known as "dazzling," is the one besetting sin most commonly attributed to electric light, and of which daylight is entirely innocent. A large part of "illuminating engineering" has been devoted to devising physical means of overcoming this defect; and the principal aim of the various statutory regulations is to prevent its occurrence to a dangerous extent in factory illumination. In the general treatment of this subject too much attention has been given to the physics of light, and too little to the physiology of vision. The effects of glare with which we are concerned are within the human body; hence the structure and operation of the visual mechanism are the important things to study. If there were but one kind of artificial light to be had, which was true up to the beginning of this century, the case would be different; but there is now a choice between two very different *kinds of light*. There is the continuous-spectra light of the incandescent electric lamp and of all other artificial sources in which incandescent solids form the radiants, which more or less nearly approximate daylight; and there is the band-spectrum and comparatively monochromatic light of the mercury vapor lamp. The various effects classed under the general term "glare" have a direct relation to the quality of the light (color composition), as well as to the physical conditions of intensity, contrast and volume. In the mercury vapor lamp the intensity of the luminous surface is below the dazzling point, while the absence of the longer light waves—red and orange—reduces the fatigue which is the source of the cumulative forms of glare.

GENERAL CONCLUSION

What, now, is the conclusion of the whole matter? A full consideration of the subject in its various aspects, which has only been outlined in this paper, would seem to justify the following conclusions:

The artificial lighting of factories can be so done as to involve no additional accident hazard over the best daylight conditions.

Artificial lighting can be provided that will offer no causes of eye-strain beyond those pertaining to daylight for the same purpose and in many special cases it may distinctly surpass daylight in this respect.

The eyes of all workmen should be periodically tested for optical defects, and such as are found defective corrected by the proper glasses.

All physical sources of danger should be reduced to the lowest factor of probability by physical means of prevention, but this should not in any case be considered a substitute for proper illumination as an indispensable safeguard.

CHAIRMAN COPP: Mr. Elliott's address will prove very valuable and has been very interesting. I am happy to announce Dr. Henderson as our next speaker.

Dr. Henderson is from Yale University and will speak to us upon "Carbon Monoxide Poisoning."

CARBON MONOXIDE POISONING

YANDELL HENDERSON, PH. D., PROFESSOR OF APPLIED PHYSIOLOGY, YALE UNIVERSITY, AND CONSULTING PHYSIOLOGIST, UNITED STATES BUREAU OF MINES

With every advance in industry and the arts there is liable to be associated some new physiological strain or health hazard. This has been true of machinery, of the chemical industries, of electricity, of illuminating gas, and it is now proving true of man's latest and most widely used utility, the automobile. The risks involved with the automobile are, however, almost universal. The loss of life in accidents, as reported in the daily papers, is so common that it is receiving serious attention, although effective measures of amelioration have not as yet been adopted, as every one knows.

It is not very generally realized that the exhaust gas from automobiles constitutes scarcely a less serious hazard. Fortunately, however, engineers are beginning to recognize that the sanitary side of large public undertakings and even of some private developments deserves study, and the public is learning to expect this protection. Accordingly, when plans were made for the construction of the first long vehicular tunnel in this country these plans included extensive investigations of the basic facts necessary to the ventilation of such a tunnel, so as to render the air not only safe but practically innocuous to its passengers. This is of special importance, as such tunnels will probably, to a considerable extent, replace bridges in the future, both because of their cheaper construction and because they do not obstruct the waterways.

The commissions of the states of New York and New Jersey charged with the construction of the vehicular tunnel, or rather tunnels, under the Hudson river at New York arranged with the United States Bureau of Mines to undertake these basic investigations. The work was divided into several special problems, of which we need here consider only two, namely: (1) The amount and chemical composition of the exhaust gas produced by various cars under various conditions of speed, load and temperature, and (2) the physiological effects of the substances in exhaust gas and their allowable amounts not involving appreciable ill effects when such gases are breathed.

SACRIFICE FUEL EFFICIENCY TO SECURE SPEED

The first of these problems was placed in the charge of Mr. A. C. Fieldner at the Bureau of Mines Experiment Station in Pittsburgh. An extensive investigation carried out by him and his collaborators has shown that to a large extent the deleterious character of the exhaust gas of automobiles arises from the tendency of drivers to adjust carbureters so as to afford a maximum of power rather than to utilize fuel with the maximum efficiency. The gasoline mixtures used are generally much richer than would be best, both from an engineering and sanitary standpoint. More easily adjustable carbureters and greater use of the adjustments so as to attain the required speed and power with a minimum of fuel would not only result in reducing the waste of gasoline but in an exhaust gas distinctly less injurious to health. These investigations show that approximately one-third of the fuel value of gasoline is wasted and that the carbon monoxide, the particular toxic constituent of exhaust gas, averages about 7 per cent.

As regards the total quantity of exhaust gas produced, it is sufficient to say that most passenger cars, with the usual carbureter adjustment, produce from 1 to 2 cubic feet of carbon monoxide per minute. This, in my opinion, could be and should be greatly reduced. Indeed, if the air in crowded city streets is not to become even worse vitiated than at present, passenger cars and trucks may be so constructed that their drivers will themselves feel the need and advantage of varying carbureter adjustment in traffic and on hills almost as freely as a driver now moves the throttle.

CARBON MONOXIDE COMPETES WITH OXYGEN

The second problem above mentioned, the strictly sanitary problem, which was assigned to me for investigation was worked out with the collaboration of Dr. H. W. Haggard and Dr. A. L. Prince in my laboratory in Yale University. Our investigations have completely confirmed the conception of Haldane, the great English investigator, who has done so much to decrease injuries and fatalities among coal miners, that carbon monoxide does not form a permanent compound with the red coloring matter, or haemoglobin, of the blood, but competes with oxygen. The affinity of carbon monoxide for haemoglobin is about 300 times as great as that of oxygen and it is capable, therefore, of rapidly displacing oxygen from the blood and causing asphyxiation and finally death. But by a reversal of the competition, carbon monoxide can be again displaced by oxygen

when a person who has absorbed a certain amount of gas breathes pure air or air enriched with oxygen. Our investigations also show that carbon monoxide has no other toxic characteristics except its combination with haemoglobin and exclusion of oxygen; it has no direct effect upon nerve cells. All of the nerve degenerations induced by carbon monoxide are due to asphyxia. Dr. Haggard has indeed even succeeded in growing pieces of chick brain (taken directly out of an egg and suspended in a little chicken plasma) in considerable amounts of carbon monoxide. Animals such as flies and other insects which have no red matter in their blood are entirely immune to carbon monoxide.

Our investigations show further that when gasoline distilled from petroleum is used, practically the only toxic constituent in the exhaust gas is carbon monoxide. When, however, benzol and probably other related substances are present, as in some of the automobile fuels now sold, the amount of these substances escaping in the exhaust gas adds decidedly to its toxicity.

Our investigations were carried out at first on ourselves and the other members of the investigating staff in an airtight room lined with sheet iron. The data so obtained were later confirmed by large-scale experiments in which a dozen or twenty people at a time sat or moved about in a garage building in which a Ford car was installed. A drop of blood was drawn from a finger and analyzed for carbon monoxide, the pulse was counted, the volume of respiration measured and the effect of exercise, after running up and down four flights of stairs, was noted. A test for steadiness was also used, for in carbon monoxide poisoning the victim is quite often unaware that anything is wrong until his legs give way and he falls, unable to rise again.

The best of all indications proved, however, to be the headache induced by carbon monoxide. This is a characteristic oxygen deficiency phenomenon, observed at great altitudes, on mountains or after high airplane ascents. It is induced in nearly all persons by certain degrees of saturation with carbon monoxide, although there are some individual differences in the exact point at which it appears. It is usually of the throbbing frontal type, more rarely occipital. It easily passes into nausea, vomiting, and prostration and is accentuated by exertion. Men in this condition lose judgment and self-control, they may become hysterical or even violent; often they behave as if under alcoholic intoxication. The time at my disposal today forbids a detailed description of theory or experiments, but data were obtained sufficient to allow the scientific law controlling the absorption of carbon monoxide from the air in the lungs to be formulated, so that we now know precisely the conditions involving slight and great danger and also the conditions which are safe and practically harmless.

RULES DERIVED FOR PRACTICAL USE

From this law the following rule was derived for practical use: When the time is expressed in hours and the concentration in parts per 10,000 there will be no appreciable physiological effect when the product of the time multiplied by the concentration equals 3; when the product

of time by concentration equals 6 there will be, in some persons, slight effects; when it equals 9 there will be, in nearly every one, a distinct effect; when it equals 15 the condition is dangerous. A concentration of carbon monoxide not exceeding 4 parts in 10,000 (that is four cubic feet of carbon monoxide in 10,000 cubic feet of air) is, therefore, recommended as a practical standard for vehicular tunnels. This involves an enormous ventilation and force to maintain it, but it is said by engineers to be entirely feasible.

It is quite certain that this standard is very often exceeded in garages and automobile repair shops where, unless there are special provisions for ventilation, high concentrations of exhaust gas are common. Severe headaches are extremely frequent among mechanics and others who work around automobiles, so much so that repeated partial asphyxia today is a distinct health hazard in this field.

Our observations indicate also the character of the hazard in the small private garage. During the winter months, in the Northern states, fatal asphyxiations in such private garages are unfortunately quite common. The owner starts his car before opening the doors, in order to get the engine warm. If the garage is 10x10x20 feet, giving a capacity of 2,000 cubic feet, and the car produces one cubic foot of carbon monoxide per minute it requires only one minute for the concentration which we have recommended for the tunnel to be reached and in five minutes the atmosphere contains 20 parts of carbon monoxide in 10,000 of air—an amount sufficient to induce asphyxiation. Of course, if the car continues to run, the concentration mounts steadily toward a rapidly fatal amount.

In addition to our experiments on men, which could not, of course, be pushed beyond the point of severe headache, we performed an extensive series of experiments on animals which we carried to the point of extreme or even fatal asphyxiation. These experiments were performed with pure carbon monoxide, with exhaust gas from automobiles, and with illuminating gas. They show that while carbon monoxide is practically the sole toxic constituent in exhaust gas from pure gasoline, the gasoline now sold in some places mixed with coal distillate containing benzol, produces a much more toxic exhaust gas.

Gasoline vapor itself has been found in our experiments to have qualities somewhat like those of the ethyl ether used in surgical operations. It is an anesthetic, but the initial stage of excitement passes through a very narrow region of full anesthesia into convulsions ended by death. In the toxicity of exhaust gas, unburned gasoline is not an appreciable factor. Workmen are, however, sometimes overcome when they go into a large tank in which gasoline has been stored. Benzol is much more toxic, as Dr. Alice Hamilton has recently pointed out.

Our investigations with illuminating gas have shown that, while the principal toxic constituent is carbon monoxide, about 20 to 25 per cent of the toxicity is due to benzol and related substances. These substances are to a large extent the illuminants which the laws of many states still require to give luminosity to the gas flame, a requirement which the

introduction of the mantle burner has made unnecessary. From a health standpoint this requirement is now perhaps even unwise.

TREATMENT OF CARBON MONOXIDE POISONING

These investigations have also led us in the study of the treatment of carbon monoxide poisoning. Obviously, the first step in any treatment must be the restoration of spontaneous breathing if it has stopped. For this purpose the manual prone-pressure method of artificial respiration is to be recommended above any apparatus, for it is as effective or even more effective than apparatus and it can be applied instantly, while the bringing and adjustment of apparatus involves delay. A delay of even a couple of minutes after breathing has stopped may sometimes be fatal and a quarter or half an hour always fatal. This delay has probably cost more lives than such apparatus has ever saved and many such lives might be saved if everyone were trained to perform the manual method.

The next step, after restoring spontaneous breathing, is to accelerate the elimination of carbon monoxide from the blood. For this purpose the inhalation of oxygen has long been recognized as the specific procedure. But the difficulty arises that after a long exposure to an atmosphere containing carbon monoxide, respiration is very much depressed and the inhalation of oxygen has no stimulating effect upon the volume of breathing. It occurred to us to utilize the stimulating action of carbon dioxide, or carbonic acid, the gas used in soda water and other carborated beverages. In a series of experiments on dogs we found that in animals, which were brought almost to the point of death and then allowed to recover spontaneously in air, the period of elimination of carbon monoxide from the blood required several hours. When the subjects were made to inhale oxygen the rate of elimination was at first not very much more rapid, the reason being that the oxygen was inadequately inhaled. When, however, a small amount of carbon dioxide was added to the oxygen a very active breathing was induced, by which the lungs were so effectively ventilated and the oxygen was given so free an opportunity to act upon the blood that, after a period of a quarter to half an hour, nearly all of the carbon monoxide had been eliminated from the blood.

Recently the American Gas Association, representing the illuminating gas interests of the country, requested Dr. C. K. Drinker of the Harvard Medical School to organize a commission for investigation of the subject of resuscitation from illuminating gas poisoning. Dr. Drinker invited my associate, Dr. H. W. Haggard, and myself to serve on this commission and the American Gas Association has generously supplied the funds needed for a thorough investigation of the efficacy of the above mentioned treatment. The Consolidated Gas Company of New York City gave us invaluable assistance by placing at our service its emergency auto trucks and their crews. Health Commissioner Copeland and the hospital authorities of New York City gave us their cordial support and co-operation. We were thus able to apply the method to a sufficient number of cases of illuminating gas poisoning to show its efficiency.

The results, in a majority of cases, were even better than our laboratory experiments had been. Asphyxiated patients who were reached within half an hour—and the utmost speed at this time is essential for success—and who were given an inhalation of oxygen containing 5 per cent carbon dioxide were practically freed from all but the merest trace of carbon monoxide in their blood within twenty-five to thirty minutes. Frequently, also, consciousness returned within this time and within a few hours the patient was practically well again. It is also noteworthy that not a single patient thus treated developed pneumonia, which is so common after gassing, nor any of the other distressing sequelae sometimes associated with poisoning by illuminating gas or the exhaust gas of automobiles.

There are thus solid reasons for the expectation that with the general introduction of the oxygen and carbon dioxide inhalation the fatalities from carbon monoxide may be very considerably decreased and its after effects largely eliminated.

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DISCUSSION

MR. LOUIS H. CARRIS (National Committee for the Prevention of Blindness): I want to emphasize what Dr. Black has said about correction of vision in industries, from the standpoint of profit to the industry itself. I think that there are at least one or two cases where it has been proved that the full cost of the correction of vision can be placed with added profit upon the industry, although I know that at the present time it would be rather expensive. With a correction of vision we have, first of all, a lessened accident hazard, which is very greatly to be desired; increased production and the added factor of better health for the individual. The National Committee for the Prevention of Blindness is interested in all phases of conservation of labor and at the present time is engaged in a revision of its bulletin No. 12, "Eye Hazards in Industrial Occupations."

NOT ALL EMPLOYEES EXAMINED EACH YEAR

DR. R. R. SAYRES (Chief Surgeon, U. S. Bureau of Mines): One of the speakers said that he used a headache as a warning; that so long as the headache remained away you were safe. This is not entirely correct; while headache is a most prominent symptom, sometimes the

man does not have a headache at all—it may be that he has carbon monoxide poisoning with practically no symptoms of headache.

DR. BECK: I would like to ask Dr. Barr if they have periodical examinations of all employees.

DR. BARR: We do not examine all employees every six months or every year as that is a rather large undertaking. Last year we examined 4,000 out of 6,000—that is, re-examined 4,000. Our safety work is under the direct supervision of the medical department.

MR. BERGHOFF (Ford Motor Company): I would like to ask Dr. Henderson why carbon monoxide will stay in low places—cling to the floor around the furnaces—when the gas itself is lighter than air.

DR. HENDERSON: Unless it is cold, I do not think that it does. Carbon monoxide has practically the same specific gravity as air and mixes with it. It does not go up or down, but simply mixes. There are all sorts of superstitions regarding it. I found one awhile ago: That it would cling to a sweater and that it would go into a coat closet and stay there for months. It does nothing of the kind as it is an exceedingly diffusible gas. If you do not look at it from a sanitary standpoint it is a beautiful gas, but it does hang in low places. You will find carbon dioxide in wells and cellars; anywhere that air forces itself through mud, where exhaustion going on, you will find carbon dioxide. While digging tunnels under the Thames river there were several asphyxiations, because the air was forced down and a certain amount of water diverted through the mud; it came out in the form of carbon dioxide. I do not think carbon monoxide usually does that.

MR. J. A. NORTHWOOD (Cambria Steel Company, Johnstown, Pa.): Should patients, after becoming overcome with carbon monoxide, be walked around and exercised in any way?

IN ASPHYXIATION CASES ALLOW VICTIM TO REST

DR. HENDERSON: The patient ought not to have any exertion whatever. He should be allowed to rest his head; he might sit up. He ought to be kept warm and absolutely quiet.

MR. CARNEY (United Gas Improvement Company): How does Dr. Henderson account for the recovery of a man who is asphyxiated, or partially asphyxiated, and then runs for half a mile. He was unconscious when found, but brought to a state of consciousness, then he got up, ran for half a mile and was fully recovered.

DR. HENDERSON: I can only say that the Lord endowed that man with a heart such as any athlete might envy.

MR. FEEHAN (Supervising Inspector, Pennsylvania State Department of Labor and Industry): Does the medical department of the National Cash Register Company inspect the plants for health hazards?

DR. BARR: The supervisor of the medical department and the safety inspector act as the health inspectors. Until recently we had what we termed a central health committee, composed of supervisors, foremen, heads of departments and doctors.

MR. FEEHAN: Does the industrial physician of the company make an inspection for health hazards to the employees during the course of their employment.

DR. BARR: Indirectly, yes.

MR. FEEHAN: Has your company ever tried to provide a uniform standard of clothing for the different classes of employees, as a precaution against a health hazard.

DR. BARR: Yes, to a certain extent.

MR. ELLIOTT: Does gasoline that is being used commercially—containing analine—introduce an extra hazard?

DR. HENDERSON: It creates a considerable hazard. We have benzol now, and from that they suffer an effect different from carbon monoxide, but excessive and more prolonged.

WHAT DEGREE OF VISION IS NECESSARY FOR CRANE OPERATORS

MR. BERGHOFF: I would like to ask Dr. Black what vision is necessary for an experienced crane operator, to permit him to work; in the case of a man whose vision was normal and who has been ten to twelve years on the job, would you consider six-tenths of normal vision sufficient?

DR. BLACK: It would depend very greatly upon the kind of work he was doing. Naturally, complete normal or standard vision is the best thing we can have. In many occupations a man with one-tenth normal vision can carry on his work perfectly. Where a man has become accustomed to his occupation, has a gradual physiological loss of vision, and his vision is reduced to one-tenth of normal, he can still do his work, because of his experience in that line of work—it is largely a matter of habit. But, as for seeing details, he will not be able to do so; he can do his work simply from habit and experience.

MR. BERGHOFF: Would you consider four-tenths all right for one who is otherwise a first class man; who has a good many years' experience on regular traveling crane work.

DR. BLACK: I should consider it a hazard.

MR. BERGHOFF: Would you consider six-tenths all right?

DR. BLACK: I would not.

MR. BERGHOFF: What degree would you consider all right?

DR. BLACK: I could not say until I investigated the amount of vision that is necessary to carry on that sort of work. For instance, we investigated the visual requirements of engineers and firemen. I put in 8,000 miles traveling on a locomotive and I attempted to learn at about what distance I could pick up signals, taking into consideration the rate at which the train was traveling and the distance in which it could be controlled. We decided that a man with a vision between twenty-thirtieths—practically two-thirds—was getting near the danger line; although twenty-fortieths was allowed in certain occupations, especially

with old employees who had been in the service a long time; these, because of their natural caution, were allowed to remain. Naturally, new firemen and engineers were required to have a standard or normal vision. Defects in vision of old employees which could be corrected by means of glasses, were made, and the men retained their positions. I would want to make experiments in the particular sort of work before stating any particular requirement for a minimum or a maximum.

Annual Banquet

August 31, 1922

A. H. YOUNG, Toastmaster
President, National Safety Council

THE TOASTMASTER: And now, my good friends, we come to the last act of our show—of what we may call our Revue of 1922. Pretty soon we shall be taking a last puff of our afterdinner cigars, a last sip of ice water, crumpling up our napkins and saying good-night and good-bye.

On the stage, as you may have heard, the last act of a show is usually a rather troublesome proposition for the playwright and the stage manager. By that time the story has been pretty well told. The climax has been duly put on in the third or fourth act, however the case may be, and about all that remains is to bring the characters in the piece together for a song or a final ensemble and a live-happily-ever-afterward ending.

But our last act is, I think, going to be a little different from a regular show. We have been careful to save for it some of the best numbers of our bill, some of our best talent. The retiring officers of the Council, who are the playwrights and stage managers for this occasion, feel that we shall be justified by the event in expecting you to enjoy this dinner—our last act—as much as any other part of the National Safety Council show of 1922.

As the first number on the program for our last act, we officers of the Council who are about to retire, assert and exercise the privilege of introducing to you the new officers who will guide the destinies of the Council through the next year.

OFFICERS FOR COMING YEAR

At the meeting of the Directors, this afternoon, there were elected as Executive Committeemen, to serve for the ensuing year, the following as holdover members from the old committee: Mr. Auel, Mr. Beyer, Mr. Dow, Mr. Forster, Mr. King, Mr. Scott, Mr. Webber, Mr. Whitney, Mr. Worth.

There were elected, as new members of the Executive Committee, from the group at large: Messrs. Sanford, Pettibone, Palmer, A. E. Davidson, and Van Schaack.

The representatives on the committee from among the group of Section Chairmen Directors are as follows: Mr. Reninger of the Cement

Section, Dr. Payne of the Educational Section, Mr. Truett of the Electric Railway, Mr. Fonda of the Engineering, Dr. Elliott of the Health, Mr. Bentley of the Steam Railroad, and Mr. Tillson of the Mining Section.

There were chosen as Executive Committeemen from the group of Local Council Representative Directors the following: Mr. A. W. Robertson of the Western Pennsylvania Council, Mr. Talbert of St. Louis, Mr. Otter of Chicago, Mr. De Blois of Delaware, Mr. Mumford of Detroit, Mr. Thompson of Rochester, Mr. Costly of the Tri-City Council.

At the meeting of the Executive Committee, held later, the following officers were elected: Secretary, William H. Cameron.

Treasurer, Mr. Homer Neisz, of Chicago.

As Vice-President in Charge of Local Councils, Mr. L. A. De Blois.

As Vice-President in Charge of Sectional Activities, Mr. George T. Fonda.

As Vice-President in Charge of Industrial Safety, Mr. C. B. Auel.

And as Vice-President in Charge of Public Safety, Mr. David Van Schaack.

Your Executive Committee chose as President one who needs no introduction to you, Mr. Marcus A. Dow.

PRESIDENT MARCUS A. DOW: My friends of the National Safety Council, I thank you sincerely for this generous manifestation of your friendship. I can think of no greater honor that could come to any man than to be President of this great organization.

I only hope that I may be able to carry on the responsibilities of the office as well as did my predecessor, who took charge of the work at a time when the prospects were anything but encouraging. We all know what he has accomplished. We all know of the splendid and capable way in which he has carried on the work as President of the Council, and I wish to say, in passing, that the National Safety Council owes a debt of gratitude to Arthur H. Young and the members of this staff who served with him during the present administration.

TABLEAU: THE SPIRIT OF SAFETY

THE SPIRIT OF SAFETY: The Spirit of the National Safety Council welcomes you all. My dear friends, my heart o'erflows with gratitude to the Great Jehovah who has preserved us all, and here and now we offer our humble thanks that our days may be extended to bring welfare and happiness among our fellow men, and that we may enjoy in the future many, many such occasions.

Tonight we are especially honored. Tonight we celebrate our eleventh anniversary—eleven years of honest endeavor, showered with loving approval and crowned with success. My friends, do you realize the importance of this occasion?

Next year, as we gather around the festive board, some of us may be missing. Who knows but that one of us shall have been called to the great beyond. Tonight, let us rejoice and pray that the bonds of loving friendship shall bind all of us closer together.

In this spirit, dear friends, let us rise and repeat:

Here assembled, and mindful of our great responsibility, we pledge our energies to the conservation of human life; to think always of the safety of our fellowman; to watch for unsafe conditions at our work, on the streets, and in our homes; and to take the proper measures to correct them.

We affirm our faith in the aims and purposes of the National Safety Council, imbued with the conviction that we are partners in a great cause. We promise our constant and staunch support of its high principles and guiding service. May that day be counted lost in which we have failed to do some deed, or to devote some serious thought for the better care and safety of human kin.

Mr. Dow, all the world knows that you "take the cake," but tonight we reverse the time-honored custom and bring the cake to you. (Mr. Dow presented with the eleventh anniversary cake, and framed copy of the oath of allegiance.)

ADDRESS OF PRESIDENT MARCUS A. DOW

PRESIDENT Dow: Having received the framed copy of the oath of allegiance and having been presented with the Council's eleventh birthday cake, I presume that the next thing, in the natural sequence of events, would be for me to proceed to cut the cake. However, there is an old saying that "you cannot eat your cake and have it too," and, inasmuch as I have been invited to retain this cake until the time shall come when another candle may be added to it, I shall regretfully refrain from cutting the cake and eating it now.

It was with some hesitancy that I accepted this place on the program, because of the fact that I have appeared before you in a similar way so many times before. It seemed to me, after looking over the program for the week, that the only reason your committee picked me as a speaker for this occasion was that all the other available speakers in the United States has already been placed on the program.

When I consider the problem and the solution, in the person of myself, I feel very much like the colored man who got a job as a porter on a railroad which ran through his home town. On his first trip, when the train stopped at the station where he lived, he placed himself at the foot of the Pullman car steps, dressed in his brand-new uniform with shining brass buttons, as proud as he could be. A superannuated old darkey, employed as a handy man about the station, looked upon him admiringly and exclaimed: "Well, Sambo, you sure do look like a gentleman; I salute you." Sambo swelled up with pride and, not wishing to be outdone, brought his hand awkwardly to his cap and replied, "Niggah, ah accepts yo solution."

COUNCIL'S RECORD ONE OF ACHIEVEMENT

One of my friends said to me, when I asked him what he thought I should talk about tonight, that he thought I ought to give an old-fashioned safety sermon; but it seems to me that if I were to do that—tell you of all of the things that have come to my mind in the ten years of my ex-

perience in this work—good as my motive might be, I might crush you beneath the weight of my good intentions. Yet there are some things about the National Safety Council and its past and the work of the members of its organization that I should like to touch upon.

This is an especially happy occasion to me and there are three things that I am particularly proud of. In the first place, I am proud that I am a citizen of the United States of America. In the second place, I am proud that, as a safety man, it has been my privilege to take part in the greatest humanitarian movement the world has ever known, this safety movement. And, third, I am proud that I am a member of the National Safety Council.

VETERANS IN THE SERVICE OF SAFETY

I should like to be able adequately to commend those workers in the field who have contributed to the success of the National Safety Council. In this I know that I shall fall far short of what is deserved. As I look around me I see among you those who have worked faithfully for safety long enough to have earned the title of safety veteran. When we think of the word veteran we naturally think of service. Those countless veterans of the great world war are veterans because they gave service to their country in its hour of need. They are veterans of service. You veterans in the field of safety have given months or years of service, not only to the industries that employ you, but to the people of the country who work in those industries or who live in the communities around them. Therefore, you are veterans of service to your country. The record of National Safety Council veterans is a record of service to humanity which stands out like a glorious light, revealing a spirit and a devotion to duty that has never been excelled in any organization of this generation. Those of you who have entered this field of endeavor more recently have quickly caught the enthusiasm and inspiration of its atmosphere and are giving a good account of yourselves in your various communities.

The first thought that has come to me in regard to the help the Council receives from you safety workers and from your plant managers and others, is that it is not only the direct service you have rendered to the Council itself that has made it a great organization; it is not merely the fact that many of the Council's friends have given so generously of their time, effort and advice that has made it a national institution of importance, but it is in reality the achievements resulting from your everyday work in preventing accidents that makes the National Safety Council one of the greatest forces for good ever conceived in the minds of man. As important as they are, and as necessary to the Council's welfare as they must continue to be, it is not the committee service, nor the contributions of literature and of ideas, that makes this a great institution. Back of it all—back of the unselfish, voluntary, co-operative service to the Council itself—is the continual day-in-and-day-out, never-ceasing accident-prevention work that you and thousands of others are doing in your plants, on your railroads and in your communities. That is the foundation of the national safety movement and it is upon that foundation that the structure of this organization rests.

THE INSPIRATION WHICH DRIVES TOWARD HIGH IDEALS

If you, as the safety engineer, thoroughly and effectively guard against or eliminate the hazards of your plant; if you, by your leadership, your initiative, your enthusiasm and your never ceasing effort, succeed in creating an atmosphere of safety among the workers in your plant, an atmosphere in which the germs of carelessness cannot live; if by your planning and organizing ability you succeed in making accidents the exception rather than the rule; if you accomplish results, no matter how modest they may be, you do something more than merely earn your salary. You do more, even, than save money for the concern that employs you—yes, even more do you accomplish than the great thing of saving life and preventing human suffering!

When you lower the accident record of your plant, railroad or community you furnish the inspiration for others to do likewise. By cutting down your own accidents you prove to the world at large that it can be done. You furnish the incentive, the very motive, for industrial and public safety work. It is the individual achievements in the saving of human life through accident prevention that makes safety a national movement. Without the tireless effort of so many loyal, conscientious safety men on the firing line the National Safety Council could not exist; there would be no safety movement worthy of the name and the Nation would be deprived of its wonderful benefits.

Every safety man who succeeds in his work helps to shape the destiny of the National Safety Council. Every safety man who surmounts the obstacles that obstruct the path to success in his own work contributes, thereby, to the great scheme of things that makes the world progress and become a better place to live in. Every man working to the end that safety shall become an integral part of shop and railroad operation assists in creating a national asset of immeasurable value. It is what you have done in industries and upon the railroads that has demonstrated that safety work is practical, that it increases efficiency, that it conserves manpower and prevents economic waste. It is what you have done that has made it a vital thing in the life of the Nation.

EMPLOYERS DESERVE HIGHEST PRAISE

Let me say a word, too, in commendation of those far-sighted employers and managers who have supported the men in the safety field. The killing of many thousands of men in the industries of the country each year and the crippling and maiming of many thousands more is a most lamentable thing to contemplate, and one cannot help but be impressed with the fact that preventable accidents are not alone a liability to the industry that causes them, but that they cause a great, appalling loss to the Nation. The employer, therefore, who has stood by his safety organization, who has steadfastly promoted and encouraged safety work in spite of the trying industrial period through which we have passed, who has adhered with determination to the safety principles, now so thoroughly developed and well defined, and who has made possible the work which has brought forth such benefits to humanity, is deserving of the

highest praise. That employer has done much more than to save the dollars his attitude could not help but save. He has done even more than minimize pain and suffering. *The American employer who has helped keep safety alive during the industrial crisis following the war has rendered to his country—the finest country in all the world—a great and glorious service.*

It is regrettable that some employers found it necessary to suspend safety work during the period of business depression. On the other hand, many have found it expedient to keep their safety organizations going, although obliged to curtail in every other department. This is manifestly the wiser policy, for at a time when everyone is striving to keep down production costs and eliminate waste it is obvious that the saving of money that accrues through accident prevention is even more necessary than ever. Even the most capable safety man, imbued as he is with the spirit of safety for humanity's sake, has felt the heavy weight of adverse industrial conditions. I doubt not that there has been a slowing up of effort on the part of some of our best safety workers because of these discouraging elements. We have been through a stormy industrial period, but there are signs of the storm's abatement. The master of a ship which has been buffeted about, shaken and swept from its course on the cheerless expanse of a storm-tossed sea, always takes the first opportunity of a lull in the storm to get his bearings and find how far from his course the elements have driven him. The time has now arrived when employers, managers, even the safety workers themselves, should take their latitude and longitude, examine the chart, ascertain how far from the course of proved efficiency the storm has carried them, and return to that course!

SAFETY AND INDUSTRIAL PEACE

I should like to comment upon the influence of safety work on industrial peace. Almost any railroad superintendent or plant manager, where safety work has been systematically and honestly applied, will agree with me in the statement that there is a real benefit derived from this effort in the getting together of officers and employees in the intimate conferences held in connection with safety work. Through the development of safety committees, employers and workers have become better acquainted with each other, they have gathered around the same table and there have discussed matters of common interest and concern. Safety is one thing in industry over which there is no controversy. It is popular with both employer and employee. Therefore, it furnishes ground for immediate friendly co-operation and the success of such co-operation points the way to the probable value of co-operation in other relations between employer and employee. You safety men who are helping to engender this get-together spirit by successfully promoting your safety work, in addition to saving life and limb, and in addition to preventing economic waste are advancing one of the most important industrial relation services that could be performed today.

There is, perhaps, little need for me to again, this year, refer to the economic value of accident prevention as measured by reduced accident

costs, because the experience of leading plants has been so frequently referred to it is familiar to most of you. I would like, however, to refer, briefly, to the saving of *indirect* costs of accidents. It has been estimated that the direct economic cost of industrial accidents each year in the United States is over one billion dollars, not including such indirect costs as spoilage of material, interrupted production and lowered morale. It is clearly evident, for instance, that whenever a workman is killed or seriously injured the work of others in the vicinity becomes demoralized, production is lessened and efficiency decreased. Therefore, aside from all other worthwhile benefits, safety in this respect also is a paying proposition. To make a plant reasonably safe, to remove unnecessary hazards and to educate employees to use a degree of care and caution in their work will reduce the frequency of accidents, will also eliminate the fear of injury from the mind of the worker and make him capable of a better day's work. One of the splendid things about safety work is that it is not only humanitarian, but at every angle you view it from it is good, sound business.

SERVE HUMANITY IMPARTIALLY AND UNSELFISHLY

The benefits to humanity from safety work do not accrue to any one class of individuals. The philosophy of safety is constant and untiring thought along the specific lines of accident prevention to *all* persons. Realizing that the great purpose of safety as a national movement is to serve humanity impartially and unselfishly, the National Safety Council plays no favorites. It recognizes no particular industry or community above others. It does not cater to nor seek the patronage of any political group. It does not ask whether a person is black or white, rich or poor; whether young or old, unintelligent or a great thinker. It matters not what that person's religious belief or calling in life may be. The single definite aim of this co-operative safety organization is to prevent injury to and preserve that person's life. Its only quarrel is with that monumental crime of this day and age—carelessness—and its fight is one to drive forever from industry and public communities the ignorance and indifference that has permitted this criminal thing to exist.

The crime of carelessness is but a form of oppression, and oppression in any guise is a thing that has no place in this land of opportunity. Back in 1775 our forefathers drove from these shores another form of oppression. If you remember your history you recall those stormy days preceding the Revolution. One night when the red-coated soldiers were about to march on to Lexington, two starlike points of light gleamed from the belfry of Old North Church in Boston as a signal that the enemy was approaching. Then it was that Paul Revere mounted his swift horse and dashed across the country, warning the inhabitants. Hundreds of men—farmers, merchants, tradesmen and others—who had pledged to be ready to answer the call at any minute sprang from their beds. They were called Minute Men because they were alert and ready every minute to protect their ideals, their homes and their loved ones. When the enemy reached Lexington, in the early dawn of that historic day, dark forms arose from the ground as if by magic. Jets of smoke

and flame spurted out from every tree, rock and crevice along the road as the Minute Men peppered away with their old muskets. At last the enemy was obliged to retreat in disorder. That was the beginning of a great drama that did not end until the brightly shining sun of Liberty arose, never again to set within the boundaries of this fair land. It was there that the thought must have been conceived, "America for humanity."

FIGHTING THE COMMON ENEMY—CARELESSNESS

We point with pride to the valor and the alertness of those Minute Men of 1775. There are here tonight men from the safety field who are on the alert, watchful and loyal, ready every minute to raise a warning hand and to use their utmost effort to drive out the common enemy—Carelessness. There are Paul Reveres among you, constantly sounding the clarion call: "Be on guard lest unsafe habits o'ercome you!" At home, in the shops, factories and railroad yards are hundreds of loyal, conscientious safety men, ready every minute to caution a fellow man against some dangerous practice, or correct a condition their watchful eyes have detected. These are the Minute Men of today—Minute Men of Safety. Just as the Minute Men of 1775 were on the alert to protect their homes and their liberty, so are you on the alert to protect the homes of your fellow men, for in the protection of life is the home protected.

We have lived to see America become the greatest and most powerful Nation ever conceived and brought forth on this earth. Its greatness has been brought about, too, by sheer moral and economic pressure. We have lived to see America become leader in the affairs of the world. From the moment she entered the great arena of the world's activities human progress was accelerated, new hopes were awakened in the breasts of mankind, and new opportunities opened for the betterment of the human race. America for humanity! That is the keynote of the Americanism that stands before the world today. America is destined to instill this spirit into the other peoples of the globe. Even as ancient Greece intellectually dominated the mind of the race and the Roman empire once swayed the conduct of men, so shall America instill the spirit of humanitarianism into the heart of the world. Small wonder, then, that this American safety organization has already made its influence felt in foreign lands.

The Secretary of the British Industrial Safety First Association has but recently said to the National Safety Council: "You lead the world in the accident-prevention movement." America for humanity—that thought, conceived in the minds of our forefathers back in the days of the Revolution, became the pledge of each succeeding generation, until in 1918 two million of our sons crossed an ocean to die if they must in its fulfillment.

DUTY IS CLEAR, OBLIGATION INDISPUTABLE

America for humanity! That is the pledge we of the Safety Council must work unceasingly to keep. Our duty is clear and our obligation

indisputable. We must lead civilization toward those ideals of human betterment which safety—industrial and public—strives to reach. Thus it is that our Safety Council—the National Safety Council of America—is destined to be the dynamic force behind the safety movement throughout the world.

ACHIEVE HONORS IN SAFETY MOVEMENT

THE TOASTMASTER: The temptation has been strong with many of us to refer to Marcus Dow as the "father of safety," yet I doubt if that appellation is strictly in accordance with historical facts. We have heard that title bestowed, for instance, on Mr. Ralph C. Richards, whose name is revered not only on the railroads but in all public and industrial safety movements. It has also been bestowed on Mr. Robert J. Young for his pioneer work in our great cause. Again it has been bestowed—and I speak with that peculiar feeling that comes to us when we speak of those who have been called from our midst to the great beyond—on Captain H. B. Smith, who was taken from our fold not many years ago, after a lifetime of devotion to safety.

Possibly, in the absence of any single father of Safety First, we may say that the parent is a syndicate, and certainly we know that Marcus Dow is at least a member of the syndicate. I think I express the voice of this Congress when I say to you, sir, that we thank God that so great a leader, so great a personage leads us forward in our work. (Applause).

I wish it fell to lips more gifted than mine to express the appreciation of our assemblage to the citizens of Detroit for their magnificent hospitality. Never have we been treated so courteously, never have we so marvelled at the beauties and the industrial wonders of any city. Never have we had such painstaking care of our comfort and I move, ladies and gentlemen, as an expression of our appreciation for the fine spirit of hospitality that we rise as an expression of appreciation to Detroit. (Audience arose and applauded.)

QUARTER-CENTURY OF EARNEST EFFORT

Detroit has a peculiar significance to the speaker we have heard and the one who is to follow. Marcus Dow spent his youth in this city; he left it twenty-five years ago. His first employment was in a machine shop, under the direction of the father of our next distinguished speaker. Then, as he labored onward and upward, he engaged in the business department of the *Detroit Free Press* and working side by side with him was a young cub reporter. The two parted twenty-five years ago and have not met since until this night, when Mr. Dow and Mr. Guest have been brought together.

I don't know and, because somebody had borrowed or purloined my book of popular quotations, I could not find out who it was that said: "I care not who writes the Nation's laws so long as I can write its songs"—something to that effect. This epigram especially fits the honored guest and speaker whom I shall next have the honor of introducing to you. Probably Americans are more familiar with his verses than with those of any other poet, living or dead. And that is largely because he writes

from no remote and exalted height, but from the midst of the plain people, whom he loves and understands.

This next speaker of ours, I say, lives and writes close to the hearts of us all. His themes are the joys and the sorrows and the affairs of people just like you and me. If his verses were set to music I am sure that they would be carried along in what Kipling says:

“* * * Common tunes,
That make you choke and blow your nose.”

Let us thank heaven that it is this kind of a poet that has written so many of our Nation's songs.

I introduce to you Mr. Edgar A. Guest.

ADDRESS OF EDGAR A. GUEST

Mr. Toastmaster and Ladies and Gentlemen of the National Safety Council: It would have been a glorious introduction and much more true if your toastmaster had merely introduced me as a pal of Mark Dow's and let it go at that. The rest of the introduction was nice to hear but it was not true. It was good to have him say it, and if he can make you believe it I will be tickled to death. So long as I don't believe it myself then no harm can come to me, and as a devotee of Safety First I believe in letting stuff like that go in one ear and out of the other. (Laughter).

I knew Marcus Dow when he was neither eloquent nor a president. He was a stenographer in the business department of the *Free Press* and I was a small boy with a headache trying to make figures add up right. The bookkeeper spent two weeks looking for 57 cents and he asked me if I were sure that I had gone over every column in the book; I said I were sure about it and he believed me. At the end of two weeks he decided to play safe and he went over them again and found the mistake. After that he said: "You are no good for a bookkeeping department. You had better go somewhere else on this paper." I thanked him and went upstairs; Mark went to New York and got a big job. Then he came back to Detroit and was elected president. I am still working on the paper—and I am still poor.

STORY OF THE CAREFUL DRIVER

I have enjoyed every minute of this party; enjoyed everything even to the announcement that some gentleman made through a megaphone when we moved the second half of the party into this room. You remember he said he was going to move the other half in because a lady that was going to speak refused to talk twice. I would like to meet that lady—a lady who won't talk twice is something new in ladies.

I wish I knew how to begin this thing. I am not a regular speaker, I haven't any advice to offer and I don't know where to begin. I played safe, though, and brought a book with me, so if I got stuck I could at least read it to you.

A friend of mine met a man on the street the other day, who said to him: "I see you are a more careful driver than you used to be." My

friend answered: "Yes, I have to be; I ran over a baby buggy the other day." The other fellow said: "I should think that would make you careful." My friend answered: "It wasn't hitting the baby buggy that decided me to be more careful; it was the milk bottles which raised the devil with the tires."

That calls to mind another man who said to his friend: "You know, I gave up smoking a year and a half ago and I discovered day before yesterday that I had saved and put \$500.00 in the bank." The friend said: "Is that so, let me take \$200, will you?" The saving fellow answered: "Yesterday the bank failed."

HE WHO KNOWS THAT HE KNOWS IS A WISE MAN

Someone said that the difference between a wise man and a fool is that the wise man knows that a thing can't be done and doesn't find out it can be done until some fool who doesn't know that it can't be done comes along and does it.

Somebody said that it couldn't be done,
But he, with a chuckle, replied:
That "maybe it couldn't," but he would be one
Who wouldn't say so till he'd tried.
So he buckled right in with the trace of a grin
On his face. If he worried he hid it.
He started to sing as he tackled the thing
That couldn't be done, and he did it.

Somebody scoffed: "Oh, you'll never do that;
At least no one ever has done it;"
But he took off his coat and he took off his hat,
And the first thing we knew he'd begun it.
With a lift of his chin and a bit of a grin,
Without any doubting or quiddit,
He started to sing as he tackled the thing
That couldn't be done, and he did it.

There are thousands to tell you it cannot be done,
There are thousands to prophesy failure;
There are thousands to point out to you one by one,
The dangers that wait to assail you.
But just buckle in with a bit of a grin,
Just take off your coat and go to it;
Just start in to sing as you tackle the thing
That "cannot be done," and you'll do it.

THE BACK-SEAT SAFETY DRIVER

I believe in safety—in every form of safety that there is—and yet, once in a while, I don't like to have it dinned into my ears, especially from the person who rides in the back seat of my automobile. Sometimes it seems to be that Mrs. Guest is obsessed with the notion that I am intent on suicide or wife murder and that if she were not there to say "Look out! That is a street car coming!" I would not know it was a street car. I have argued with her until I have been blue in the face, trying to convince her that if Henry had intended that bus to be driven from the back seat he would have put pedals and the steering gear back there.

I may look foolish to you folks, but I am not crazy enough to put into my own mouth words that are going to get me into trouble at home, when I can just as well let Bud say them and he can get away with it. Bud is only 10, but he can say things to his mother that I wouldn't dare even to think. We were driving one day, and afterward I went down to the office. I took Bud with me and we collaborated on this. Bud tells the story:

Before we take an auto ride pa says to ma: "My dear, Now just remember I don't need suggestions from the rear. If you will just sit still back there and hold in check your fright, I'll take you where you want to go and get you back all right. Remember that my hearing's good and also I'm not blind, And I can drive this car without suggestions from behind."

Ma promises that she'll keep still, then off we gayly start, But soon she notices ahead a peddler and his cart. "You'd better toot your horn," says she, "to let him know we're near; He might turn out!" and pa replies: "Just shriek at him, my dear." And then he adds: "Some day, some guy will make a lot of dough By putting horns on tonneau seats for women-folk to blow!"

A little farther on ma cries: "He's signaled for a turn!" And pa says: "Did he?" in a tone that's hot enough to burn. "Oh, there's a boy on roller skates!" cries ma. "Now do go slow. I'm sure he doesn't see our car." And pa says: "I dunno; I think I don't need glasses yet, but really it may be That I am blind and cannot see what's right in front of me."

If pa should speed the car a bit some rigs to hurry past, Ma whispers: "Do be careful now. You're driving much too fast." And all the time she's pointing out the dangers of the street And keeps him posted on the roads where trolley cars he'll meet. Last night when we got safely home, pa sighed and said: "My dear, I'm sure we've all enjoyed the drive you gave us from the rear!"

BILL SNOW HAD THE RIGHT-OF-WAY

On the other hand, I think I am the most careful driver that steps into the seat of an automobile. I never take a chance. I am like old Bill Snow, who trusted his life to the right-of-way. You know the worst fool in the world is the fellow who has the right-of-way. I would rather ride with anybody rather than the fellow who tells me, "This is all right. I've got the right-of-way," because I know they say of Old Bill Snow:

Here lies the body of Old Bill Snow,
Awaiting the judgment day;
And it comforts his widow a lot to know
That he had the right-of-way.

I play safe in more ways than one. I am not going to get hurt; I am not going to have anyone that is near me get hurt, but there are other ways to play safe, too, I think. It occurred to me, one day, as I was walking down Woodward Avenue, that some thirty or forty years from now the world is going to need some particularly big man to do some particularly big job; when the job is ready the man is going to

be there. If that is true, then someone tonight has in his keeping a little bit of a fellow who is going to be that big man of tomorrow. What sort of stopped me was the thought—it scared me stiff and sent the shivers up my spine—that I might be carrying just that responsibility, and did not know it. Bud is bright and he is normal, notwithstanding the fact that he is considerably handicapped by having me for a father. He has a chance. I began to wonder, if I knew definitely what his destiny in this life is to be, whether or not I would try to train him differently.

IT MAY BE YOUR BOY OR MINE

Then came to my mind some men whom I know that take long chances with small boys. I know one man that piled up at least forty million dollars; when he got all through with his money making he had a son 21 years old that wasn't worth a nickel. I often thought, if he could have had his choice, he would have split that fortune and had a better boy; or no money at all and had a better son.

Some day the world will need a man of courage in a time of doubt,
And somewhere, as a little boy, that future hero plays about.
Within some humble home, no doubt, that instrument of greater things
Now climbs upon his father's knee, or to his mother's garments clings.
And when shall come that call for him to render service that is fine,
He that shall do God's mission here, may be your little boy or mine.

Long years of preparation mark the pathway for the splendid souls,
And generations live and die, and seem no nearer to their goals.
And yet the purpose of it all, the fleeting pleasure and the woe,
The laughter and the grief of life that all who come to earth must know,
May be to pave the way for one—one man to serve the Will Divine—
And it is possible that he may be your little boy or mine.

Some day the world will need a man! I stand beside his cot at night,
And wonder if I'm teaching him, as best I can, to know the right.
I am the father of a boy—his life is mine to make or mar—
And he no better man can be than what my daily teachings are.
There will be need for someone great—I dare not falter from the line—
The man that is to serve the world may be that little boy of mine.

Perhaps your boy and mine may not ascend the lofty heights of fame,
The orders for their births are hid. We know not why to earth they came.
Yet in some little bed tonight the great man of tomorrow sleeps,
And only He that sent him there the secret of his purpose keeps.
As fathers, then, our care is this, to keep in mind the Great Design,
The man the world shall need some day may be your little boy or mine.

A FINER AND A TRUER TYPE O' MAN

I don't look like a fellow that ever thinks seriously about anything in the world, and yet I do. Here are a couple that I never have tried before. I thought to myself if I got by at a Safety Council maybe I could try them somewhere else. That is just a notion I have. I don't know that it has any place here, or whether it is going to help, or whether it is going to prove anything to you.

We were settin' there an' smokin' of our pipes, discussin' things
Like liquor, votes fer wimmin, an' the totterin' thrones o' kings,
When he ups an' strokes his whiskers with his hand an' says t' me:

"Changin' laws an' legislatures ain't, as fur as I kin see.
Goin' to make this world much better, unless somehow we can
Find a way to make a better an' finer sort o' man.

"The trouble ain't with statutes or with systems—not at all;
It's we humans, jest like we air, an' their petty ways an' small.
We could stop our writin' lawbooks an' our regulatin' rules.
If a better sort of manhood was the product of our schools.
For the things that we air needin' ain't no writin' from a pen,
Nor bigger guns to shoot with, but a bigger type of men.

"I reckon all these problems air jest ornery, like the weeds.
They grow in soil that oughter nourish only decent deeds.
An' they waste our time an' fret us when, if we were thinking straight,
An' livin' right they wouldn't be so terrible and great,
A good horse needs no snaffle an' a good man, I opine,
Doesn't need a law to check him or to force him into line.

"If we ever start in teachin' to our children, year by year,
How to live with one another there'll be less o' trouble here.
If we'd teach 'em how to neighbor an' to walk in honor's ways.
We could settle every problem which the mind o' man can raise.
What we're needin' isn't systems or some regulatin' plan,
But a bigger an' a finer an' a truer type o' man."

THE FACES OF THE PEOPLE PASSING BY

The extent of an accident appeals to me more than anything else.
Somehow or other, I never saw anybody bumped over in the street—I
never saw anybody that was hurt—but what the actual injury itself does
not make as deep an impression as the thought of what might be be-
hind it.

Riding down Woodward avenue on a street car one day I noticed a
particularly sad and old face on a woman who really was much younger
than she appeared. I found myself speculating as to just what had hap-
pened to write all the age and all the sorrow on the face of that woman.
I tried to work it out:

I look into the faces of the people passing by,
The glad ones and the sad ones all lined with misery,
And I wonder why the sorrow or the twinkle in the eye,
But the pale and weary faces are the ones that trouble me.

I saw a face this morning, and time was when t'was fair,
Youth had brushed it bright with color in the distant long ago,
And the goddess of the lovely once had kept a temple there,
But the cheeks were pale with grieving and the eyes were dull with woe.

Who has done this thing, I wondered, what has wrought the ruin here,
Why these sunken cheeks and pallid, where the roses once were pink?
Why has beauty fled her palace; did some vandal hand appear?
Did her lover prove unfaithful or her husband take to drink?

Once the golden voice of promise whispered sweetly in her ears—
She was born to be a garden where the smiles of love might lurk.
Now the eyes that shone like jewels are but gateways for her tears,
And she takes her place among us toilers, early bound for work.

Is it fate that writes so sadly, or the cruelty of man,
What foul deed has marred the parchment of a life so fair as this?
Who has wrecked this lovely temple and destroyed the Maker's plan.
Raining blows on cheeks of beauty God had fashioned just to kiss?

Oh! the pale and weary faces of the people that I see,
Are the ones that seem to haunt me, and I pray to God above
That such cruel desolation shall not ever come to be
Stamped forever in the future on the faces that I love.

THE MAN WITH AN HONEST DREAM

Mark Dow has done such a good job and he put so much patriotism into his speech it was a good boost for safety. I believe in playing safe for America, too. It is all right to put up a lot of safeguards for the men, but somehow I feel that I would like to put up a lot of safeguards for our American institutions. One day I had that hunch, and it occurred to me that we have a fine big country here, as fine a country as the world is ever to know, and as big a country as the world is ever to know; we have a lot of room, but we have room only for fine people. We haven't any room for people that don't want to be fine.

We have room for the man with an honest dream,
With his heart on fire and his eyes a gleam;
We have room for the man with a purpose true,
Who comes to our shores to start life anew,
But we haven't an inch of space for him
Who comes to plot against life and limb.

We have room for the man who will learn our ways,
Who will stand by our flag in its troubled days;
We have room for the man who will till the soil,
Who will give his hands to a fair day's toil,
But we haven't an inch of space to spare
For the breeder of hatred and black despair.

We have room for the man who will neighbor here,
Who will keep his hands and his conscience clear;
We have room for the man who'll respect our laws,
And pledge himself to our country's cause,
But we haven't an inch of land to give
To the alien breed that will alien live.

Against the vicious we bar the gate!
This is no breeding ground for hate.
This is the land of the brave and free,
And such we pray it will always be.
We have room for men who will love our flag
But none for the friends of the scarlet rag.

WHEN WE HAVE SAFELY LIVED THE DAY

One night I had sat up later than usual. Mother had been in bed for quite a while, and brother had been in bed for a much longer while. It came around 10 o'clock. I went into the kitchen and put out the milk bottle; I put the chain on the kitchen door; then I went to the front door and saw that was locked, too. I turned out all the lights on the lower floor and went upstairs. The house was still and quiet and this thought came to me: That so far as it was humanly possible we had safely lived that day. In the morning we did not know what was in store for us, we did not know what might happen to us; here it was 10 o'clock, and bedtime, and we were all safe and sound under that roof—

save for the great calamity which can come through locked doors. It seemed a comfort, so next day I tried to work it out:

It's bedtime, and we lock the door,
Put out the lights—the day is o'er.
All that can come of good or ill,
The record of this day to fill,
Is written down; the worries cease,
And old and young may rest in peace.

We knew not, when we started out,
What dangers hedged us all about;
What little pleasures we should gain,
What should be ours to bear of pain.
But now the fires are burning low,
And this day's history we know.

No harm has come. The laughter here
Has been unbroken by a tear;
We've met no hurt too great to bear,
We haven't had to bow to care;
The children all are safe in bed,
There's nothing now for us to dread.

When bedtime comes and we can say,
That we have safely lived the day,
How sweet the calm that settles down
And shuts away the noisy town!
There is no danger now to fear,
Until tomorrow shall appear.

When a long bedtime comes, and I
In sleep eternal come to lie—
When life has nothing more in store,
And silently I close the door,
God grant my weary soul may claim,
Security from hurt and shame.

"DID YOU SPEND IT ALL ON YOURSELF?"

Just a bit in conclusion; it was written by me. It is so much easier to write these things than it is to live up to them that I am ashamed to stand on my feet and read them afterwards. Yet it occurs to me that when the journey of life is over there may be some inquisitive fellow, on the other side of the stream, who may stop me at the gate and say: "Edgar, we gave you a bunch of time to spend on the earth. What did you do with it?" And I will ask: "What?" And he will say: "Well, we gave you so many years and so many months and so many weeks, and a couple of days extra for good measure. You had it all and you spent it all. Anybody down there any better off because you had that much time to spend, or did you spend it all on yourself?"

If he should get that impertinent and that inquisitive, and want to know so closely how I spent my time, I rather think I would like to be able to stand on my feet, look him in the eye and say: "I did have a bunch of time and I spent it all. I had a good time spending it and I spent a lot of it on myself, too; but I don't think I spent it all on myself. I did try to spend a little of it on somebody else. If you don't believe it send somebody down there that knows me and find out."

I'd like to think, when life is done
 That I had won a needed post;
 That here and there I'd paid my fare
 With more than idle talk and boast.
 That I had taken gifts divine,
 The breath of life and manhood fine,
 And tried to use them, now and then,
 In service for my fellowmen.

I'd hate to think when life is through,
 That I had lived my round of years,
 A useless kind that leaves behind,
 No record in this vale of tears.
 That I had wasted all my days,
 By treading only selfish ways,
 And that this world would be the same,
 If it had never known my name.

I'd like to think that here and there,
 When I am gone, there shall remain
 A bright spot that might have not
 Existed had I toiled for gain—
 That someone's cheery voice and smile
 Shall prove that I had been worth while;
 That I had paid with something fine
 My debt to God for life divine.

Thank you very much. (Applause and cheers).

IN MEMORY OF JAMES WHITCOMB RILEY

That is awfully nice, friends. I appreciate it more than I can tell you. I am thoroughly flattered, and yet I don't want to recommend the custom or encoring banquet speakers. Some night you are going to run into a long-winded bird who will think you mean it and you will be sorry.

Mr. Cameron has just asked for a little bit that was written in 1916; the occasion was the death of James Whitcomb Riley. One of the boys came downstairs and said, "Did you get the news? We got a flash from Indianapolis that James Whitcomb Riley is dead."

I did then what every column conductor did. I put fresh paper into the machine and began to write a bit of obituary verse, deploring the death of America's greatest poet. I must have had eight or nine lines written when one of the boys came up and said, "Well, I see you are doing it in the same old way, the way you always have and the way you always will do it. You are saying what a great loss has come to the world. Why don't you forget, for once in your life, that worldly view, and try to picture the great joy that must be taking place on the other side of the stream, where they are getting Jim Riley back again? So out of the machine came that piece of paper and into the waste basket it went—in went a fresh piece.

There must be great rejoicin' on the Golden Shore today,
 An' the big an' little angels must be feelin' mighty gay;
 Could we look beyond the curtain now I fancy we should see
 Old Aunt Mary waitin', smilin' for the coming that's to be.
 An' Little Orphant Annie an' the whole excited pack
 Dancin' up and down an' shoutin': "Mr. Riley's comin' back!"

There's a heap o' real sadness in this good old world today;
There are lumpy throats this morning now that Riley's gone away.
There's a voice now stilled forever that in sweetness only spoke,
An' whispered words of courage with a faith that never broke.
There's much of joy and laughter that we mortals here will lack,
But the angels must be happy now that Riley's coming back.

The world was getting dreary, there was too much sigh an' frown,
In this vale o' mortal strivin', so God sent Jim Riley down.
And he said: "Go there an' cheer 'em in your good old-fashioned way,
With your songs of tender sweetness, but don't make your plans to stay.
'Coz you're needed up in Heaven. I am lendin' you to men,
Just to help 'em with your music, but I'll want you back again."

An' Riley came, an' mortals heard the music of his voice,
An' they caught his songs o' beauty an' they started to rejoice;
An' they leaned on him in sorrow, an' they shared with him their joys,
An' they walked with him the pathways that they knew when they were
boys.

But the heavenly angels missed him, missed his tender, gentle knock
Of makin' people happy, an' they wanted Riley back.

There must be great rejoicin' on the streets of Heaven today,
An' all the angel children must be troopin' down the way,
Singin' heavenly songs of welcome and preparin' now to greet
The soul that God had tintured with an everlasting sweet.
The world is robed in sadness an' is draped in sombre black,
But joy must reign in Heaven now that Riley's comin' back.

(Cheers and Applause.)

A B C Session

August 31, 1922

J. M. WOLTZ, Chairman

**SAFETY DIRECTOR, YOUNGSTOWN SHEET AND TUBE COMPANY,
YOUNGSTOWN, OHIO**

DEBATE—COMMERCIAL VS. HOMEMADE MACHINE GUARDS

Affirmative by F. S. Benedict, Norwich Wire Works, Providence, R. I.

MR. BENEDICT: This debate has its inception in a description of an "ideal guard" given at a former Safety Congress.

Picture any other manufactured product that you may liken to being ideal and you immediately identify with its development the necessary experimenting on the part of men skilled in that particular line of work. This should be the last audience in the world to attach less importance to the attainment of the ideal in a safety guard, yet how can you consistently hold to that opinion and at the same time be of a mind that anybody can design an ideal guard.

Every manufacturing plant in the country must be regarded as a potential builder of homemade guards. Less than 20 per cent are safeguarding their machines on their own initiative; the balance, more than 80 per cent, largely consider the guarding of their machines as impractical and unnecessary and only do so through compulsion on the part of state and insurance inspectors.

To design an ideal guard for a specific machine one must possess accurate knowledge as to the operation of that and adjacent machines, the material used and the manner of handling it, the necessity and the best method of reaching certain parts to be guarded, the different styles of standard guards and their cost, and the most generally approved types. Being possessed of this knowledge, one knows whether to design the guard with or without legs; of one, two, three or four sides; to a height of three and a half, five or six feet, or to make a complete enclosure with a frame of round, flat, channel or angle iron of the proper size; a filler of wire, or perforated or expanded metal of standard and correct gauge and opening, or of sheet metal; with a removable front or back, whole

or part doors and the best way to make them, and the best method of attaching the guard.

FACILITY OFTEN LACKING FOR THE MAKING OF EFFICIENT SAFEGUARDS

Without the inclination to build a proper guard, and with no experience in designing them or of the state and insurance company standards, and caring less, I fail to see how anyone can believe that this last group of more than 80 per cent of potential builders of homemade guards could design an ideal guard for even one machine.

What are the actual conditions? Instead of one machine they have from twenty to one hundred or more, hardly any two alike or set up in the same position and operating under the same conditions. Why waste time in debating the possibility of this group designing ideal guards? It never has been done and it is not within the widest realm of probability that it ever will be done. This group has few if any facilities for fabricating guards and would not use the best method if they did, for they build guards only with the idea of temporarily getting by.

As to cost: Of what moment is the cost of a guard that does not fit, that is impractical in design, that interferes with the operation of the machine and is sub-standard? When and where does the cost of such a guard stop?

The negative side of our debate is not represented by any member of this group. I would not have given them any more consideration if it were not for the fact that they form the great majority of potential builders of homemade guards and, also, to impress upon your minds the fact that the greatest field of endeavor in the advancement of the safety movement, so far it pertains to the safeguarding of machinery, lies in your bringing to the attention of the members of this group the fact that practical safeguards can be designed for almost any machine if the work is entrusted to men of experience. Show them one practical safeguard and they are sold on the idea of safety!

As to the first group, representing less than 20 per cent of the potential builders of homemade guards, what qualifications have they that better fit them to design ideal guards than the professional designers of commercial firms? And in considering commercial builders, it is but fair to ask you to take only into account the leaders, for when you purchase a commercial safeguard you are not confined to any one firm—you go into the open market to procure the best. You cannot draw a line of distinction between these two classes of designers; what would best fit one to design ideal guards must also apply to the other.

Does this group possess a greater knowledge of the operation of different machines, of methods of handling material, of different types of guards that are permissible under state and insurance standards, of the necessity and best method of reaching certain parts to be guarded, and of the most suitable and approved forms of construction and what do they know about costs?

COMMERCIAL COMPANIES GUARANTEE SATISFACTORY RESULTS

If they are possessed of greater knowledge, where did they attain it? How else could they have gotten it than through experience in designing safeguards and in observing the work of others? What greater incentive have they to endeavor to design more nearly ideal guards? Is their work subjected to more severe criticism? Having such confidence in his ability to design ideal guards, is there one who will guarantee every guard to fit, to pass state and insurance inspection, and to be satisfactory in every way, or else he will assume the cost of a guard that will?

The professional designer of safety guards gives such a guaranty. He can tell you the cost of any type of guard in any form of construction. He can explain the advantages or disadvantages of guards with or without legs, removable fronts or backs and whole or part doors; round, flat, angle or channel iron frames; perforated, sheet, expanded metal or wire filler; the weight of the frames; the gauge and opening of the filler, and the most generally accepted forms of design and construction.

The professional designer of safety guards usually has no sideline or other distraction; he has taken up the designing of safety guards as his life work and is bound to take pride in it and exert his best efforts. He designs guards for hundreds of different works. His work is always subjected to the severest criticism, from the plant owner down to the operator and the state and insurance inspectors. He receives hundreds of suggestions as to the better method in designing guards and he has the opportunity of observing the work of hundreds of other guard builders; he is able to adopt or improve upon their good points and avoid their mistakes.

Many professional designers have been so employed from five to ten years and have designed hundreds and, in many cases, thousands of guards for the same type of machines; some have experience covering the designing of guards for more than 200 metal and as many more woodworking establishments, 100 silk mills, 80 woolen mills, 60 cotton mills, 50 plants for the manufacture of paper and paper products, and anywhere from 6 to 50 other lines.

Most designers of homemade guards have an experience limited to working in one or two plants, to designing guards only for certain types of machines and to working with only one kind of material. They know little or nothing about the many types of guards designed by others for similar machines. For the most part, they are selected because they are employed in the department to which this work would naturally be assigned, and, in many cases, they are the final judges as to the perfection of their own work. They know nothing whatever about the cost of guards of different design and construction.

COSTS OF HOMEMADE COMPARED WITH COMMERCIAL GUARDS

The commercial guard-building firms employ trained men to lay out their designs. They have special facilities for bending the frames cold, for doing electric and acetylene welding; they are equipped with up-to-date

facilities for building guards on any type or form of construction and employ skilled mechanics in each line of work.

On the point of comparison of costs—and this is the only thing considered—I want to lay the greatest emphasis on the fact that this is the biggest bugaboo ever advanced in an argument; it has absolutely no basis of fact and is founded only on the guesswork of men absolutely unfamiliar with manufacturing costs. Wherever a comparison of costs has been made, the homemade guard has exceeded that of commercial guards three and four times. Hundreds of the leading and best equipped firms for manufacturing homemade guards will testify to the truth of this statement.

CHAIRMAN WOLTZ: The negative on this most interesting subject will now be presented by Mr. G. A. Kuechenmeister.

Negative by G. A. Kuechenmeister, Dominion Forge and Stamping Company, Ltd., Walkerville, Ont.

MR. KUECHENMEISTER: A majority of manufacturers build their own guards. We have no professional safeguard builders in the industrial district of Detroit and the plants here resort to their own designs and construction. We admit that commercial men can build good guards; there is no reason in the world why they should not. They may be good mechanics; they may buy the same machines we have in our own plants, and get their ideas and information from the same sources; we do—the experience of men attending conventions for the express purpose of interchanging such ideas and from the files of the National Safety Council library and other organizations that voluntarily pass out that kind of information. We know of a lot of people that build good guards. There are thousands of good, neat, durable and practical guards installed in American industrial plants during the last ten or twenty years and all have been built according to the best mechanical practices, at less cost, promptly when needed, and with far better results than you could buy them from an outside company.

The argument of having a special trained staff of engineers to design and build safeguards is ridiculous; in fact, it is almost an insult to the engineering profession. An engineering department can lay out a building and plan its construction, design, build and operate the machines in the plant—if they cannot build, design and install mechanical safeguards into that plant, the trouble is in the heart and not in the head; it is because there is no one with authority in the organization who has a desire to make it a safe plant. The same mechanical ability that we use for production can, and is, being used to produce good guards.

MAKING OF GUARDS NOT WHOLLY A QUESTION OF MECHANICS

The cost of all manufacturing is important these days and guards will receive the same careful scrutiny by the management that they give other costs in the plant, but to argue the cost of guards is a waste of time at a meeting of this kind because costs in my plant are far different from costs in another plant. If the guarding of a plant were merely a question of mechanics and costs, the whole problem would be very much

simplified; then an outside company might be able to do the work for us. But that is not true. Rather than figure how much a guard costs, it is better to ask: "What is the attitude of the shop toward the guard being used?"

We have learned that industrial safety is a matter of education and that education must be carried on continuously. Mechanical safeguarding is the first, the very first, thing that must be done in every safety campaign in the shop. We have also learned that safety campaigns do not run themselves; someone must be in charge to keep them going. Whether it is the safety man, the safety department, the engineer, superintendent or manager who has charge of the educational work, this authority can always attend to the mechanical guarding. We are told that we must employ an expert. Nothing of the kind! Our state factory inspectors and the insurance men are the best experts on guards in the country. They have grown up with guard construction in the plants and we can have their services without additional cost.

Unless provision is made in a plant for the continual carrying on of safety work, including mechanical guarding, the whole movement will be a flat failure. The path of industrial safety is strewn with the remnants of discouraged safety organizations—they failed because no provision had been made for carrying out the suggestions and recommendations offered by enthusiastic safety committeemen—men who were asked to make recommendations which were later ignored. If you safety men had to depend upon guards you fought for through your office and through the purchasing department, you know very well there would not be as many guards in your plant as there are today. By having your own people make the guards and prove their worth (and what you secured were all the better because they were your own guards), you have succeeded in guarding your plants as they are now protected.

SPIRIT OF CO-OPERATION SECURED WHEN LOCAL TALENT EMPLOYED

Another thing: With this organization in the plant, whether it is one man or a dozen to whom the foremen and workmen can turn for help when they need it, you can develop to the highest degree the spirit of co-operation that we hear so much about. No commercial guard company, no man on the outside, can visit your plant occasionally and sell you co-operation. Just as safety is a personal matter, no one can do this work for us.

When the man in charge of mechanical guarding goes into a plant to take measurements for building guards he does so with his eyes and ears wide open for information; he is willing to incorporate every worthwhile suggestion that he can secure and, if he is the right kind of a man, he is always looking for them. When the commercial guard man visits your plant he comes in as a salesman and his first qualification is his conviction that his guard is absolutely the best in the world. He must argue down any suggestion to the contrary, no matter in how good faith it is given, because he cannot go back to his factory and say that "Bill Jones of such-and-such a company wants a change made in the

guard." If he does that he ruins their standards and gets nowhere. That salesman invariably creates resentment by the men in the plant not only against his one guard, but against all guards.

On the other hand, the more interest you create among the men in the matter of guarding a building the further you will get. After all arguments are over, and after we have said and done all we can, you must kindly remember that the little, old, and often homely home-made guard—the product of the brain of the man on that machine, the guard he has talked about and talked to his wife about—that guard is the one that goes on that machine and is always in place. And, ladies and gentlemen, isn't that the final test of superiority of a guard?

REBUTTAL

CHAIRMAN WOLTZ: We have had the affirmative and negative of the discussion, now let us hear the rebuttal.

MR. BENEDICT: If a man could design a guard for one machine he could soon make a better one; if he built a third and fourth he could still improve upon it. That is the point. In the homemade guard-building plant they build one for a lathe, a drill or a planer; one may be located in the building, in one part of a room, one in an alleyway and another along the wall—always under different conditions. It is very plain, it would seem to me, that if a man had experience in designing and building a hundred or a thousand guards for that one machine, and receiving suggestions from hundreds of different people, that he should build a good guard.

As to the point of the commercial guard designer being a salesman: You have all had experience with the salesmen of today and know there is a great deal more to the calling than mere selling. Selling commercial guards is different from selling other products. The man who sells oil, machinery or the different things used in the plant calls back week after week and month after month and continues to re-sell them, but the commercial guard builder visits the plant only occasionally. He must offer a salable guard and if it does not give complete satisfaction he will lose all possibility of ever selling to that firm again. I represent my company in the New-England States and there are many mills in the cities and small towns—one may have woolen mills, one cotton mills and another paper mills. The companies know each other and if I sell one and do not furnish a satisfactory guard, my chance of selling to any other firm in the town is eliminated.

The commercial guard builder must guarantee complete satisfaction. That is the point I make and I would like to know if there is one single designer of homemade guards who can guarantee every guard to fit, pass state and insurance company inspections and be satisfactory in every other way or who will assume the cost of a guard that will? There is not one but every designer of commercial guards will do that—I will even guarantee a guard to meet the whim of the operator on the machine!

COMMERCIAL GUARDS USED IN NEW ENGLAND MILLS

On costs. In the New England States, 30 per cent of the manufacturing plants are buying commercial safeguards and there are no more capable or skilled mechanics in the world than are to be found there. I can name town after town where 90 per cent of the plants buy commercial guards and it is only here and there that you find a plant with ones that are homemade. I dare say, out in this country, where you have not had experience with the large commercial guard-builder, there are firms still building their own guards. They know nothing of the work of the commercial builders; but some day they will learn; some day the commercial guard builder will come into their plant and re-guard 90 per cent of the machines. As the safety movement progresses, no man is going to have an impractical guard on his machine.

Last year 20 per cent of my business was the re-guarding of machinery that had homemade devices on it. The man who designs thousands of guards for the same type of machine receives hundreds of suggestions and the management stands ready, when the guard is planned, for everyone to come forward and criticize it. I get the benefit of those suggestions. If the guard does not fit, back it goes to the factory and we sell them one that will fit and give satisfaction.

CHAIRMAN WOLTZ: I am the referee, the audience will decide the question on its merits. We have several gentlemen who desire to take the affirmative or negative on this subject.

WHEN IT IS ADVISABLE TO GO OUTSIDE ORGANIZATION FOR GUARDS

MR. KINGSBURY (President, Standard Safety Equipment Company, Chicago, Ill.): I will speak only from the experience I have gained in the safeguarding business. I have gone into plants where they needed machine guards and have heard the arguments that they could build the guards cheaper than they could buy them. We have figured on the guard and after considerable planning and discussion the management has usually decided that it would be cheaper to let an outside guarding crew come into the plant and do the work than it would be to take the men off of their usual jobs in the plant and to worry about misfits and other things; that applies to small as well as large plants. In the small places, where they have no safety organizations, they are very glad to have an outside company come in, look over their machinery, give estimates, and to furnish the guards, because they have no one in their organizations competent to build the guards that are necessary to meet the standards and approval of the insurance companies.

In the large plants they have large jobs and they seem to favor the commercial guard-builder more particularly, I think, because they do not want to take their own men off their other work. They do not want to train the men in their own organization to build safeguards because the work is intermittent and if there is a job in the factory that is more important (and there usually is) the foreman will put the men back on the job. In the meantime an accident may happen that could have been avoided. I have often been told: "We do not want to be bothered;

we would rather have someone who knows his business go through the plant and guard it."

I can recall any number of plants where the factory inspector came along and found a machine running open. He would say, "You will have to cover that machine." The answer would be, "All right, we will do it." When the inspector goes out the fellow gets a box or barrel or some thing of the sort and sticks it over the fly wheel. I have seen wooden guards over belts—just pieces of boards nailed together. When you speak of homemade safeguards you leave the door open for that kind of work and it is wrong.

In the larger companies, where they have experienced engineers and men competent to build safeguards, they, of course, want to do it. If they can put a crew on the job and keep them there until the guarding work is completed, I do not try to talk them out of it. I think that a guarding crew can be worked up in a plant—that is, if they start right and go to it in the right way—but a majority of companies, in my opinion, prefer to have an outside commercial organization come in and build the guards for them, rather than to fuss around drilling the men inside the plant to do the work.

COMPETITIVE PRICE SHOULD NOT INFLUENCE PURCHASE OF GUARDS

MR. D. P. KENNEDY (Assistant Safety Engineer, Pittsburgh Plate Glass Company): Have you ever seen a case where the commercial safeguard became an actual hazard because of its having been displaced and being kicked aside because it was not liked and because it was unsatisfactory? That has actually happened. The purchase of safeguards from the ordinary commercial manufacturer is usually made because of competitive prices, and I think right there is where we have our most dangerous point—purchase because of competitive price. The only safe way to buy a commercial safeguard is to adhere to strict specifications.

What kind of service are the guards going to give us? Our new machinery is guarded before it is operated and the guards are a part of the cost of the machine, just as are the belts, shaftings, etc. If the guard is a part of the original investment, it should be right, complete, strong and properly placed, because it is going to stay there as long as the machine lasts. The cost is not the most important factor in building safeguards.

In our plants we have technical men and engineers; men who understand the needs of a machine, the guards which will be acceptable and the kind which will last—and that is the kind of guard they will put in place. If the men in your own plant put a guard in place and have the complete support of the management behind them, believe me, it is going to stay in place and have the right kind of attention. (Stereopticon views were shown by Mr. Kennedy.)

VALUE EXPERIENCE ACQUIRED BY FIELD MEN

CHAIRMAN WOLTZ: Mr. Ayres has kindly consented to substitute for Mr. Dinker who is unable to be present.

Mr. J. B. ARMES (Safety Director, National Tube Company, McKeesport, Pa.): Not everyone in the industrial world is in a position to manufacture their own guards; they do not have the facilities or the material for doing so, although they may have the brains that apply to whatever their product may be. For instance, those who operate in the textiles have brains that are familiar with that industry; those in mechanical lines have brains to manufacture and produce a machine that serves the textile worker. Consequently the textile man knows he is not a specialist on the makeup of the machine that he employs and, when he desires to have that machine guarded, he calls upon someone to guard it for him—the commercial guard builder would naturally be the man.

Years ago there was no commercial guard manufacturing, but the demand of the times has emphasized the needs for such a man and whatever the commodity may be that we are producing, or whether we are engaged in the professions or arts, all of us are taking on the characteristics of the specialist. The commercial man is no exception and he has acquired sufficient technical knowledge and mechanical ideas to qualify on that line, developing and becoming more expert every day. With the extensive and valuable experience he has gained, through the volume of business he transacts in serving the public, he is doing better work and making more improvements than ever before.

QUESTION OF COST AND UTILITY

I do not say that a man, if he wants to, cannot guard his own place, but he is apt to do so in a crude way; it may be a guard, but in appearance it might not be a sightly one and an unsightly guard has almost as bad an influence upon the workmen near it as if there were no guard on the machine at all. Humanity, as a rule, has an eye for the beautiful, the symmetrical; the commercial guard manufacturer puts into his finished product a symmetry of form as well as attractiveness. When this is accomplished, the device is looked upon with pride by the operator who is being protected. This is not often accomplished by those in the plant making their own guards. Sometimes they make barricades with planks of varying thickness, or they build a crude wall around a dangerous place; they may cover a machine with fabricated stuff, and the result is most terrifying in its appearance. As a result, the individual working on or near the machinery, instead of going about with a sense of security, feels there is something repellant about it.

The workman can do the guarding in his own way, but I think the commercial man, after making a study of the situation and having in mind the requirements of the particular job and the particular type of machine and what is to be accomplished, is better acquainted with the work and best informed as to the needs of the occasion. There may be some hazards about punch presses or other machines that he does not grasp until he sees the machines in operation, and if he is kept in ignorance of these particular dangers, do not expect him to understand just what is required to overcome them. The commercial man is constantly informing himself as to what the needs of a punch press or other machines may be.

A MAN WHO BUYS CHEAP, GETS POOR GUARDS

The commercial man's field is a large one, the opportunity is great, and he should endeavor to get away from the strictly competitive basis—the mere dollar-and-cents part of the proposition. We know everyone is in business for profit—that is legitimate—but the man who invites competitive bidding on the safeguarding of his machinery is as much at fault as the commercial man who always tries to meet the lowest prices. He gets just what he pays for; if he buys a low-priced commodity he gets a low-priced article; if he pays a good price, and if he deems his protective measures worth spending money for, then the more he pays the less the cost is to him, as he secures the guards that will give him the greatest durability protection.

We call in the engineer and the architect and make known our wants for a building in which we wish to carry on a certain business or to use as a manufacturing plant. If we desire a home we tell the architect what we want and he designs it. So it is with commercial safeguard manufacturers when you call him in to look over your factory. You want it protected and he can do this, I think, in a manner far superior to what you might accomplish if you attempt to perform the work with your own force. Your plant may not have the necessary facilities for this particular service and, even if it has, there is the upkeep to be considered and, even then, you may not be prepared to do it as well as the commercial builder, unless you maintain a very large plant indeed.

CHAIRMAN WOLTZ: The closing discussion will be on the negative side by Mr. R. G. Adair.

MR. R. G. ADAIR (Safety Engineer, American Rolling Mill Company, Middletown, Ohio): In our own plant we have learned by experience to prefer homemade safeguards. One point has been overlooked by both sides of this argument, perhaps, and that is that the guarding of machinery is not the only problem of the safety engineer—I believe it is the smaller of our problems. There are other safeguards that are very, very essential to the carrying out of a good safety program. I will ask you to bear in mind several points because I, too, have brought some slides with me and I will attempt to demonstrate machine safeguards as well as safeguards other than for machinery.

MAXIMUM PROTECTION, EFFICIENCY, DURABILITY, SIMPLICITY

Of the four points I wish to bring to your attention, the first is that safeguards must afford the maximum of protection. The second, that under no consideration must the guard interfere with operation. I am thoroughly convinced that any safety device, be it a machine guard or otherwise, that in any way interferes with operation is ultimately doomed to failure.

The third point about a safeguard—the ideal one—is that it must be durable; it must be strong; it must not only stand the natural wear and tear on machinery but it must stand abuse. The fourth point is that the guard must be simple in design and construction; in the case of a

machine safeguard it must afford easy access to the machine for the purpose of making adjustments, changes or lubrication. (Stereopticon slides were used by Mr. Adair to illustrate his points.)

CHAIRMAN WOLTZ: The real benefits of this morning's discussion will accrue after we have returned home and have had an opportunity to study and weigh carefully the various points presented. There is much to be said on both sides. For the small man, who has not the mechanical layout in his machine shops or the necessary engineering department, undoubtedly the commercial guard-maker is the man for him to see. For the larger employer, the man who has a competent engineering staff and a good mechanical force, it is probably just as cheap for him to make the guards himself. Guards should be made neatly and symmetrically—the psychology of it can be made just as effective with a homemade as with a commercial guard. I sincerely hope that we never again, even in the smallest shops, see some of the old homemade guards that those of us who were early in the game not only saw, but helped, to install—we did not know any better then.

A playlet is to be presented by the Detroit Safety Council and I think you will find it very interesting as it brings out some excellent points in safety work. It is entitled, "One Way and Another." (The playlet, in three acts, was produced. It showed the introduction and development of the safety committee idea in a factory, portraying the early discouragements, due to lack of interest, and ending with a model committee meeting. Copies of the complete play are obtainable from the National Safety Council, Chicago.)

CHAIRMAN WOLTZ: I cannot add anything to the appreciation you have shown for this very beautiful production. It was not only entertaining but highly instructive, and we have all learned something to our advantage that we can take home with us.

Automotive Section

August 29-30, 1922

A. L. KAEMS, Chairman

Safety Engineer, Simmons Company, Kenosha, Wis.

E. F. BLANK, Vice Chairman

Safety Director, Buick Motor Company, Flint, Mich.

M. K. AVERILL, Secretary

Insurance Manager, Dodge Brothers, Detroit, Mich.

TUESDAY MORNING SESSION

THE meeting was called to order by Chairman Kaems. After brief reports by the Chairman and the Secretary, the Chair appointed Robert Shaw, Theo Meisner and J. H. Goldie as a Nominating Committee. Mr. Hook was then introduced.

THE DOLLAR SIDE OF SAFETY

**CHARLES R. HOOK, VICE-PRESIDENT, AMERICAN ROLLING MILL COMPANY,
MIDDLETOWN, OHIO**

The human side of the safety problem is so great that we should not consider dollars when we talk about saving the lives or the health of the workers in industry. However, we are in business today to make money and, since that is the case, anything which is going to save loss and increase earnings is, necessarily, of great interest to executives. So I think you will agree that it is perfectly proper to present the dollar side of safety.

Regardless of our religious thoughts, our moral inclinations and our desire to follow either the rule of Confucious or Jesus Christ—regardless of all of these—when someone shows us a way to save money or protect our pocketbooks, it is human nature to sit up and take notice.

To present a lot of dry statistics would be uninteresting and of no particular value, but just to concentrate your minds on the size of this dollar question I will take the liberty of reading to you a few paragraphs from an article which appeared over my name in *The Nation's Business* last year.

ACCIDENTS COST SEVERAL BILLIONS A YEAR

Such incomplete figures as are available show that, in the aggregate, the savings possible to organize safety work amount to several billions of dollars annually. In one year there occurred, in all the industries of the United States, about 23,000 fatal accidents, 575,000 non-fatal accidents causing four weeks or more disability, and about 3,000,000 accidents causing at least one day's disability. These figures are from an estimate made by Frederick S. Crum, assistant statistician of the Prudential Life Insurance Company, and are based upon available statistics. The time lost, as the result of these accidents, may be computed as follows:

Actual lost time. 2,977,000 non-fatal accidents, 58,000,000 man-days. Loss of future earning power as a result of complete or partial permanent disability resulting from 115,000 accidents, included in the above, equivalent to 96,000,000 days. Loss of earning power resulting from 23,000 fatal accidents, equivalent to 118,000,000 days; a total of 292,000,000 days per annum. If we may assume an average wage of \$4.00 per day, this lost time represents a wage loss of \$1,168,000,000. From these we may subtract the actual cost of the subsistence of the men killed, based upon twenty years' average life of work, which may be placed at approximately 60 per cent of their wages, or about \$331,000,000. This leaves a net economic loss to the country of \$837,000,000 for the year.

You can go on, taking separate industries. For instance, if we were to take the statistics of the steel industry and actually figure out the economic loss per annum, the figure would be so astounding that you would not want to believe me. You would say: "There is another one of those hot air merchants that come around and talk about something with which they are not entirely familiar. He carries around a lot of statistics that nobody in particular can refute and yet they are not based on sound facts."

SAFETY COMMITTEES MUST HAVE SPIRIT, NOT FORM

I know from our own experience. I came up through the plant—I have been an operating man, a machinist; I have been a foreman, a general superintendent; I worked up to my present position, so that I know the problems of the operating man and I know just what it used to cost us as compared to what it costs us today. I say to you I know—I am not guessing at it—the tremendous cost in dollars to the industry with which I am connected, because of losses due to accidents, and I know what can be accomplished by a safety program in which the management is interested and which it backs up; in which the manager's department is interested and gives its support, and in which there is a conscientious interest on the part of the rank and file. I know the difference that can be accomplished by a program of that kind.

There are plants that have safety programs; they have safety engineers and have safety committees, but too often it is a matter of form and not of spirit. Many and many times you men, who are interested sincerely in the safety movement, no doubt have made use of the expression: "That a plant of careful men is far safer than a plant perfectly

safeguarded as far as mechanical devices is concerned, but in which there is no thought for safety." It seems to me that the problem which presents itself to us today is the same as that which presented itself to us in this city, I think, in 1915, when I made use of another expression that rather caused some comment and surprise. I was asked to give a talk on safety, with reference to the problems of the superintendent of a steel plant. After it was over I made this statement: That the biggest problem of the safety engineer today—then and today, I repeat it—is not so much the mechanical safeguarding of the plant as it is to sell the safety idea; to make men think safety all the time, from the time they come through the gates until they go out. You sell the idea to the organization and the organization will propose the mechanical safeguards which are necessary.

SAFETY MEANS ADDED PRODUCTION

Our safety engineer, Mr. Adair, is to give a talk on Thursday and he has illustrations explaining safety devices which have been gotten up by men on the job. One very interesting illustration will be a safety guard in connection with a saw. A great deal of thought has been given to the question of safeguarding saws, but in this particular instance, where the safeguard was worked out by men who did the operation, it is worked out far better than you or I could do it, because we are not familiar with the moves the men make. This shows that when you sell the idea to the organization, the mechanical side of it will come about as a natural course of events.

There are two sides to the question of dollars in connection with safety; that is, there are two kinds of safety. There is the saving which comes as a result of the reduction in actual expenditure of money to men for lost time, according to the several plans of State compensation; there is also that larger amount which can be, and is being, largely saved through increased production as the result of safe methods.

A few years ago I did not think the safety movement was a particularly good method of efficient production; I did not see the connection between the two. But the more information I secured and the more I studied the problem the more I am convinced that the efficient plan is the safe plan. Watch and study the proposition and see if that is not the case.

To illustrate that particular point I asked Mr. Adair to enumerate a few of the things which we have done. I am sorry that I am not in position to pick out, as illustrations, points which would be particularly clear to you men of the automobile industry, but I believe that illustrations which might be used in connection with the steel industry are illustrative of what can be accomplished in any other industry; the principle is the same. When you make a plant safe there is a psychology which begins to operate, which in turn secures for you increased production; because, instead of a man worrying about the next move he has to make—whether he is apt to get his finger too far in, or get in the way of something that is coming down—if the operation can be made more or less fool-proof he can go through with his movements without thought

of what accident might happen to him and his production will increase. We have innumerable instances of that kind.

DISORGANIZED WORKING FORCE COSTS MONEY

When you run on a piece-work basis that can be measured very accurately. In many other instances the actual saving is hard to compute, yet it is there. At our blast furnace, at Columbus, we changed the design of the mud gun, primarily to safeguard the workmen against hot metal, but in the accomplishing of this the time required to plug the cap hole has been greatly cut down. We have not figured out exactly how many dollars and cents per day we are saving, but I know we are saving a lot of money.

Another problem that gave us a great deal of trouble was that of buggies on the incline leading into our open hearth getting away and running down the incline, and in some cases running out to what is known as our east gate. I remember that one time we had a rather disastrous accident; a string of buggies got away and ran down the track into an engine that was standing further down the track. It knocked the engine off the track, bruised the engineer who was in the cab quite a little bit, and smashed things generally.

Such an accident not only causes loss of money, because of damage to the engine and cars, but injury to the workmen and compensation which you pay out as the result thereof. When an accident of that kind happens the men in the switching crews all talk about it and you will find gangs here and there saying: "John Jones is hurt. Did you hear about the buggies running off the track?" The men up in the open hearth are talking about it, too. They get together in little groups and waste a lot of time. If it were possible to figure out the actual dollars and cents that is lost from such an accident you would be astounded. That same thing happens in all kinds of plants.

MAKE SAFETY DEVICES FOOL-PROOF IF POSSIBLE

We put a bumper on the track so that after the cars passed up the incline, even if they did get away, they could only get so far. It works automatically and the bumper cannot be released until a man goes back, takes hold of a lever and turns the trigger down to release it. We had a good deal of discussion over that. I remember when we talked about it, the operating department or the engineering department sent me a recommendation that a rather costly installation be made. It is my recollection that installation cost us something like \$4,500—just that one safety device. There was a great deal of discussion as to whether this particular mechanism would work, and the first two or three designs that were presented, after a general conference, we considered would not work; but as the result of those discussions a tremendous amount of interest arose with reference to that particular point and the whole engineering department got to work on it. As a result a device has been worked out and installed and for two years we have had no maintenance at all on it.

The man who charges the machine—and that is one of the very important positions on the open-hearth floor—goes on with his work unconcerned about the buggies, because if he does happen to hit them and they should be knocked onto the incline and start down, he knows they are going to stop. His mind is free and the same is true with the men in front of the furnace, and as a result we have secured increased production.

I have not taken the time to have someone make an estimate as to the exact number of dollars and cents we have saved as the result thereof, but I know that the saving is very large. I know that installation, costing us possibly \$4,500 to \$5,000, has been a moneymaker; aside from the fact that it ought to have been put there to safeguard life and limb. I know that it has saved us money from two angles. It has saved us the money which would have been paid out as compensation to injured workmen, and it has saved us money by decreasing our costs through increased production.

I have four pages of illustrations which point out that, through the introduction of certain safety devices or the introduction of safer methods, we have both increased production and decreased our outgo for compensation. So I will say to you safety engineers here assembled that your job, from the standpoint of profit to your company, is a far bigger one than 90 per cent of our executives today realize. It is not because they do not appreciate the efforts of the safety engineer; it is simply because they have not had the time, possibly, to get into the subject from that side and realize what can be done in the way of increased production and decreased cost through safe methods and safe men, brought about through a proper safety program.

You say that it is easy enough to talk about these things, but has anything been accomplished that you can use as an illustration to show us that a safety program really does what you claim for it?

I would like to call your attention to this chart. (Indicating chart on wall.) There is the record for the years 1915 to 1921; the blue line shows the number of accidents per hundred men. The red line is actual days lost per hundred men. In 1915 we were just beginning our intensive safety campaign. In that year we put on a great many new men, as a result of war business. We started in a game we did not know anything about, the making of shells, the machining of shrapnel, etc., and as a result, coincident with the employment of a large number of new men, up shot our accidents.

NEW MEN IN PLANT OFTENEST INJURED

Just follow through 1915, 1916, 1917; it tells its own story. I could talk to you all day long and analyze it and tell you the various things that happened, but the chart tells the story. In 1918 we put on a lot more of new men. The government asked us to increase the production of shells very largely, and it meant, during a short period of time the introduction of a lot of new workers. That line on the chart illustrates most beautifully the contention that has been made time and time again.

that new men coming into a plant with which they are not familiar are a hazard which is not generally recognized. I present the chart and the facts. The figures have been kept very accurately and you can see what happened. Our biggest year, the year of our greatest production, was 1920. And just look how both those lines come down. It tells its own story.

We have another chart that illustrates the point that a lot of safety programs are merely formal; they have a safety engineer, appoint a lot of safety committees and then stop. The safety committee functions in a more or less haphazard manner. The safety engineer goes around looking for places to put on a guard, and he tries to talk to the foremen and get them interested—or the superintendent of the managers of departments. The safety spirit is not in that organization and if the spirit is not there you cannot produce a thoroughly efficient safety program.

There is a reason for the difference between these two records, which I am going to explain. We took over the plant that I am going to use as an illustration on the 1st of January of this year, and shortly after we took it over I asked the general manager what sort of a safety program he had. "Why," he said, "we have safety committees, but we have no safety engineer, because we are a small plant, comparably. We have a manager of the blast furnace department (there are only two blast furnaces), we have a manager at the steel works, we are running the blooming mill on day turns, we have only six open-hearth furnaces; that is the extent of the plant. The managers of the departments can watch these things pretty carefully themselves. We have a pretty good accident record."

PROGRAM MUST BE WELL THOUGHT OUT

I thought we would try that out; maybe they had a better plan than we did, so we began to keep a very accurate record of time lost through accidents at the Ashland works, after it came under our control, and we have been watching it pretty carefully ever since. They did have safety committees; I think the superintendents were really conscientiously trying to do what they could along safety lines, but, as I said, the program had not been well thought out. The spirit from top to bottom was not there; the plant was not thinking safety. It was a sort of sideline, not a headline, and a safety program must go along coincident with all the more important programs; it is one of the most important programs and it must be analyzed and watched by the executives, just as the cost sheet is analyzed and watched by the executives.

The executive must consult with and talk to department heads, general superintendents and general foremen with reference to these subjects, just as he does with respect to the other things that he has to take into consideration, if the plant is to be run in the proper way. Otherwise, the organization will not feel that the officers or the general manager is behind the program, and believe in it, and the organization from top to bottom must feel and understand and realize that every man is interested in safety and working for better accident protection.

This illustrates the whole situation. The lower two lines on the chart show our Middletown plant, where we have something like 4,000 men, and the hazard is really greater when you take into consideration the number of men and some of the processes in our finishing department in connection with the manufacture, for instance, of automobile sheets. These we manufacture in large quantities and some operations in connection therewith were formerly very hazardous. They have been studied and worked out so that now they are not hazardous. This is the result at Middletown, with over 4,000 men. [Indicating] This is the result at our Ashland plant, where we now have 1,200 men, but in the early part of the year not over 700 were employed. The yellow line represents the days lost per 100 men at our Ashland works. The black line shows the number of lost-time accidents, accidents per 100 men. That tells the story.

A PLANT MAN'S VIEW OF SAFETY

We are going to start not later than Oct. 1, and we are going after that thing hammer and tongs. I will tell you how we propose to do it. The general manager is going there and we will have a meeting of all the employees in the plant, telling them how we believe in safety. We believe in it from two angles. We believe in it because it is the human thing to do and we believe in it because—just cold-blooded, every-day business men—it is a profitable thing to believe in. A plant with a proper safety program is an efficient and profitable plant and we are going to bring that line [indicating] down. Mr. Fanning says. We are going to beat this line, which represents the Middletown plant. I hope he does. That is one of his problems.

I don't know whether you have ever heard the story of "Blue Vases." Get the little book some time and read it. We told the Ashland management there is a "blue vase" for them to hunt and they have got to find it. Next year, unless I am a bad guesser, they will either be down on the line with the Middletown record or they will be below it.

Take a truck driver, for instance, comparatively an unimportant man. We were discussing this only last Saturday in our plant. I had our employment manager and our works manager in my office, discussing some problems we have; we were discussing, too, some bonus and wage methods, and were talking about truck drivers. The employment manager said: "You think a truck driver is a comparatively unimportant man—he is, after he is broken in—but think what moves you have to make when you are breaking that man in. He is not a highly paid man, in a town of our size; his work is routine, but when that man is hurt and you have to break another man in, there are a number of problems to explain. For instance, when he is trucking a small lot of automobile sheets to the depot, that these sheets must be thoroughly braced so they won't slide, so they won't be scratched—you men up here have microscopes looking for scratches on automobile sheets, at least we think so. So we have got to watch that we don't have a scratch on them. A new man on a

truck might allow those sheets to shift and scratch half of them; then they would all come back to be replaced—a tremendous loss.

THROWING AWAY MONEY THROUGH UNSAFE METHODS

You have to teach him where to go to find his load; how he has to pack it; tell him where to go with it. It will take you a week. In the meantime, you may have lost two or three trips per day through that one man. I simply use that to illustrate the fact that an accident costs you a lot more money than you realize. The dollar side of safety is mighty important. Until we realize how much money we are throwing away as the result of unsafe methods and unsafe organization, we will go on throwing our money into the gutter. "Accidents will happen." How many times have you heard that expression! Accidents will not happen if we think, and if we plan to avoid them. There is no reason for accidents happening at the rate that they do and this chart illustrates the fact that accidents do not have to happen. But we have to think about them and think hard, and the whole organization has to be brought to the point where they not only think, but act safety.

DISCUSSION

CHAIRMAN KAEMS: I am sorry that all the plant managers could not be here today and have heard Mr. Hook drive home this thing of what ought to be done. A safe plant is an efficient plant; you cannot separate the two. In our rolling mill I took up this question with our superintendent and he told me that if for any reason, through an accident or breakdown, we stopped, it cost us \$1.20 a minute.

PRODUCTION INCREASED, ACCIDENTS DECREASED

This is what we have accomplished in our plant at Kenosha: Our lost-time in 1919 was 10.5 days per man per year. In 1920 I took hold of the work and we cut that to 3.90 days per man per year. Last year we cut it to 1.29 per man. We had one department—our most hazardous department—in 1919 that cut off twenty-four fingers. In 1920, the first six months, they cut off seven fingers, but that department has run since Aug. 2, 1920, to date, without a punch press accident and has increased production 50 per cent.

Yesterday a man who had attended our Boston meeting last year told me that when he returned home he had tried out some of the things that we had suggested and that by taking hold of the work in a sensible way they had increased their output—they make chains—from where a man was doing between 300 and 400 pieces per hour he was now doing 1,500 and doing it in a safe way.

In behalf of the Automotive Section I want to thank Mr. Hook for the splendid lesson that he brought to us.

MR. A. L. KROSS (Employees Mutual Liability Insurance Company): How do the men take it, when you say "safety is production?"

NEITHER SUBTERFUGE NOR CAMOUFLAGE

MR. HOOK: I can only answer your question by telling you what our policy is with respect to all things of that kind. We never permit the

word "welfare" to be used in connection with any publication of ours, or in any notice or talk or statement of any kind, because as such we do not believe in it. Every bit of work of this kind is economic, or it has no business in industry, and it is to be defended on that basis. It is my opinion that you get very much further with any group of men by being frank with them and putting your cards on the table, no matter what those cards say, than if in any way you try subterfuge or camouflage.

About eighteen years ago it was my privilege, being assistant general superintendent of what was then a rather small plant, to appoint our first advisory committee. They were elected by the men. Since that time the plan has grown so that now every department is represented by a group of men, elected by the men in that department, and when we have an important announcement, whether it be wages, safety, or anything else, the general manager makes it to that group.

Last Saturday night, for instance, we had a meeting at which I explained the general business situation and our position with reference to an advance in wages, effective Sept. 1. The whole situation was analyzed. The men were told how much per ton that was going to increase our cost. Once a year I take our financial statement and put it before them. Some of our directors were rather scared the first time I did so. "My Lord! That will be all over the street and there will be all sorts of rumors; the men will misunderstand it!" But thus far there has been no unfavorable reaction. I have yet to find the time when it has not paid to be absolutely frank and honest with every man in the plant.

CHAIRMAN KAEMS: We will now take up our next subject.

EYE INJURIES

HARRY GUILBERT, DIRECTOR OF SAFETY, PULLMAN COMPANY,
MICHIGAN CITY, IND.

I have spent a good deal of my time studying the subject of eye protection. I am not going to talk about eye injuries, but I do want to talk about why men do not wear goggles. You safety men in the audience, please raise your hands. I want to get an idea how many there are here. I want to ask you a question and what you are about to say is the truth and nothing but the truth, so help you God. How many of you men wear goggles, you safety men; come on, let us see the hands! How many of you wear goggles? I want to see who those hands belong to. One, two, three, four, five.

When I was given this subject I immediately got busy and wrote to some of the most prominent safety men. I wrote to all the old-timers and to Arthur Young, President of the Council. I said to him in brief: "Dear Arthur—I have been informed from a reliable source that you do not wear your goggles in the plant. Is it so?" He wrote back: "I must admit that I have not been wearing my goggles, but I give you my word that in the future I will." I wrote other prominent safety men and they all made some excuse.

WHEN IS A PLANT SAFE?

I have been in court on a great many occasions, defending cases for the company, and these technicalities came up, showing who shall and who shall not wear glasses. I say nobody is in a position to say who shall and who shall not; nobody knows. I could stand here a week enumerating ways in which men lose their eyes. Just lately, in a tour through the Western States, I spoke to a workman in one of the yards, asking how he lost his eye. He said: "At home; one of the youngsters threw a fork at me." I asked another man how he lost his eye. He said: "I got a hairpin it in."

"Of course, we are all human. I realize that, too. Foremen are human, workmen are human, safety men are human—and safety men make mistakes. But I contend, gentlemen, that one of the reasons men do not wear goggles is because other men, who are supposed to have more intelligence than they have, do not set the example.

The president, vice-president, superintendent, foremen, the safety man—all are made of the same material the men are made of. The little chips of steel are inanimate objects, they haven't any brains; it does not mean anything to the little chip of steel who is walking through the shop. No one knows what is a dangerous department and what is not a dangerous department. I don't care what kind of a department you are in, you are liable to lose an eye, and the chip of steel, not having brains or intelligence and flying across the room, is not going to stop because the president of the company is in the way. It would just as soon knock his eye out as John Slevinski's.

That is my argument regarding goggles. I could tell you all about the different objections the men have to wearing them. The main objection is the steaming up of the goggles, but it is not a logical argument. Why isn't it logical? Because one-eyed men wear goggles all the time; it is compulsory in our plant. If a one-eyed man can wear goggles all the time, why can't a two-eyed man?

ONE HUNDRED GLASS EYES SOLD EVERY MONTH

Goggles are no protection against the flight of rivets; a rivet will fly the length of this room and break a window. We had an accident a short time ago to a colored man. You know they are given thicker skulls by nature to protect them from the terrific heat in their native clime. This colored man's skull was fractured by a flying rivet. I know of one case where a rivet went through a man's goggles and knocked his eye out. Goggles are no protection against flying rivets. You must wear a mask for that class of work.

I heard of a dentist, a short time ago, losing his eye from a bit of grinding that came from a tooth while he was working on it. I know of a gardener who was pulling up weeds; a weed struck him in the eye, destroying the sight. I was playing baseball and had my glasses smashed and my nose broken a couple of years ago. There is even danger in hanging pictures.

I have spent some time with the different optical companies, and one day I asked to see the records of one such house. I wanted to find out how many glass eyes they sold in a year. I asked the man in charge and he said about 100 a month. He showed me the books and it was about as he stated. While there a man came in with one eye. "Pardon me, I said, "How did you lose your eye?" He answered: "I was getting on a street car and somebody banged the door; the glass flew and knocked my eye out."

Another man came in. "How did you lose your eye?" I asked. "I was hanging a picture at home and the nail flew back and knocked my eye out," he answered. The man's wife was with him and she had a glass eye, but I didn't have the nerve to ask her how she lost it.

YOU CAN'T SEE THROUGH A GLASS EYE

Chopping kindling wood in your own basement is sometimes dangerous. I have a pair of goggles in my basement. I have been struck in the face several times while cutting wood. Breaking coal sometimes results in loss of eyesight.

A VOICE: And hairpins.

MR. GUILBERT: Hairpins and feathers, too. I heard of a man who got a feather in his eye. I suppose we could overdo this proposition, but I don't think so, because, in my humble opinion, your sight is the most important thing you have. If you lose a leg you can get a good artificial one; you can get an artificial arm that you can do all kinds of fancy stunts with, and you can get a glass eye for about \$5.00, but you cannot see through it. In my experience in this work, for the last fifteen years, I have come to realize the number of men who have lost one or both eyes; it is absolutely preventable. There is no argument in God's green world, in my opinion, against goggles.

Goggles are practical, but men come in every day and say: "My goggles hurt me; I can't wear them." "How long did you wear them, Joe?" "Oh, a long while." "About how long?" "About an hour?" "An hour or a half hour, or maybe about five minutes." "Yes; I wore them about five minutes." "They hurt you?" "Yes." "When you buy a new hat it hurts you; it is kind of tight?" "Oh, yes." "What do you do; throw it away?" "Well, I get used to it." "When you buy a new pair of shoes, for a while they hurt you, but you don't throw the shoes away if they bother you. I am willing to suffer a little inconvenience until they are broken in to my feet or my feet are broken in to the shoes. That applies to goggles."

GIVE A MAN GOGGLES WHEN YOU GIVE HIM A JOB

About the distribution of goggles: A lot of men go into the plants and to their jobs before they have their goggles on. When they get their slip or their badge, they should get their goggles at that time and they should be fitted for them.

At our plant we fit all the men who have defective vision, and three out of every ten wear glasses; there ought to be seven out of ten, they say. We have prescription lenses put in their glasses and we pay the bill.

We have sixty-eight one-eyed men there; they require special glasses. Men with defective vision, like myself, need special goggles, but the most important thing, gentlemen, first, last and all the time, is that supervisors set the example—from the president down. If the president of my company is there, and I know it, and he goes around that plant without goggles on, that is my fault. Safety men should practice what they preach. They are made of the same clay as the workmen.

CHAIRMAN KAEMS: Mr. Guilbert has brought us a real message and what he has said hits hard. I am going to profit by it.

EVERY MAN IN PLANT WEARS GOGGLES

MR. A. C. CLARK (Dayton Engineering Laboratories Company): Mr. Guilbert, what method do you take to make your goggle wearing compulsory? Is it all through your shop, in every department, or just where the work is most hazardous?

MR. GUILBERT: In the foundry it is compulsory for the men who are pouring, chipping or grinding. There are other places in the plant where it should be compulsory, but is not.

MR. AVERILL (Oakland Motor Car Company, Pontiac): What do you do to overcome the trouble of goggles sweating in the foundry and what type of goggle do you use?

MR. GUILBERT: The men wear a hat band or a strip of cloth around the forehead to stop the sweat from dropping. A man comes in and says: "I can't see through these goggles." I take them off him and say: "Neither can I. Have you ever tried cleaning them; there is too much dirt on them." I have provided thousands of men with a little piece of soap. Rub it on both sides of the lens and wipe the goggles off; it helps materially.

INTEREST A MAN, DON'T HAMMER HIM

ROBERT A. SHAW (Ford Motor Company): Mr. Guilbert presented the topic very forcefully, but if any one of you will take his message back to the good common-sense manufacturer or production man, he will laugh at you. I am not here to say that we have not lost an eye in our plant—I think the record is one eye in two years. We have recommended goggles on shaping machines and for tool makers. We want a goggle to fit comfortably, because it does not do to force a rule with a hammer on the average individual. I would rather get him inoculated with the common-sense spirit; that goggles are good things to wear; I would rather have him use them of his own desire, than to force restrictions on him. In safety work we have to use common sense and consider efficiency. In other words, good common-sense safety, as we know it today.

CHAIRMAN KAEMS: We again thank Mr. Guilbert for his speech. I have had considerable trouble in our rolling mills trying to make the men wear goggles, and have had many say it cannot be done. I was invited last February to run over to Canada and I found a place that was much worse than ours to work in, but every man was wearing goggles. The man who managed it is here today and is going to tell you how he worked it. I want to introduce to you Mr. Kuechenmeister.

"WEAR GOGGLES OR BE FIRED"

MR. G. A. KUECHENMEISTER (Dominion Force & Stamping Company, Walkerville, Ont., Canada): I am going to tell the story of how we got the men in our plant to wear goggles. To start with, our aim was to put the wearing of goggles on the same level with any other shop regulation. We have a requirement that men must be on time; if they are not on time they are docked. We have a rule that a man must do a day's work; men who have not done so are now working elsewhere. We have a "no-smoking" rule, and we enforce it. It is compulsory for every man to wear goggles every moment of the time he is in our plant. We very frankly tell him that if he does not wear them one of two things will happen: "You may lose your eyes at any moment, and, second, you may be fired; we would rather fire you than have you lose your eyes."

I want to go back to the fall of 1917, when we first organized our safety department. The very first week it was in existence a man lost an eye. He was knocking a tool out of a piercing die; a hardened chip flew out and struck his eye. An investigation was made by the safety committee and at that time we made the statement that "unless we had a rule compelling the wearing of goggles, men would continue to lose their eyes." We were told at the time that such a rule could not be put in force and we did not get it. We continued to fight eye troubles, as most of you have, without a rule to back us up. We went along for two months and in gathering up our statistics we found our grinding department was sending what seemed a constant stream of men to the first-aid room; then to the doctor; then downtown. There is a path leading across a vacant field near the plant that it is said was started by men from the die-room going to the doctor. One day we sent for the foreman and showed him the number of accidents he was sending to the first-aid room and to the doctor; showed him how his department was losing time, and the amount of money, as near as we could compile it. We said: "You wear glasses and get all your men to wear them!" To the credit of that foreman, all through the war—when there was a scarcity of labor and men were hard to get—that man had little trouble keeping his grinding-room filled up and all his men wearing goggles. In two years' time only two men went to the doctor.

DEFECTIVE SIGHT CAUSE OF ACCIDENTS

Even with that record before us we were not convinced that we could put it across with every department in the place, so we kept running along. The next case we had was a die-sinker; he was hit by a chip from a shaper or a milling machine. This boy was one of our best safety boosters and we were surprised that he was not wearing his goggles. We asked him why he was not wearing them and he said: "I took them back to the tool crib yesterday and got my check." We asked why and he said: "The darn things gave me a headache." We answered: "All right, George. As soon as your eye is sufficiently well to be examined we will have the doctor examine your eyes and find out what is wrong." The

doctor found that he had been wearing improper goggles for the last ten years. We fitted him with special lenses and he has had no more trouble. But the things that has helped us most was when our manager's eyes weakened; his eyes went bad and he had to get reading glasses.

Our manager was convinced that men could learn to wear goggles and it made our problem considerably easier. We kept on with our stunts and pleadings, asking the men to wear them, and in time did convince a great many—so many that later on sentiment was with us. About a year ago one of our hammermen lost an eye. That very morning our superintendent came to the safety department and ordered us to put up a notice compelling men to wear goggles all the time in the hammer department.

"SHOULD HAVE BEEN DONE A LONG TIME AGO"

We considered seriously what sort of notice to put up. We did not want to come right out and say "You have got to wear goggles!" so we studied it for a day. We decided to post a notice calling attention to the hammerman that lost his eye, saying this man confessed that he had learned his lesson and in order to protect other men in the department from now on: "Rule No. 9 (our goggle rule) would be enforced by the foreman."

The notice went up shortly before noon one Saturday and I remember those of us who were interested had a very bad Saturday afternoon and Sunday; we worried about what would happen when the men came into the plant Monday morning and saw the notice. The rule said that any man who did not have goggles should go to the first-aid room. There were a few that did not have goggles and they said: "Hell, this should have been done a long time ago!" They were with us. We had their confidence and we knew we had the thing on the run.

One of our foremen had never worn goggles, he had worn big glasses, but he changed them for goggles, and the manager complimented him on it. "Well," he said, "I can't get my men to wear them unless I wear them myself." Three days later that man walked into my office and said: "Gus, if it is necessary for me to wear these ---- goggles I'll have to quit." "What's the matter?" I asked. "Why," he said, "they take the top of my head off with the headache; it is unbearable." "Bill, you are going to work in this plant and you are going to wear goggles," I said; "this rule won't be given up for any man in this shop. Do you know any eye specialist you would like to go to?" He answered: "Yes; there is one over in Detroit." He gave me the name and I called the doctor: "When can you examine this man's eyes?" "Eleven o'clock this morning." The foreman went over; about 2 o'clock he came back, smiling, and said: "I am going to have my glasses at 6 o'clock tonight." Up to that time he had suffered from headaches and at times, in the social activities of the shop, he could not participate because at the end of a day's work he was all in. From that time on he has changed considerably. If he ever forgets his glasses, he sends home for them. He wears them all the time. He should have been wearing them fourteen years ago, because at that time he had

his left eye injured and he should have had corrective glasses from that time on.

FOREMEN MUST SET GOOD EXAMPLE

We had another case, that of a young fellow on a steam roller who wore goggles, but every time you looked at him he had them on his forehead. It came to a question his wearing them or being fired and he finally said: "I can't wear them." He had not said a word before that. We sent him to the doctor and I wish you gentlemen could have seen him and heard what that boy said when he first put on the special lenses in my office. "Oh, gee! Everything looks different." Now he wears them.

At the time we put through the order we neglected to include the entire shop; the order said the hammer shop and we went along all last year without the machine shop being included. The first few months of 1922 we sent three men to the doctor and all of them came from the die-room. We called the foreman in and told him it was a matter of record; that some day the manager would take it up and he would get "bawled out." A few weeks later the manager saw the record and he called that foreman in. To this day I don't know what he told the foreman, but I know that fifteen minutes later there was a very satisfactory meeting in the personnel-room and the order went up to wear goggles. None of the men argued whether or not they were going to wear them; the question was "When are we going to wear them?" and the foreman said: "Wear them all the time." We told the men we were going all the way in fixing them up with goggles, and we have. We told the manager the medicine he gave that foreman worked so fine that it should be applied to the machine repair department; he gave word to do it and the order went through to wear goggles all the time.

Just a word about the method of handling goggles: When a new man comes in he is sent to the first-aid room and is fitted with a pair of goggles. He is told at that time not to bother about the little peculiar feeling around his nose, or around the back of his head, or the rubber strap, but if he has a real headache to come in and we would have him examined. We pay for the examination and furnish the frames; he pays for the lenses. We caution him never to return that pair of goggles to our first-aid room; we would tear up the receipt he signed when he first received his goggles. We have examined any number of men and only one came back with word from the optician that he did not need special lenses. He was licked and he confessed; he wore goggles as long as he was with us.

GOGGLES STOPPED A SIXTEEN-POUND SLEDGE

Objections? Yes, we have them. Men will come and tell you the goggles are too heavy. "No, they are not too heavy. They must be heavy," as we show him a goggle that stopped a sixteen-pound sledge—all the man got was a cut on the nose and a ring around the eyes. That pair of goggles, the very same day, convinced three men that the goggles are not too heavy; that they must be heavy.

Men say that they are too hot. We say, absolutely no. Goggles are the coolest things you ever put on your face; we have hammermen and

heaters and helpers out in the shop that will prove it to you. We have men over there that used to leave the plant at night with blood-shot eyes and in the morning, when they woke up, their eyes would be glued shut. These men will stand up in any meeting and swear that goggles are cool and that they are a protection, not only from injury, but from heat.

Steaming up? We had a big fellow working on an upsetter that said I was a fool; that I never worked a hammer; I didn't know what I was talking about; that the water and steam was blinding him; you would be continually wiping off your glasses; you can't wear them. That man's eyes went bad—not from an injury, just weakening. He went down, on his own account, and had his eyes examined; he came back wearing little gold-rimmed glasses. A few weeks before we put the goggle order through that man came to the office and asked how much we would charge him for a pair of goggle frames. We asked: "Why?" He said: "I have broken two of these gold things and I want a heavy frame." We gave him the frame; he put them on right there at that time and in the presence of the manager I asked him whether he had any difficulty wearing his goggles running the upsetter. He said: "No; if the oil or steam splashes them up, wipe them off."

The very first hot spell after we got the men wearing goggles a man came to the office. One of the foremen was there. This man had a pair of glasses, covered with perspiration and water. He said: "I can't wear these things!" I took a cloth and began wiping them. The foreman asked: "Did you come in here to have your goggles wiped?" He said: "No; I can't wear them." "Use a little glycerine soap on them," I suggested. The next day I asked how they worked and he said: "Fine!"

CHIP SHIELDS OFTEN EFFECTIVE

Our aim was to get the goggle rule working on an equal plane with every shop requirement and we have done it. You ask me if men wear goggles throughout the shop? Yes, they do; as they do everything else in the shop. I will be frank and tell you the truth; if our foremen and superintendents do not supervise production, it falls off; if we are not strict in keeping the men on time, they begin to drag in all hours of the day; if we slack up on the no-smoking rule they will begin sneaking a smoke here and there and pretty soon they will try to smoke while the machines are in operation. We have to watch that all the time, and that is what we have to do with our goggle problem, but we think our goggle problem is the most serious. In 1921 our entire compensation amounted to \$3,800; the eye injury that brought out that order cost us \$3,200. It is serious, and we think we have got it—if not entirely licked—pretty well under control.

MR. SHAW: The easiest way to get at the problem is put a pair of goggles on the individual, but my idea of preventing eye injuries to a certain extent, is to use other means. For instance, you can build little shields over a certain type of wheels or a certain type of lathes. There are certain places, on steady work, where glasses steam up and it is a hard problem to use them, successfully. Devices can be arranged (we are

experimenting with them) which will make it just as safe for the workman and it will do away with a pair of glasses for every man. I think that is something that safety men should work on. There are other ways of saving eyes than by goggles.

MR. CLARK: Do you employ an optician by the year and what do you do in the renewing of special lenses after they are fitted? Does the man pay for them individually or does the company stand any part of that expense?

MR. KUECHENMEISTER: We have an arrangement with the optician that we send the men to, but if the man wants to go to another optician he is allowed to do so.

MR. CLARK: Does the man pay cash or is he allowed to make some sort of credit arrangement?

MR. KUECHENMEISTER: The optician sends the bill to the man, through us; we guarantee payment of the lenses. The men pay a dollar a week, if they choose.

MR. CLARK: How about renewals?

MR. KUECHENMEISTER: The problem of renewals has just come up—whether we should pay or not. One department has that matter up with me now. I told the man to get new lenses and we would talk about it later. We have not decided, but I think we should pay for renewals.

WEAR SWEAT BANDS DURING HOT WEATHER

MR. LIETCH: (Continental Motors Company, Muskegon, Mich.): I would like to ask Mr. Kuechenmeister what, if any, provision they make for hammermen or heaters or helpers on large furnaces to keep the sweat from dripping down on their glasses. We tried to put the goggle rule into effect in our plant at Muskegon six months ago, but the perspiration befogged the goggles and much time was wasted in taking the goggles off and wiping them.

MR. KUECHENMEISTER: We sell them this little device for 10 cents. It consists of a strip, held in place by a rubber band. We have quite a run on sweat bands every time the weather gets hot. Some are washable and some you have to throw away.

MR. LIETCH: Is it compulsory for your diesinkers to wear goggles in is die work.

MR. KUECHENMEISTER: Yes; the rule says: "Wear them all the time." If they don't wear them they cheat and are subject to dismissal.

MR. CLARK: What is your work?

MR. KUECHENMEISTER: Drop forging; the only machine work we have is die work.

MR. FRED HAZEL (Maxwell Motor Company): Has the gentleman any statistics showing the relative cost of compensation compared to the cost of goggles?

MR. KUECHENMEISTER: I haven't any charts or statistics. One eye accident cost us \$3,200. We haven't paid out \$500 for goggles as yet.

MISS BURCH (Terre Haute Malleable Manufacturing Company): The question has arisen many times with us as to the distress of men wearing

goggles while pouring their heat, because of the radiation of the heat on the metal frame of the goggle. Does anyone have a special goggle that ought to be used during pouring?

CHAIRMAN KAEMS: We are pouring continuously in one of our departments and our people wear the cheapest kind of large glass goggle; they wear them all day long. We tried them with rubber bands, but they like the metal, which goes behind the ears better.

MISS BURCH: Many times we have to wrap the goggles of our furnace men (they are required to wear them) with adhesive tape, because in continuous work their faces are burned. I have seen their faces with red rings around the eyes because of the heat of the metal on the face. The Section then adjourned.

WEDNESDAY MORNING SESSION

THE meeting was called to order by Chairman A. L. Kaems.

CHAIRMAN KAEMS: Mr. Durham, who was to have spoken this morning is unable to be present, but he has sent a representative to take his place. I have great pleasure in introducing to you Mr. Boswell.

MR. FORREST W. BOSWELL (Director, Personal Service Department, Buick Motor Company): Mr. Durham wished me to express to the Congress his disappointment at being unable to be with you this morning. We think a lot of him in our organization because he is a real fellow. He has addressed the Congress on several occasions and you know the character of the work. Mr. Durham is tremendously interested in safety work, especially that of the Buick Motor Company.

SUPERVISION AND ITS RELATION TO ACCIDENT PREVENTION

FORREST W. BOSWELL, DIRECTOR, PERSONNEL SERVICE DEPARTMENT,
BUICK MOTOR COMPANY

Supervision and its relation to accident prevention—Webster defines the word supervision as "the act of overseeing; superintendence; oversight." The last term, oversight, is where the trouble usually begins; this definition is probably used by a good many executives in their interpretation of the meaning of the word "supervision." Too much "oversight" and not enough "insight" into things that occur in the plant, especially along safety lines, is the thing that usually happens.

What relation has supervision to accident prevention? Is not supervision in a sense the mother of accident prevention? Without adequate supervision on the part of the plant executives there can be no successful accident prevention.

Let us take, for example, supervision in production and determine, if possible, what definite relation we can establish between it and accident prevention. Production must be obtained at a minimum cost. In

order to do so all unnecessary expense must be eliminated, the superintendent and foreman spare no effort in producing the finished article with the least amount of scrap, fewest number of men and the lowest possible investment in machines and tools. Why is it they do not want scrap? Simply because it is an unnecessary expense of too many men and too expensive an equipment of machines and tools. How are these things detected? Do they just "pop up" in the limelight or is some one constantly watching for them? Most certainly someone is watching, and that is the part supervision plays in production. Frequently, the job is done under unsafe conditions and the workers lose fingers or are injured otherwise. Who is paying for these injuries? You say that this comes out of the overhead charge against that particular job or factory. But does it? That is part of the "unnecessary" expense and it is costing as much more to make that article as the amount of compensation you must pay to make it. Something is wrong. Your supervision is weak and somebody has been "seeing over" the job instead of "overseeing" it. You are constantly on the alert, looking for defective stock, scrap, inefficient operators, etc., because these are unnecessary expenses, but still you will permit a job to be run unsafely, knowing all the time that it is costing you money which could be saved by a little forethought on the part of your executives.

MR. SUPERINTENDENT: ARE YOU DOING THESE THINGS?

Likewise with the stock department. Stock is shipped to you and stored away in warehouses to protect it from exposure to the weather or against other losses, such as theft, fire or other damage. At the same time, has the proper precaution been exercised to protect the workers who handle this stock to see that they are free from injury? Do you instruct them to pile it safely? Do you tell them of the hazards connected with the handling of that particular kind of stock? If not, then you are not supervising the work properly, as accidents arising from the handling of stock are unnecessary expenses and can be eliminated as easily as machine accidents.

Let us go into the foundry. Here we see men rushing back and forth with hot metal, sand, flasks, etc., and every effort is being made to turn out the maximum tonnage possible. There are foremen here and there, assistant foremen, inspectors, time checkers, etc., to see that the complete operation is running smoothly. The metal must be hot enough, the sand must be of the proper consistency, the finished article must be O. K., and evidently they are producing the finished article at the minimum cost. Suddenly a man is seen going down the aisle holding his hand over his eye and someone remarks: "Some hot metal splashed in his eye and destroyed his sight!"

Was the supervision on that job linked up properly on a basis of safe production? Did the foreman produce the article as cheaply as he thought he was going to produce it? Did he compel his pourers to wear goggles? No! And what happened? The iron he poured that day did not cost what he figured it would cost, because there was added an unnecessary expense

to the operation—the loss of sight of an employee. Proper supervision would have made it possible to produce iron that day at a much lower cost than was obtained, and in addition a man's eyesight would have been saved. Supervision would have seen to it that those foundry men wore goggles, leggings and moulders' shoes, to protect them from the hazards incident to their labor. So it is through all of the plants. Supervision plays the role of the watchman constantly on the alert, eliminating needless unnecessary expenses.

RESULT OF 100 PER CENT SUPERVISION

As an example of the close relation between supervision and accident prevention I would like to cite the experience of the Buick Motor Company. Many of you have undoubtedly read the article which appeared in *The National Safety News* of May 24, 1920, telling of the remarkable record that was made by Buick Factory No. 12, in which this particular shop, during the first six months of 1919, cut off thirty fingers, but for the ten months following there was not one lost-finger accident. The working force averaged 750 men during this period. Three of these months were absolutely free of compensation payments. The first six months of 1919 the foreman in charge of the plant was very lax on supervision. To him a sheet-metal plant was a dangerous one and it was considered necessary to cut off a few fingers in the course of manufacturing the finished product. He was succeeded by another man in July of that year, and conditions in the plant were radically changed, as is shown by the remarkable record that was made; all this with very little guard work. The big feature was detailed instructions to the operators; in other words, *100 per cent supervision*. Later this same plant ran fifteen months without an amputation accident, showing that supervision can work the wonders of Aladdin's lamp if properly "rubbed." This same kind of supervision, as successful as it is in Buick No. 12, can be put into effect in any other type of plant with the same or possibly even better results.

Another example in our plant: You will pardon me for reference to the Buick, but these records look pretty good to us and I want to cite examples that I know are right. In 1920 twelve eyes were lost as a result of men working at hazardous occupations and not wearing the proper goggles. Memoranda was sent to all plant managers, with specifications for the goggles required on particular kinds of work, stating that goggles must be worn. Here supervision again played the all-important part, as is shown by the remarkable record made. In 1920 twelve eyes were lost; in 1921 five were lost, and in 1922, up to the present time, only one eye has been lost. Surely something was responsible for this remarkable reduction. The goggles were in the cribs, the men could have them free of charge; the Buick Motor Company furnished them wherever they were needed; the only thing left to do was for someone to see that they were worn.

EVERY PLANT IN ORGANIZATION ON SAFETY BASIS

Evidently, as the record shows, proper supervision prevented accidents, because goggles were worn according to specifications sent out, and

the wonderful result obtained. These are just a few examples to show what relation supervision is to accident prevention. Not only has the supervision in our plant been of this character in a few of the factories, but the same standard exists throughout the entire organization. To substantiate this statement the following figures are interesting:

	1920	1921	Per Cent Reduction
Number of lost time accidents.....	1671	767	..
Frequency rate—number accidents per million hours worked	40	31	22
Severity rate—number of days lost per 1,000 hours worked	2.65	0.92	64
Compensation cost, per employee.....	\$5.75	\$4.29	25

Following is a list of the permanent disabilities computed according to the National Standards:

	1920	1921
Number of fatalities.....	8	0
Number of eyes lost.....	12	5
Number of dismemberments.....	36	10
Total number permanent disabilities.....	56	15

This record showing a marked reduction in "severity" and "frequency" of accidents and the amount of "compensation per full-time worker" demonstrates the possibilities that exist along the line of supervision, for had it not been for supervision this remarkable showing could not have been made.

You are aware of the fact that 75 per cent of all accidents can be prevented through educational measures (supervision), while 25 per cent can be prevented by engineering revision and mechanical devices. Supervision also plays a part in this minority class of accidents, because it requires untiring efforts on the part of the foreman to see that all the appliances that are put on machines for the benefit of the men *are used*.

FOREMAN'S BONUS DEPENDS ON HIS SAFETY RECORD

Why do we try to eliminate this 75 per cent class of accidents? Because it is man's nature to constantly strive to improve his condition. For example, let us take the beaver and see wherein man differs from the animal kingdom. The beaver, although a very skillful mechanic, builds his dam today exactly as it was built thousands of years ago. There is no new way or sign of improvement. Likewise with the robin. The robin has, and always will, build its nest the same as it was built long ago. But this is not true of man. He is constantly endeavoring to better himself and his improvements are based on what his past experience has been. So by the use of statistics, which have been compiled for the past twelve years, showing that 75 per cent of all accidents can be prevented by supervision, we should endeavor to wipe out this class of accidents by exercising the proper supervision in all our work, day in and day out.

As a means of encouraging closer supervision along the line of safety practice and accident prevention, we adopted two distinct policies more than a year ago. One of these policies is as follows: .

Each unit comprising the Buick Motor Company, which now numbers forty separate units, is charged in its operating expenses with the full amount paid covering compensable cases in the given unit. This plan

has been called to the attention not only of the managers and superintendents of the respective units, but to the foremen as well. The result of such a policy is plainly apparent and needs no further comment than this. It has acted as an excellent stimulus in giving closer attention to the whole safety program.

The other policy is this (and this refers exclusively to the foremen): Before an award of bonus stock is made to any foreman there is taken into consideration that foreman's experience and practice along safety lines. A foreman might qualify for a bonus award in all other lines, but if it was shown that he was negligent and careless in observing safety practices and rules such an experience would militate against his chances of receiving the bonus award. This has also served as an effective spur to closer and more effective supervision along the lines of accident prevention.

AMERICA'S MATERIAL WEALTH MEANS TO END

In closing, I wish to express the thought of Mr. Arthur T. Morey, Past President of the National Safety Council and a pioneer in safety work. He said: "Our best resources are our men. The measure of our wealth is the extent of man's development under the opportunities America's institutions give him. Our best attainment is the emergence of everyone into man's estate. All America's material wealth is but a means—America's end is man as he ought to be. This being so, we cannot safeguard him too well." These words lead me to add the following:

Machine power is mighty, but man power is mightier. Therefore, it behooves us, first from a humanitarian standpoint, and second, as manufacturers, to conserve our manpower to the Nth degree. All our efforts along the lines of safeguarding life and limb and preventing lost-time accidents on the part of our manpower can be made tremendously effective by proper education and example on the part of our entire supervisory force. We consider this as casting bread upon the waters and, in the experience of the Buick, a mighty good investment.

REPORT OF NOMINATING COMMITTEE

CHAIRMAN KAEMS: The Nominating Committee is ready to report.

MR. SHAW: It has been customary, in this Section, to advance the Vice-Chairman to the chairmanship the following year. Therefore, Mr. Earl Blank, Safety Director, Buick Motor Company, Flint, Mich., is nominated as Chairman for the coming year; Mr. Theodore O. Meisner, Manager, Central District Safety Division, American Can Company, Vice-Chairman; Mr. L. E. Averill, Safety Engineer, Oakland Motor Car Company, Pontiac, Secretary.

CHAIRMAN KEAMS: Gentlemen, you have heard the recommendations of the Committee. What is your pleasure?

MR. SMITH: I move the recommendation be accepted.

[The motion was seconded and, on being put to a vote, unanimously adopted.]

GENERAL DISCUSSION

CHAIRMAN KAEMS: Mr. Boswell spoke about the wearing of goggles. We had to go so far, when we were enforcing that rule, that eighty men quit at one time. We let them go and they were out four or five days before they drifted back. We have no trouble today in our foundry with men not wearing goggles and I assure you that hardly a month passes but someone brings in a goggle with metal splashed on it—I have seen hot metal on the goggles sometimes as thick as a quarter of an inch. You can readily understand what that would have done to the eye. So it only goes to show what must be done and what supervision does. Someone must be behind the rule—someone that has his full thoughts and heart in the work if he is to get results. If the heads of departments are slack on that matter, how can you expect the men to be strong for it?

MR. R. S. BONSB: (Standard Oil Company): I would like to know exactly what supervisory methods are used at the Buick plants to make men wear goggles.

MR. BOSWELL: We found that our safety experience was not nearly satisfactory until the management was completely sold on the whole program of safety. When this was accomplished a memoranda was issued from the office of our president and general manager and from the office of our assistant general manager, Mr. Durham. Then our safety experience improved. As to the matter of goggles: Every man understands that unless he wears goggles he is subject to immediate dismissal. In the plant, as a whole, we have had a very pleasant experience. With some of our construction and maintenance men we have had a little difficulty. For instance, the rule required the holding of chisels with tongs; the men pooh-poohed the idea, and it was not until a man lost an eye—until the hazard came home to them—that we were able to sell them on such a program. But we made the rule mandatory and are enforcing it.

A VALUABLE MAN OBEYS THE RULES

MR. BONSB: If a very valuable employee does not wear his goggles, what do you do?

MR. BOSWELL: We give him another chance. If he is stubborn and persistent in not wearing goggles we let him go. If he is a valuable man we have a little tete-a-tete with him. Mr. Blank and Mr. Thalner, who has direct charge of that work, or one of their inspectors, have a little session with him—maybe call him into the office of the manager of that particular unit. Then, if he persists, it is "good-night."

CHAIRMAN KAEMS: You say he is a valuable man. Supposing he doesn't wear goggles and will not wear them, and was blinded—how much good would he do you then? I am sick and tired of hearing that he is a valuable man. He is not a valuable man if he won't do the things you want him to.

MR. BONSB: I am glad to hear you say that; I wish every manager in the United States would feel that way. If we could get them to do so our problem would be solved.

GOGGLES IN DROP FORGE DEPARTMENT

MR. R. F. THALNER (Buick Motor Company): Suppose this valuable man quits of his own accord; what do we do? We go out and look for another man. If he quits as the result of not wearing goggles, or is released, we can get a man just as easily to replace him as if the man quits of his own accord.

MR. E. L. LEITCH (Continental Motors, Muskegon): I have charge of the drop forge department of the Continental Motors. I would like to ask Mr. Boswell if compulsory wearing of goggles applies to the forge department. We tried to enforce the goggle rule and had one heck of a time. The men claim the goggles become fogged and production is decreased. But after hearing the addresses I am going back imbued with the idea of putting the thing across. If we could get suggestions along that line, how to handle a balky crew, we would appreciate it.

MR. E. F. BLANK (Buick Motor Company): We have not, in the drop forge department, put a compulsory rule on the hammer men and heaters as to the wearing of goggles. About 75 per cent of them wear goggles, through the insistence of the managers and superintendents. We have done everything we can to make it easy for them to wear goggles. We furnish, free of charge, a sweatband, like Mr. Kuechenmeister showed yesterday. It is made of felt, with an elastic band in the back, to keep perspiration from running onto the goggles and causing them to sweat up and become wet. It won't be long before everyone will be wearing goggles in that plant, because the fellows gradually are selling themselves on it. In the foundry, everyone that handles molten iron must wear goggles. The same is true in the chipping and grinding departments. There it is compulsory, as it is on spot welding and on all grinding operations.

SAFETY CODE FOR PUNCH PRESSES

CHAIRMAN KAEMS: The next question is the matter of a Safety Code for Punch Presses. As we all know, not only the Automotive Section is interested in this, but every user of punch presses. Different States have different laws and rules and regulations covering the subject. It has been the thought of the National Safety Council, and those who have the work in hand, to see if it were not possible to formulate rules by which all could be guided. A committee was appointed to draft a code and the result of their work will be discussed today. I will have Mr. Williams explain the idea.

S. J. WILLIAMS (Chief Engineer, National Safety Council, Chicago): You all know that quite a number of safety codes have been prepared or are being prepared, under the auspices of the American Engineering Standards Committee. The idea of this and all other safety codes is that they shall be on an absolutely representative and democratic basis. That is, all the interests that have anything to do with the particular subject—such as punch presses—shall come together, through properly appointed representatives, and jointly prepare a standard. When you once have a

national standard established, prepared in a fair and democratic way. the various States, insurance authorities and others, having to do with the enforcement of regulations on the subject, will naturally be inclined to use that standard as a model. They may not adopt all of it at one time, but they will gradually work toward it and be guided by it. In the industry itself, the companies that you gentlemen represent, even where you are not subject to any particular State regulation, you will have this standard as a guide.

CODE BASED ON INHERENT SAFETY METHODS

This particular code has been assigned to the sponsorship of the National Safety Council and after several meetings of the committee we have tentatively agreed upon a draft of the code. This has been printed and distributed in proof form. This draft represents, we believe, the best current practice and standards and is brought before the Congress because it is here that we can receive the most intelligent criticism and thorough discussion of its provisions.

The code rests on this basis: The best way to guard punch press operations is not to guard it at all, but to use safe methods of feeding, automatic or semi-automatic, as may be practicable. In a very large percentage of cases it is possible to employ safe methods of feeding; not always a full automatic feed, of course, but a slide feed, such as Mr. Kaems described to you last year; or various kinds of hand tools—pickers, tweezers, pliers and magnetic tools—such as are being used in many plants.

To make punch press operations safe we must first adopt one of these safe methods of feeding and removing the material, one which will not require the hand to be placed between the dies at any time; only in cases where such methods of feeding are impracticable shall dependence be placed upon any externally applied guard. There is no guard made that is as effective as the safe methods of feeding. Therefore, the code first takes up inherently safe methods of feeding, and specifies that they shall be used in all cases, wherever practicable; in cases where they are not practicable, one or another form of guard shall be used. Your committee found, from the very nature of the subject, that definite requirements, which could be written into a State law, are comparatively brief and general. You will find them in the code, but the main and important part, the things that will be of greatest value, if the code is to have any value at all, are not set forth in those definite requirements, such as might be written into a law, but in the discussion which follows. We have included a large number of illustrations of different methods of feeding and so on, which have been found to be practicable—there are so many different conditions in punch press work that you cannot specify any one way or any half dozen ways. You can show fifty or a hundred ways of meeting the problem and offer suggestion or recommendation. One may be useful because it will fit the particular work you have under consideration

(The code was then read and discussed. Only a few minor changes were suggested; most of these were later incorporated in the code. The discussion is not reproduced here because the completed code is now obtainable from the National Safety Council.)

The meeting then adjourned.

Joint Meeting of the Automotive, Drop Forge and Metals Sections

September 1, 1922

A. L. KAEMS, Chairman, Automotive Section,
Safety Engineer, The Simmons Company, Kenosha, Wis.

E. C. EVANS, Chairman, Drop Forge Section,
Wyman-Gordon Company, Worcester, Mass.

J. R. MULLIGAN, Chairman, Metals Section,
Safety Inspector, Bethlehem Steel Company, Bethlehem, Pa.

THE meeting was called to order by Mr. Kaems. Dr. L. A. Shoudy, Bethlehem Steel Company, delivered an extemporaneous address on "How the Plant Surgeon Can Help in Accident Prevention." (Through an unfortunate misunderstanding, Dr. Shoudy's address was not recorded by the reporter and as no record of it exists, it cannot be reproduced here.)

CHAIRMAN KAEMS: I have no words to express the appreciation of myself and our members for this splendid address of Dr. Shoudy. There is no doubt of what he said about the plant doctor being a necessity, and we owe it to our men to send them back to their homes in as good condition as we receive them.

Physical examination is coming sooner or later. I have two cases in mind. One was of a man working for us who received a slight stroke of paralysis, due to high blood pressure; had we examined him we could have done something for him. Another was that of a girl who lost a hand, due to epileptic fits. Had we examined her, we would have known what was wrong and the accident would not have occurred.

What the doctor said about Tony is absolutely true, and you men who have visited injured men all realize what kind words mean and what impression they make—not only upon Tony but upon Tony's family, when they know that someone is looking after them.

PHYSICAL EXAMINATIONS FOR OCCUPATIONAL DISEASE

MR. C. B. BARTLETT (Geuder, Paeschke & Frey Company, Milwaukee): As a production engineer, I am with the doctor; the factory first-aid room can be made a very vital factor in production. Incidentally, he touched on the movement towards compensation for occupational diseases. In Sep-

tember, 1920, occupational diseases were included and we have to pay compensation in Wisconsin, it being left to the Industrial Commission as to what an industrial disease is.

There are certain well-known diseases about which there is no argument, but here is the question: Whether you are pushing such laws, whether you are working them out or opposing them, I want to give you the experience of Wisconsin for whatever value you will get out of it.

At first no one was willing to take a definite stand on a definition of what an occupational disease was. As a result, when the first few cases came up they were put up to our insurance carriers for a decision. A doctor's job, primarily, is to take care of sick persons and assist them to get well, no matter what the cause. The Industrial Commission was a little fearful as to how far they ought to go; the net result was that in 1921, after a six-months' period, one-third of the total compensation we paid was on occupational diseases cases. I finally made up my mind that it was mighty poor business—it would have to be taken up some time—so I instructed the hospital that no occupational disease cases should be accepted, except through appeal to the commission or that did not specifically show itself as having been caused in our factory. Since that time occupational disease practically does not exist.

I would suggest that when such matters come up in territories in which you are located, it is very important that a definition be given as to what an industrial disease is. No one will dispute losses that are legitimately due to industrial diseases, but which ones are legitimate? That is the big question.

CHAIRMAN KAENS: We now have a case of neuritis and wasting of the nerve tissue before the commission. You can see how necessary it becomes for us in Wisconsin to get to physical examinations.

MR. A. W. BRADFIELD (Industrial Works, Bay City, Mich.): I would like to ask the doctor what percentage of sprained backs reported to the hospital would be considered traumatic in nature.

SEND MEN TO OWN DOCTOR

DR. SHOUDY: Only those that have a direct trauma. Of course, just as with industrial diseases, a great deal depends upon the state in which you are operating and the state of mind your board is in when you come before it. I know of one board you may go before where I don't think you will ever get away with a lame back as an accidental injury. When a man has a direct history of an accident—for instance, if he gets his feet knocked out from under him and he comes down hard—such things will give a direct trauma. Personally, I do not consider a man who stoops over and picks up something and complains of a lame back is entitled to compensation under any law in the United States.

MR. J. A. VOSS (Inland Steel Company, Indiana Harbor, Ind.): I would like to ask Dr. Shoudy how far he goes with his medical cases. Does he furnish first-aid treatment and then recommend a doctor, or does he continue to attend cases that are reported at the first-aid room at the plant?

DR. SHOUDY: That depends on circumstances. As a rule, where a man reports a minor sickness and needs to be kept in the hospital only a couple of hours, and then goes back on the job—something like diarrhea—we furnish the medicine. If the man is too ill to stay on the job, and we often have them coming in with a temperature of 103 and 104, we not only tell them to go home, but we put them in a machine and take them there. When he says he wants Dr. Smith (his doctor), we call him up and say: "We are sending one of your patients home." Only in those cases which, as human beings, we know are absolutely up against it financially, do we take care of personally. If I know a man in our plant is too poor to pay a doctor, and he is ill, he will be taken care of and nothing will be said about a bill.

CHAIRMAN KAEMS: We have as our next speaker, Mr. C. E. Ralston; he has a real subject.

HANDLING MATERIAL

CLARENCE E. RALSTON, EQUITABLE LIFE ASSURANCE SOCIETY OF THE UNITED STATES

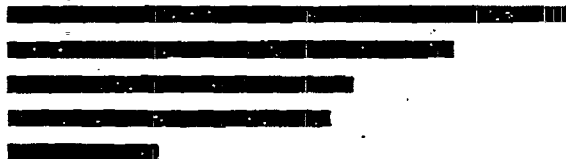
This subject quite naturally recalls to our minds the varied operations which have come under our observation during many years which have now passed into history. We can readily recall how we would pause in our own work and observe the actions of others, they being either so-called "unskilled labor" or mechanics of some special class. While watching the various operations, no doubt, there was a question in our minds: "Why is the work being done in that manner and not in some other?" The past twenty-five years have witnessed remarkable advances in the methods employed in carrying on various industrial operations. Of these none, perhaps, are more striking than those having to do with handling material.

One remembers the old days when great gangs of men were necessary for handling almost any kind of work, because labor-saving devices had not yet come into general use, nor were many of them perfected as we find them at the present time. Cars were loaded and unloaded by wheelbarrow gangs. Charging boxes, around furnaces, were loaded by hand. To "put over" a job it was of first importance to secure an adequate force of men; then followed the necessary hand equipment—just the

PERCENTAGE OF ACCIDENTS CHARGED TO HANDLING MATERIAL AS COMPARED WITH TOTAL ACCIDENTS

(The graphics which follow tables relate to subjects referred to therein and are designed to visualize percentages.)

YEAR	Company	Per Cent
1921	Bethlehem Steel..	48.00
1919	N. Y. C. R. R....	36.00
1921	Nat. Cash Reg....	26.00
....	Du Pont.....	25.00
'20 and '21	S. O. (Bayonne)...	10.00



STANDARD OIL COMPANY, BAYONNE REFINERY

Cost of accidents charged to handling material

YEAR	Total Accidents	Accidents Charged to Handling Material	Total Cost of Accidents	Cost of Accidents Charged to Handling Material
1920	184	18	\$12,996.43	\$437.39
1921	103	*10	10,962.38	*\$12.55

*44 per cent reduction, but 109 per cent increase in cost.

reverse of present methods, which gives first consideration to what equipment to use and then to the men who will operate it.

With the recollection of the large gangs of men we also recall the dark side of the picture, the frequent accidents among them. Many such accidents, causing serious injuries, are now considered preventable and entirely unwarranted. Lack of proper equipment was responsible for much wasted labor and a lack of proper interest on the part of supervisors was responsible for even a greater waste, through the methods used. Properly trained supervisors or trained men were not given much consideration and, in fact, in many cases, were never even thought of. The one consideration seemed to be to get the cheapest labor possible for such work, regardless of the nature of the material to be handled.

The two causes of waste were just as truly the causes of the many accidents which occurred, as has been clearly demonstrated where the accidents were carefully analyzed to determine the real cause. Where proper consideration has been given to these two causes the accidents have been greatly reduced and in some cases practically eliminated.

The old-time methods of handling work are fast going into the discard and, whether it be on construction work, from the excavation

JONES AND LAUGHLIN STEEL COMPANY, PITTSBURGH WORKS

Percentage of accidents charged to handling material, as compared with total accidents

YEAR	Total Accidents	Accidents Charged to Handling Material	Per Cent of Total Accidents
1919	17,603	6,661	38.00
1920	23,398	10,226	44.00
1921	5,854	2,294	39.00

Percentage of lost-time accidents charged to handling material, as compared with total lost-time accidents

YEAR	Total Lost-Time Accidents	Lost-Time Accidents Charged to Handling Material	Per Cent of Total Lost-Time Accidents
1919	512	157	31.00
1920	394	164	42.00
1921	140	56	40.00

JONES AND LAUGHLIN STEEL COMPANY, SOUTH SIDE WORKS
Percentage of accidents charged to handling material, as compared with total accidents

YEAR	Total Accidents	Accidents Charged to Handling Material	Per Cent of Total Accidents
1916	16,499	7,020	43.00
1917	19,859	8,568	43.00
1918	15,817	7,262	46.00

Percentage of lost-time accidents charged to handling material, as compared with total lost-time accidents

YEAR	Total Lost-Time Accidents	Lost-Time Accidents Charged to Handling Material	Per Cent of Total Lost-Time Accidents
1916	548	185	34.00
1917	520	187	36.00
1918	354	187	53.00

to the completed project, or the operations in various industries, from handling the raw materials to the shipment of the finished product; or the transportation of goods, from the loading to the delivery, we find wonderful progress in all lines. Conveyors and hoists have supplanted the wheelbarrow gangs, electric magnets have taken the place of the laborer in the scrapyard and around charging boxes, and power-operated trucks have replaced the old handtrucks. Numerous other mechanical and electrical appliances of like nature might be added to the list.

Consideration is now given not only to equipment for the safe and efficient handling of materials but to men and methods as well. With the consideration of methods comes first the trained worker, including both the supervisor and the man in the ranks.

Much of this great change is due to the natural growth and development of industry, but one of the most important factors has been the great safety movement.

WISCONSIN, 1920
Compensable injuries, analyzed by principal causes

CAUSE	Total Injuries
Handling objects.....	3,533
All machinery.....	3,437
Falls of persons.....	1,826
Metalworking machines..	1,340
Hand tools.....	1,267
Stepping on or striking against objects.....	1,127
Falling objects.....	1,063
Woodworking machines..	1,028

Note—A all causes under 800 injuries.

Compensable injuries analyzed by principal causes and medical costs

CAUSE	Medical Aid
All machinery.....	\$116,193
Handling objects.....	96,866
Falls of persons.....	91,165
Metalworking machines.	43,668
Hand tools.....	39,487
Woodworking machines.	34,384
Falling objects.....	34,275
Hoisting machines.....	25,839

This recalls to mind an instance during the world war which illustrates the point, particularly as it relates to one phase of transportation. The United States Transport West Indies called at the Mare Island navy yard, California, for a cargo of 12" x 12" timbers which was very much needed at the Norfolk navy yard on the Atlantic coast. The shipment was quite large—over 2,000,000 feet of timber—and orders had been issued to load the vessel with all possible speed, as each hour meant just

Compensable deaths analyzed by principal causes

CAUSE	*Estimated Days Lost
Falls of persons.....	156,000
All machinery.....	102,000
Hoisting machines.....	90,000
Falling objects.....	84,000
Handling objects.....	60,000
Woodworking machines.	30,000
Metalworking machines.	24,000
Hand tools.....	18,000

*6,000 days charged for one death.

that much delay in getting the timber where it was needed. The loading of a cargo vessel, with all the loose rigging with which such vessels are equipped, is no child's play, and shortly after the work was started a man was knocked overboard and severely injured. The investigation of the accident, which was made immediately, developed two glaring conditions—defective hooks on some of the rigging (although this was not the cause of the accident) and inadequate supervision, as all the hatches were being loaded at the same time. The defective hooks were replaced at once and a force of supervisors distributed over the deck of the vessel in order to observe the work at each hatch. There were no more accidents of any kind and the vessel was loaded and started on her voyage in record time.

A glance over the accident records of the state of Wisconsin for the year 1920 reveals some very interesting data concerning this matter. During that year there were 16,246 compensable injuries and of this number 3,533 or 21.7 per cent were charged to handling objects—more than those charged to any other cause. The severity classification of the in-

WISCONSIN, 1920
Compensable deaths, analyzed by principal causes

CAUSE	Deaths
Falls of persons.....	26
All machinery.....	17
Falling objects.....	14
Handling objects.....	10
Stepping on or striking against objects	5
Woodworking machines.	5
Metalworking machines.	4
Hand tools.....	3

juries places this cause as fifth in time lost, third in compensation cost and second in medical cost.

One large steel company reports handling material as the cause of 48 per cent of their accidents during the year 1921, while another holds it responsible for over 40 per cent of their accidents during the last six years. With these facts before us, I am sure we are all agreed that a concerted move must be made to eliminate accidents due to this cause. From personal experience I am fully convinced that the key to this problem will be found in the supervisor; he must first be taught to plan his work and then work his plan. Next must come the worker in the ranks, who must be taught to think as he works—not of some foreign subject but of his work—how and why he is doing it.

The supervisor is responsible for methods, the condition of equipment and at least part of the training of the worker. After planning his work, his next move should be the careful selection and placing of his workers. They should be placed according to both physical and mental

Eleventh Safety Congress

WISCONSIN, 1920

Compensable injuries, analysed by principal causes and severity

CAUSE	Total Days Lost
All machinery.....	754,752
Falls of persons.....	313,870
Metalworking machines.	254,878
Woodworking machines.	244,879
Handling objects.....	227,784
Hoisting machines.....	162,484
Falling objects.....	155,562
Hand tools.....	152,221

fitness as far as possible. Too much cannot be said of the importance of this part of the program, as a "misfit" will cause the failure of the most carefully developed plan—he is the weak link in the chain.

The training of workers can be done in several ways, in order to be complete and effective. The training by demonstration must be done through the supervisor on the job, while the training by illustration will come within the duties of the safety engineer or director. This latter training should be through the use of lantern slides and other pictures, showing very clearly how to do and how not to do the work. These pictures can be analyzed with the men in small groups and through such group meetings their personal interest will be aroused and held. This method was used at the Mare Island navy yard during the war and I am convinced was a big factor in enabling us to reduce the accident rate 86 per cent in the face of a 116 per cent increase in force, and this during a sixteen-month period. Such training will not only decrease the accidents but will greatly increase the efficiency of all concerned—thus giving us a three-fold profit from safety work: Lessened waste through accidents and compensation costs, increased production, and lessened costs of production.

WISCONSIN, 1920

Compensable injuries, analyzed by principal causes and compensation costs

CAUSE	Compensation
All machinery.....	\$524,186
Falls of persons.....	250,984
Handling objects.....	207,936
Metalworking machines.	171,814
Woodworking machines.	162,874
Hand tools.....	129,957
Hoisting machines.....	118,070
Falling objects.....	117,620

Careful training of men along these lines will gradually bring them to that understanding which is so much to be desired in industry—that they are working with their employer and supervisor to accomplish that which society expects of them and not working for the employer or supervisor. The supervisor must be made to realize that he is the personal representative of the employer and that it is his duty to see that the working conditions are safe. He must also realize that losses through accidents are an indication of his inefficiency and that the workers must be protected even better than the equipment, which can be replaced without any physical suffering. It is not to be supposed that he will personally inspect all equipment and conditions, but he should select competent men for this purpose.

DISCUSSION

MR. E. J. REEDER (Lansing, Mich.): One of the big factors in accident prevention, in material handling, is the fact that the work is usually, and needs to be, split into sections. Someone handles the material and transports it, and then someone else takes it for some other reason. The one party who handles it forgets the safety of the next, who is to take it beyond that point. That is one of the things that must be supervised particularly—one of the hazards that has to be watched out for. Get each foreman who has charge of any part of the work to realize that when stock goes to the next department for handling, it should be deposited by him in a position and in such a way that when the other party takes it it is going to be handled in safety.

The speaker made a very good point when he said that supervision was one of the big and important things in the accident-prevention problem. I am very confident that it can be solved. If you will pardon a personal experience, it was my privilege and pleasure to take up the work in a certain plant that up to that time had a very large number of compensable accidents occurring from stock handling and piling and allied hazards. We made an analysis to find out what the difficulty really was, and began a campaign to overcome it. We found it quite easy to do this by getting to the foremen of the various departments who had any contact with the problem—the fundamental principles that were involved in it. We did not tell him how to file such and such a parcel of stock or how to handle it in a certain way. We told him some of the fundamental principles and some of the things we thought ought eventually to be accomplished; the details were worked out by him. During the first three of the twelve months' period we had more compensable cases from material handling than we had during all the rest of the period; likewise the same in the amount of total compensation cost.

MR. J. A. NORTHWOOD (Cambria Steel Company): I would like to ask for information whether there is any one here today who is doing anything in the way of showing pictures of proper, safe ways of handling material during the meal hour, and if so, how they are handling it? I know it was done during the war in the shipyards, but the question is whether it is being done now on the company's time.

LECTURES AND PICTURES FOR WORKMEN

MR. R. A. SHAW (Ford Motor Company): We show moving pictures to the men after eight hours of work. That really does not answer your question, but I would not approve of showing them during the eight-hour shift. We take 500 men at a time and try to sell the idea so that they will attend; so far we are interesting 420 out of 500. They get tickets from the foreman and he checks their attendance. If the man does not go to the meeting that night, he must go the next. If you don't do that you will have out about 2,000 tickets with only 500 men attending.

MR. NORTHWOOD: Is that immediately after the shift?

MR. SHAW: After the day's shift. We generally cut the meetings pretty short and get the meat of the question, because the men are in their working clothes and we realize we are taking their time. We try to make it as short as possible.

MR. J. A. AYRES (National Tube Company): We have several thousand feet of reels in moving pictures, including safe practices in the handling of material. We also have a monthly meeting for the presentation of a picture of unsafe methods—we could not get an auditorium of sufficient size to take in the entire plant. We issue tickets to a group of about 1,400 employees. The tickets are numbered serially and are allotted proportionately to the departments. The superintendents distribute them and take the individual names. After the performance the tickets are taken up and it is my duty to show which department had 100 per cent of attendance. About 150 tickets are not turned in on an average. The foreman asks the workman: "Why did you not go there; there are others here who would like to go, if you don't want to." We have pictures and light entertainment.

MR. J. H. LA MONTAGUE (Union Carbide Company, Sault Ste. Marie, Mich.): We have slides made of safe and unsafe methods and half an hour before the shift goes off we get the men in our moving-picture room. We bring the time cards up and as the men go out they are handed their cards. If they are not there they get no time. That is on the eight-hour shift; we do the same thing on the nine-hour shift. We have about 400 men in the plant.

CHAIRMAN KAEMS: I know many of you will be interested in acetylene welding; we have one here who is nationally known on this subject. I have the pleasure of introducing Mr. H. S. Smith.

SAFE PRACTICES IN ACETYLENE AND
OXYGEN WELDING

H. S. SMITH, PREST-O-LITE COMPANY, NEW YORK CITY

So many papers have been written on the subject of "Safe Practices in Oxy-Acetylene Welding," so many rules promulgated, that I am afraid it will be difficult for me to tell you anything new, or make new suggestions which will tend to eliminate accidents in the welding industry.

As matters now stand the record of the oxy-acetylene industry is a wonderfully good one and the number of accidents that occur are really infinitesimal when one takes time to consider the exceedingly rapid growth of the process and the enormous extent to which it is now employed. I do not think it is possible today to cite a single industry in some of the ramifications of which oxy-acetylene welding is not employed.

There have been some serious accidents in which oxy-acetylene has been involved, but practically in every case such accidents would have been avoided if common sense had been used and if the recommendations made by the National Safety Council in their Safe Practices Pamphlet No. 23 had been followed. I may talk to you in somewhat different language, but I really cannot give you any better advice or recommendations than those outlined in this pamphlet. I would like to suggest to you members who employ oxy-acetylene welding in your plants that you make a point of seeing that all your foremen and all your welders have copies of Safe Practices No. 23 in their possession, and that they be given to understand the importance of carefully reading it and following the instructions in their daily work. I may suggest further that you make a point of reading and digesting this bulletin yourselves, so that when you are going through your own plants you may make observations as to the welding work going on and be in a position to judge whether safe practices are being followed. One of the troubles the oxy-acetylene industry has had to contend with in the past has been that the heads of the establishments have not appreciated the importance of their welding work; consequently, they have not personally taken the trouble to learn much about it, but have left matters relating to it entirely in the hands of subordinates, without first assuring themselves that the subordinates delegated to look after the work knew sufficient about it, and without making sure that the right sort of equipment was being employed, properly installed and safely operated.

WHEN PURCHASING EQUIPMENT

I will endeavor to give you a few suggestions which might help to steer you clear from trouble and accidents. Before you can use oxy-acetylene welding you have to purchase equipment and in order to safeguard yourselves right at the start your purchasing agent should specify acetylene generators, blowpipes, regulators and other apparatus in strict conformance with such types as are officially recognized and approved in the list of inspected mechanical appliances published by the Underwriters Laboratories of Chicago. Likewise, when he is purchasing supplies of oxygen and acetylene in cylinders, he should call for the gases to be supplied in cylinders that are manufactured according to the specifications of the Interstate Commerce Commission and that are marked as signifying that they so comply. The purchase specifications for calcium carbide, from which the acetylene is made, should call for the drums or packages to be made of metal, of sufficient strength to enable

them to be handled without rupture, and should call for the drums to be provided with a screw top or its equivalent.

Having purchased the necessary equipment and supplies, it is necessary to see that the supplies are properly stored and the equipment properly installed. In this connection there are two points that should be carefully observed when you first adopt the welding process:

First—Secure a copy of the rules of the National Board of Fire Underwriters covering the installation and operation of acetylene equipment and make sure that these rules are followed when your plant is installed. This will assure you of employing the best practice that is known today.

Second—Follow very closely the instructions which are supplied you by the manufacturers of the acetylene generator or other equipment to be installed.

STORE ONLY IN DRY, WELL-VENTILATED PLACES

I will deal briefly with the storage of your supplies of calcium carbide, compressed acetylene and compressed oxygen. Certain cities and municipalities have regulations prescribing where and how and how much of these commodities shall be stored and when such is the case a copy of the local regulations should be secured and followed closely. As a matter of fact, it will generally be found that these local regulations are almost identical with the regulations of the National Board of Fire Underwriters.

Calcium carbide does not constitute a fire hazard, but when brought in contact with water, acetylene is generated, and acetylene is an inflammable gas. Therefore, calcium carbide should be stored only in dry and well-ventilated places. Many users store their calcium carbide in the same building or compartment in which their acetylene generator is housed. When the calcium carbide is stored in the same compartment with the acetylene generator the carbide should be placed on a platform at least six inches higher than the main floor level, so as to keep the drums clear of any water that might get on the floor when the generator is being flushed or when the floor is being washed. It is always essential to see that drums, the contents of which have been partly used, have their screw cover put back after a part of the carbide has been removed from the drum. Otherwise moist air will attack the carbide in the open drum and generate acetylene gas which might accumulate in the premises.

It should be appreciated that no matter whether calcium carbide is stored in a separate building or in an acetylene generator house, the location should only be illuminated with incandescent electric lights, which should be properly guarded so as to prevent the globes from being broken by accident; all switches should be outside the building, as should other spark-emitting devices, including the telephone. In cases where calcium carbide is stored in large quantities, and a separate building or compartment is used for this purpose only, it is desirable, where feasible, to have the floor of the building level with the floors of

railway cars and trucks. This will facilitate unloading and prevent a certain amount of damage being done to the drums, which frequently occurs through rough handling when the drums have to be lowered to the ground from a car or truck. When unloading calcium carbide, received from the shipper, any drum that has been damaged in transit to the extent that a hole has been made in it should be set to one side for immediate use, or the contents should be transferred to another package. This would show that it is desirable to keep on hand a few empty packages for such emergency use.

HANDLING AND STORAGE OF CYLINDERS

In the matter of storage of cylinders of compressed oxygen and compressed acetylene: It is bad practice to have these stored and located indiscriminately around your premises. Where compressed gases are used you will naturally have to have a cylinder of oxygen and a cylinder of acetylene at each point where the welding work is being carried on, but cylinders on hand in excess of those in actual use should be properly and methodically stored.

With regard to the acetylene cylinders, it is considered good practice to store these in the room or building employed also for the storage of calcium carbide, but the storage space should be used for no other purpose except the storing of calcium carbide and cylinders of compressed acetylene. If the room or location in which the acetylene cylinders are stored is artificially heated the cylinders should not be located close to the regulators. It will be noted that there is no need to heat the locations in which calcium carbide or compressed acetylene are stored.

Acetylene cylinders, when being unloaded for storage, should be handled carefully. In the case of carbide it is desirable, where possible, at the warehouse in which the acetylene is to be stored, to have the floor level with car and truck floors, but naturally this is only possible in establishments having their own car sidings.

Always insist that workmen employed in unloading cylinders of acetylene for storage exercise care in lowering the cylinders from the truck or car to the ground. Workmen get careless on this job and it frequently occurs that cylinders are dropped from truck or car floors to the ground, sometimes onto concrete. The cylinders are very strong and will stand an enormous amount of abuse, but it should be appreciated that they have pressure in them and that there are of necessity safety fittings which project from the surfaces of the cylinders. Many acetylene cylinders have fuse plugs located in their bottoms. These plugs are protected by a band, which prevents their striking or coming in contact with the floor when the cylinder is properly and sanely handled; but, nevertheless, they can be damaged if the cylinder is dropped from a height, so as to cause the protecting band to be driven off the shell, or if it is dropped onto a rough surface. If one of the fuse plugs is broken off or loosened gas will escape from the cylinders and may be ignited.

Oxygen cylinders can be safely and properly stored in your regular plant stock or supply rooms. However, they should not be stored close

to radiators or adjacent to combustible material. Above all things, be sure that they are not stored adjacent to oil or grease. If a warehouse is provided for the storage of oxygen, compressed acetylene and calcium carbide, the calcium carbide and acetylene may be properly stored in the same compartment, but oxygen should never be stored in the same compartment that acetylene is stored in. The reason for making this recommendation is as follows:

SPECIAL TYPE OF STOREROOMS

Suppose for some reason or other there was a fire in the building, the fuse plugs in the acetylene cylinders would melt at a comparatively low temperature, would release the gas from the cylinders, and the acetylene would be ignited. The heat from the burning acetylene would cause the pressure in the oxygen cylinders to increase and build up to a point where the frangible bursting discs, which are generally employed as the safety devices in oxygen cylinders, would be released, with the result that oxygen also would escape, and you can imagine what a terrific heat and blaze there would be with thousands of cubic feet of acetylene combining with pure oxygen in the same room.

Let me deal briefly now with the installation of the various equipment that may be employed: There is one of three things to do with the acetylene generator—it can be housed in a separate building, away from other buildings; it can be housed in a lean-to building or shed adjoining your plant; or it can be installed inside one of your plant buildings. A separate, isolated gashouse is the ideal method, especially so if you go to the expense of having a substantial structure with floors at truck-floor level and divide the building into three or four compartments, using one section for housing the acetylene generator, one or two sections for the housing of calcium carbide and acetylene cylinders, and another section for the storage of oxygen cylinders. The isolated generator, carbide and gas storage warehouse need not necessarily be of fireproof construction, although such construction is preferable. In the case where it is decided to house the acetylene generator in a building which is a lean-to to your main plant, it should be separated from such plant building by an unpierced fire wall.

Where it is decided to house the generator inside one of the plant buildings it is important to be sure that your insurance companies do not object, and also to see that you are not breaking some local ordinance. However, if such is not the case and you are housing the generator inside, a special compartment or room must be constructed, and such compartment should be built of non-combustible material. The door to such a compartment should preferably open to the outside, but if it does open into the main building or shop the door should be of the fire, self-closing type. You will readily appreciate, however, that it is far more desirable to have the door open to the outside; then, if there is any leak of gas, there is no chance for the gas to escape through the door into the main building or shop, with the possibility of being ignited by some heat or spark-emitting device.

I am of the opinion that acetylene generators should not be installed inside buildings where the building is more than one story in height, except in the case of a special generator house provided with two floors, when the second floor is sometimes used for the storage of a supply of carbide and for charging the generator.

Be sure to see that the generator stands on a substantial and firm foundation. I have known of cases where generators were put up on a flimsy foundation, which were later undermined by the water discharged from the generator and, as a result, the generators canted over and broke off certain piping connections, causing serious trouble.

LOCATE SWITCHES OUTSIDE BUILDING

A generator room must be protected from freezing. This is most important. Freezing up of acetylene generators is the cause of 50 per cent of the accidents that have happened with them. One should never attempt to lower the freezing point of the water by using calcium chloride in an attempt to do away with the necessity of heating, for the reason that the calcium chloride not only tends to corrode the generator itself, but will gradually permeate the whole piping system and cause serious trouble.

Generator houses should be provided with plenty of daylight illumination and plenty of head room. It must necessarily be well ventilated and also be provided with good and sufficient artificial illumination. This must necessarily be of the incandescent electric type, with globes properly protected and with switches outside the building. Certain existing rules call for acetylene generators to be charged during daylight hours only, but such rules are today obsolete and cannot be complied with for the reason that many generators are in constant use, and during the winter months it is necessary to charge in other than daylight hours. For this reason it is essential that the artificial illumination be good.

One would think today that any workman who could get a job would be educated sufficiently to know that you can't bring a naked flame in contact with a combustible gas without getting ignition or explosion, yet a considerable percentage of the accidents that have occurred with acetylene generators have been caused by this very thing. It is for this reason that I strongly recommend good natural and artificial illumination in the generator house, so that there will be no possible inducement for the thoughtless workman to strike a match or use a lantern when examining the generator.

The instructions furnished by the manufacturers of acetylene generators for the installation of their machines should be followed closely and it is advisable, when at all possible, to have the manufacturer install the machine and put it in operation.

INSTALLATION OF PIPING

I think it is quite unnecessary to say anything about the installation of acetylene gas piping beyond stating that it should be of ample size to meet the estimated maximum demand and should be installed according

to the requirements of the National Board of Underwriters. I venture to suggest that if you who have acetylene installations would secure a copy of the National Board of Fire Underwriters' rules and would, on your return home, peruse these rules and observe whether your installations comply with them or not, quite a number would find that the National Fire Underwriters' rules were not followed when your installations were made. It should be appreciated that National Board rules are recommended and drawn up by the National Fire Protection Association, a body that has always made a point of consulting with the industry when preparing rules. Possibly it can be said that National Board rules are the rules recommended by the acetylene industry. You will find amongst the National Board Installation rules, rules calling for escape and relief pipes to be carried outside of buildings. I have personally inspected numerous installations where no attention was paid to this rule and safety devices, if they were called upon to operate, discharged their gas inside of the buildings. This was asking for trouble.

A considerable number of the acetylene generators in use today for supplying gas to shop piping systems deliver the gas to the piping system at pressures up to fifteen pounds per square inch. It is, therefore, necessary to have the piping systems tested after installation at a good deal higher pressure than is commonly employed for testing out city gas piping systems.

Let us now deal with the installation of the oxygen supply: In the majority of cases oxygen is used direct from a standard oxygen cylinder, a separate cylinder being used for each welding station or blowpipe in use. In some instances, however, a number of oxygen cylinders are manifolded together, the gas being supplied to the shops through a system of piping. In rare cases oxygen is manufactured on the premises, the gas being first collected in a gas holder and then compressed in a receiver to a pressure of a few hundred pounds, after which it is passed through a regulator and supplied to the welding stations through a system of shop piping.

MANIFOLDS OF OXYGEN CYLINDERS

In systems where it is desired to manifold a number of oxygen cylinders and supply gas to welding stations, it is extremely desirable that the necessary manifolds be purchased from a responsible apparatus manufacturer or be made up to their specifications. Every care possible must be taken with the installation of the oxygen piping system. It should be appreciated that oxygen, when supplied in cylinders, is under a pressure of approximately 2,000 pounds per square inch and, consequently, oxygen manifolds must be sufficiently strong to withstand this pressure. It must be borne in mind also that no combustible material should be employed in making up the manifolds, for the reason that oxygen under pressure is liable to cause a spontaneous combustion of such material.

When assembling the manifolds and the piping system, great care must be taken to see that fittings, etc., are handled with clean hands.

Grease on a joint or in the interior of the piping might cause serious trouble. The interior of the piping must be clear of all scale and rust, and should be thoroughly washed out with caustic soda before being put in service.

It is needless for me to talk at all about the actual setting up of welding apparatus, beyond saying that the manufacturer's instructions should be followed to the letter.

In those installations where both gases, oxygen and acetylene, are supplied from a single cylinder of each gas, the cylinders should be so located that they cannot be knocked over or struck by passing traffic. In most cases, where the individual cylinders are employed, it is the best practice to have both cylinders mounted on a truck, so that they can be conveniently transported from point to point.

OPERATION AND CARE OF GENERATORS

Now a few words about the operation and manipulation of the generators and other equipment.

When starting up an acetylene generator the first time, the instructions of the manufacturer must be followed in detail. Where possible it is extremely desirable that the acetylene generator manufacturer should not only install the machine but should put it in operation. After the generator is charged with water and carbide a connection should be made at the extreme end of the piping system, so that the gas can be discharged from that point to the open air. It is most important, before starting to use the gas for welding, to make sure that all air has been purged from the generator and the piping system. Some common sense has to be used to judge when this has been accomplished, but in the average installation the decomposition of ten to fifteen pounds of carbide will have generated sufficient gas to expel all air from the generator and pipe lines. You may possibly wonder why this is so important and I will therefore endeavor to explain to you.

Under normal and proper working conditions, the pressure of the acetylene gas in your pipe lines and generator will never exceed fifteen pounds per square inch. Pure acetylene gas (that is, acetylene without any air mixture) at any pressure below fifteen pounds per square inch is non-explosive. It is possible to fill an empty cylinder with pure acetylene at a pressure of fifteen pounds per square inch, fit the cylinder with a spark plug and make a spark and there will be absolutely no ignition of the acetylene, but if there is a small percentage of air present there will be a violent explosion.

If the same cylinder were filled with acetylene at thirty pounds pressure, and there was no air present and the spark plug was sparked, there would be a violent explosion. The action of acetylene under pressure between fifteen and thirty pounds per square inch is somewhat uncertain, but all the best authorities have definitely decided that acetylene should never be used in a free state at a pressure in excess of fifteen pounds per square inch.

Let us assume that you failed to purge your pipe lines of air, or mixtures of air and acetylene, and were to light a blowpipe that is supplied with gas from the pipe line, and then suppose that the blowpipe backfired—it would be possible for the backfire to propagate right through the piping system up to the flashback or hydraulic seal, which is necessarily attached to the discharge outlet of all generators. This backfire along the piping system might be of sufficient violence to split the pipe or loosen the joints. I have known cases where, while the generator was being purged, a cap at the end of the piping system has been removed and a match applied, under the idea that as soon as the discharge from the pipe would ignite it would show that all air had been driven out of the pipe. In such cases, of course, an accident has generally occurred, the mixture of gas and air discharging from the pipe having ignited, and owing to the orifice being large and the velocity of the gas and air comparatively low, ignition has propagated throughout the piping system.

UNINSTRUCTED WORKMEN MAY CAUSE EXPLOSION

It is always desirable to have two workmen trained to properly operate the acetylene generator. If you only have one man in your employ who knows how to operate the generator, and he should be sick or absent from some other cause, you are liable to permit a man who knows absolutely nothing about the operation of the generator to attend to it, and possibly with serious results, and the chances are that your foreman, or even you, yourself, don't know enough about the generator to tell an unskilled man how to operate it or to judge whether he is operating it properly.

In the recharging of acetylene generators, it is most important to follow the orders and instructions for consecutive operations as laid down by the manufacturer. Manufacturers of acetylene generators have endeavored, as far as seems humanly possible, to make their generators fool-proof, but the idea has never been quite accomplished. It is most important to remember, when an acetylene generator is recharged, that the generating chamber which contains the water and spent carbide is first of all drained or flushed out and again filled with water before any attempt is made to open or fill the hopper or container with carbide.

Supposing you have drained all the water from the generating or water chamber, and that you then, before refilling it with water, fill your carbide hopper, there is just the possibility that a piece of carbide may drop down through the feeding mechanism into the empty generating chamber. You must remember that the bottom of this generating chamber will probably have a coating of moist lime sludge. The moisture will attack the carbide and start to decompose. There is, however, not sufficient water to cause the decomposition to take place rapidly, and, as a result, the decomposing carbide may heat up and reach a temperature where it is possible for it to ignite a mixture of acetylene and air. Remember, if the carbide hopper were opened up before the gen-

erating chamber was filled with water, it would be possible for some air to have gotten into it.

SPECIAL CARE EXERCISED WHEN MAKING REPAIRS

Special attention should always be given to making sure that the hydraulic seals and backflash devices at the discharge of the generator are properly filled with water and are in proper working order. The pressure relief valves, which are commonly employed on what is known as the medium pressure type of generator, should be tested periodically, in order to see that they are working freely and release at the proper pressure.

If any repairs have to be made to an acetylene generator, the whole machine should be thoroughly flooded with water to make sure that all gas has been expelled. This may seem very elementary advice, but history seems to warrant it being given as often as possible, and notwithstanding the fact that this advice is given on every possible occasion, workmen will sometimes occasionally open up an acetylene generator, to make some minor repair or adjustment, and then, without making sure that all gas has been expelled, start to use some metal tool and create the spark necessary to cause trouble.

In those cases where the shops are piped for oxygen supply, and the oxygen is supplied from a number of cylinders manifolded together, it will probably be arranged for the same man who looks after your acetylene generator to look after the oxygen manifold and replace the exhausted cylinders with full ones when necessary. It is essential that the workman looking after this work be very carefully instructed in the matter of handling the cylinders with his hands free of grease or oil. When the empty cylinders are disconnected from the manifold and put on one side, the full ones that are to be attached should all have their valves cracked, that is to say, they should be opened very slightly for a moment, to blow out any dirt or foreign matter that may have accumulated in the valve orifices during transport or storage. The cylinders should be then connected up through flexible connections to the manifold, and the valve on one cylinder opened up, care being taken to open the valve slowly so as not to throw a pressure of 2,000 pounds suddenly on the system. With the valve of one cylinder opened up, the manifold and all connections will contain oxygen at 2,000 pounds pressure per square inch.

A careful search should then be made for leaks, which will be detected by a hissing sound. Connections where leaks occur should be tightened up immediately. After the operator has made sure there are no leaks in the manifolding system, the rest of the cylinders connected to the manifold can be opened up. It should be appreciated that it is necessary to open the valves on oxygen cylinders fully. If any cylinders are found that leak around the valve stem, they should be disconnected and returned to the manufacturer.

RIGHT AND LEFT HAND VALVES

Under no circumstances whatever should workmen be permitted to attempt to make any repair to the valves and valve fittings on an oxygen cylinder. All oxygen cylinders are fitted with valves having right-handed connections. Unfortunately, certain combustible gases are stored in cylinders of similar size and appearance to oxygen cylinders. Such cylinders should, in the cause of safety, be equipped with left-handed valves, but there are no laws which make it possible to enforce such a safety measure, and I regret to say that there have been one or two isolated instances where a cylinder of combustible gas has been connected up to an oxygen manifold along with oxygen cylinders, and with of course, disastrous results. These occasions, however, have been so rare, there is really nothing much to worry about, and even if every combustible gas cylinder were equipped with left-handed valves, we would still have the man who might occasionally, by some means or other, connect a right-hand connection to a left-hand connector. As a matter of fact, I know of one case where an operator endeavored to connect up a connection from an oxygen manifold to a cylinder of combustible gas, and he found he was unable to make a proper connection because the thread on the valve of the combustible gas cylinder was left-handed. This, however, did not thwart the determined worker, and he went into the machine shop and got them to make up an adapter for him, so that he could make the connection. Now, when instances of this sort do occur, it is very clear that the workman delegated to look after cylinders, generators, etc., has not been properly instructed and cautioned.

It is quite needless for me to talk about the operation of the actual welding units, that is, the blowpipe, gas regulators, hose and the installations using individual oxygen and acetylene cylinders where they are employed. Every manufacturer of apparatus puts out detailed instructions of how the various items of equipment are to be connected up and operated, and if users would follow these instructions, few, if any, accidents would occur. If, for some reason or other, oxygen or acetylene regulators which are employed for adjusting the pressure of the gas for delivery to the blowpipe, become disarranged, do not permit your workmen to attempt to repair these themselves. Large establishments can, of course, have a department where welding equipment can be periodically overhauled, repaired and tested, and can employ in that department a man who is properly and thoroughly skilled in his work; but in the case of smaller establishments it is advisable for defective apparatus to be returned to its manufacturer when overhaul or repair is necessary.

WORKING PRESSURE GAUGES ON CYLINDERS

It is very important to periodically test the working pressure gauges on the regulators. These are the pressure gauges that indicate the delivery pressure of the gas from the regulator. As previously mentioned, acetylene should never be used in a blowpipe or in a hose or piping system at pressure over fifteen pounds per square inch, and it is on

this account that I emphasize the importance of making sure that the working pressure gauges, particularly those on the acetylene supply, are periodically tested, to see that they register correctly. You hear occasionally of accidents where the hose supplying the gas to the blowpipes has burst. In nearly every case this can be traced down to the fact that acetylene was being supplied to the hose at a pressure in excess of fifteen pounds per square inch, either intentionally or because the working pressure gauge on the regulator did not record properly, with the result that a backfire in the blowpipe propagated through the blowpipe to the hose. Now, appreciate that the backfire would not matter at all if the pressure in the hose was not above fifteen pounds per square inch. The acetylene would not even burn. But, when the pressure is over fifteen pounds to the square inch, the acetylene may readily decompose and cause the hose to be ruptured and probably disarrange the functioning of the regulator attached to the gas cylinder.

Let me warn you against using long lengths of hose of too small a diameter. Quite a number of blowpipes only function properly when the acetylene is delivered to the inlet to the blowpipe at a pressure somewhere between ten and twelve pounds to the square inch. Therefore care must be taken to see that the diameter of the hose is large enough in proportion to the length to be employed to insure that the drop in pressure between the outlet of the regulator and the inlet of the blowpipe is not more than a pound or so.

It is probably advisable for me to say a few words about the acetylene cylinders. Some of you may not appreciate the fact that an acetylene cylinder is not merely an empty shell containing compressed gas the same as an oxygen cylinder. The interior of an acetylene cylinder is completely filled with a porous material such as asbestos or a concrete made up of charcoal instead of crushed stone. This porous mass has a porosity of about 70 to 80 per cent, and is being employed for the following reason:

WHAT THE CYLINDERS CONTAIN AND WHY

It is found that if acetylene is compressed into a porous substance, and where the porosity does not exceed 80 per cent, the acetylene cannot be exploded or ignition propagated when the pressure is over fifteen pounds per square inch, as it could be if the cylinder contained no porous mass. Therefore, a cylinder properly constructed and containing the proper porous mass can safely be used for the storage of acetylene at over fifteen pounds pressure per square inch. Cylinders commercially used today, in addition to containing the porous mass, also have in them a solvent, which will dissolve many times its own volume of acetylene, thus making it possible to store in the cylinders large quantities of gas at comparatively low pressures. A charged cylinder of compressed acetylene contains practically no free gas. All the gas that is in the cylinder is in solution in the liquid solvent, which liquid solvent is in turn absorbed in the porous mass in the same manner that a sponge absorbs water. When the valve of the cylinder is opened and

pressure released, the acetylene gas comes off from the solvent in the same manner that CO₂ bubbles up through the water in a seltzer water siphon when the valve is opened. Acetylene cylinders should always be stored and used standing upright.

As mentioned previously, the safety devices in acetylene cylinders consist of fusible plugs which melt at a temperature of 212° F. It will therefore be seen that care must be taken not to let any flame come in contact with the fusible plugs. Otherwise they will melt instantly and release the full charge of gas in the cylinder.

GOGGLES, GLOVES AND FIREPROOF CLOTHING

Make a point of insisting that all welding operators wear suitable goggles. When securing goggles it is advisable to have them comply with the specifications for goggles of the National Head and Eye Protection Code (United States Bureau of Standards).

Welders employed on heavy work should be supplied with fireproof gauntlets and aprons as a protection against radiated heat, and it is considered advisable where welding is being performed in the interior of some structures to insist that all outer clothing be fireproof.

I could go on giving you numerous more recommendations of what to do and what not to do, but will refrain from fear I shall become tiresome.

I sincerely hope that some of the recommendations I have made may help to steer you clear of accidents which need not occur, but don't forget that safety practice does not end with proper operation of your welding equipment. Welding must only be used for work where welding can be considered good and safe practice for construction or repair. Some users become overenthusiastic and attempt to employ welding on certain work where it should never be attempted and consequently fall down badly, with the result that it tends to give welding a bad name and creates a feeling of insecurity about the process in the minds of those who are considering its use.

Those of you who are intimately acquainted with welding work know that perfectly sound and safe welds can be made in almost any class of work, but such safe, sound welds can only be secured when properly trained and skilled operators are permitted to work. In the ends of safety, it is just as much your duty to assure yourselves that the men employed in welding work in your establishments make sound welds, as it is for you to see that they work under safe conditions.

I may have failed to refer to some particular phase of the welding industry which may be of particular interest to some of you, and if such is the case, I shall only be too pleased to endeavor to answer any questions you may care to put to me.

DISCUSSION

MR. G. A. KUECHENMEISTER (Dominion Forge and Stamping Company): I would like to ask why, every so often, an acetylene cylinder lets loose and causes trouble in the plant?

MR. SMITH: I have been connected with the acetylene industry from its inception, and I do not know of more than six or seven instances where cylinders of the type used for welding have exploded. Most of you gentlemen know there was a bad accident in Detroit early this year. I investigated and thoroughly agree with the statement made by the engineer of the City of Detroit. In that particular case there was an interior lamination in the steel of the cylinder that it was impossible at the time of manufacture to detect. The cylinder had been in use since 1914 and probably had been charged nine or ten times each year since then, but the lamination was the weakest part, and that eventually caused the failure. That is one of the unfortunate things we are bound to have occasionally with any vessel which contains pressure.

MR. KUECHENMEISTER: How many cylinders are in use?

MR. SMITH: I don't know. Altogether, the company with which I am connected has somewhere between a million and a half and a million and three quarters in circulation.

MR. SHAW: Will you explain just how that explosion occurred? Was it in the tank or in the room?

MR. SMITH: The evidence given at the inquest showed that it was an explosion in the room. Apparently the cylinder opened up and gas was released into the room, creating a mixture of acetylene and air, and there was ignition, resulting, of course, in a violent explosion. There were plenty of causes for ignition, because there was an electric welder working within twenty feet of the tank. The man handling the cylinder at the time of the accident was killed. In the accidents that I have had cause to investigate, the man actually using gas and manipulating the cylinder has been killed. He was the only one really qualified to say what he had done or what had occurred immediately preceding the accident. You never get the real truth from other witnesses, because they don't know. I always make it a point, when possible, to investigate cylinder accidents, with the idea of trying to learn something and be in a position to give advice to prevent a recurrence. In the case of the particular cylinder you are talking about I agree with the findings of the engineer.

SHIELDS FOR CYLINDERS

MR. E. S. CHAPIN (Pennsylvania Railroad Company): We use a good many oxy-acetylene sets and for that purpose we have carts throughout the shop. We have become apprehensive, maybe unduly so, lest contact with the valves and so forth, which are on the upper end of the flask in these carts, may cause trouble. The Safe Practices Pamphlet does not show protection for such valves. Of course, they must be visible from the operator's standpoint. I have wondered whether anyone in this Section has considered building any kind of guard to protect the valves and gauges from mechanical injury which might cause a rupture and release the gases.

MR. R. G. ADAIR (American Rolling Mill Company): Perhaps we have solved that situation. We have stirrups that carry the oxy-acety-

lene containers to hold them perfectly still in the cart while it is being pulled along and this prevents any injury to the fittings.

MR. SHAW: We have an idea that we are trying out and the superintendent has ordered possibly two or three hundred made up. (Drawing on blackboard). There is three-eighth inches of metal that goes around the acetylene tank, the idea being, if the cylinder explodes, it will go straight up. Your acetylene tank would be here with this shield around it, so if one of the plugs blew out the flame would go up; the flame would hit the shield and not the tank. That is being done quite extensively in the Ford plant; we have had plugs let loose quite often. We make it a practice to test under water all acetylene cylinders received at the Ford plant to make sure there are no leaks.

MR. J. R. MULLIGAN (Bethlehem Steel Company): I have a specific case of a tank letting go recently in one of our plants. We had a very heavy thunder shower while the driver had five acetylene tanks on his truck. He reached his destination and with his helper was sitting in the cab. The helper, because of the heavy downpour, refused to help unload and to put up a plank on which they slide them down. The driver, in a hurry, went out and kicked them off himself. He got them to the side of the truck, pulled his sticks out and let them fall. According to his testimony, he had let the second one down and the third one a distance of about forty inches. He was reaching for the fourth one when this happened: The disc flew back a distance of twenty feet and hit a brick wall at a height of four feet, making an impression very nearly an inch deep. The cylinder part went 275 feet and struck an up-right angle support at our blast furnace with such force that it bent the four-inch angle out of plumb eighteen inches and tore loose the gusset plate as clean as though cut with a knife. Those who looked at the result of the impact figured that it would have gone another 275 feet.

We who use acetylene want to take all precautions and we also want to have those manufacturing the acetylene do the same. We feel that dumping the tank off the truck was the primary cause for its letting go.

Was there an explosion? There was no evidence on the cylinder as we found it that there was. Is there sufficient pressure in the tank to drive the cylinder possibly 500 feet?

ALL PRESSURE TANKS REQUIRE CAREFUL HANDLING

MR. SMITH: Without examining the cylinder and looking at the fracture I would not like to offer a definite opinion, but I would say from what you have told us there was no explosion. If there had been an explosion in the cylinder you would not have found the cylinder shell intact. The end might have gone out just the same, but the shell would have opened out and turned back on itself. Two hundred and fifty pounds pressure to the square inch in a cylinder twelve inches in diameter would drive it 500 feet. It looks as if there was some defect in the steel itself, which showed up as a result of the concussion when the cylinder was dropped. I would say that the acetylene had nothing whatever to do with the accident; it was simply a question of the steel con-

tainer and the pressure on it. The same thing probably would have happened if the cylinder had contained air; probably a good deal worse, because you would have had the full force of the air, while here you had not, because the acetylene gas was in solution. It had to release itself from the acetone before it could exert its full effect.

MR. GASTON: May I point out that any pressure vessel, any commodity delivered under pressure by truck, is subject to the same thing? Take the matter of soda-fountain carbonic tanks; every once in a while we have them let go. Years ago when one of our commodities, now more or less obsolete, was delivered by a brewery wagon, every wagon was provided with a big stiff pad to drop these on, even if they had a slide. It would seem we ought to have that much at least. It is not a one-man job to get them off the wagon.

MR. NORTHWOOD: We use a rubber pad in taking them from the cars and delivering them in our plant, but our trouble is to make the men handling them realize that if they are negligent they are in danger every day and every minute. They become accustomed to handling them and familiarity breeds contempt.

MR. W. E. WATTERS (National Malleable Casting Company): Is it safe to make oxygen manifolds out of iron or steel pipe? What result would oxygen have on iron or steel instead of brass?

MR. SMITH: It is quite safe to make them out of steel pipe. It should be of double extra strength.

MR. ADAIR: Is it ever safe to use oxygen without a regulating device?

MR. SMITH: For welding work it would be distinctly bad practice and I don't think it is ever done. However, I have heard of places where oxygen was used for purposes other than welding and large volumes and heavy pressures were required where users depended on single cylinders without regulators to provide the supply; this is a practice which I consider very bad.

MR. ADAIR: We had three quite serious explosions lately in clearing tap holes.

MR. SMITH: For that work I believe the best practice is to connect six or eight, or possibly more, oxygen cylinders to a manifold and have one big master regulator. In certain instances users of oxygen for this work have tried to operate with a supply of oxygen from one cylinder only, using an ordinary oxygen welding regulator which has failed to function on account of freezing due to the exceptionally heavy duty. As a result, the user resorts to the single oxygen cylinder without a regulator, instead of manifolding a number of cylinders and employing a suitable master regulator.

KEEP CYLINDERS AWAY FROM EXCESSIVE HEAT

MR. ADAIR: What about the application of local heat to a cylinder? For instance, you are clearing a tap hole around a furnace—you take the bottles up to the furnace. Is there any danger of an explosion of oxygen

MR. SMITH: I think it is distinctly poor practice to bring any cylinder containing pressure into an area where you have molten metal or excessive heat. Cylinders should always be kept some distance from the furnace and the gas should be brought up to the furnace through pipe lines. Molten metal could burn through a cylinder and cause it to explode; excessive heat would cause the pressure to build up until the safety devices released.

MR. ADAIR: What would you say was a safe length for a hose a quarter of an inch inside diameter?

MR. SMITH: It depends entirely on the pressure and on the volume of gas you want to use per minute. There are tables which give the drop of pressure in transmitting gas through pipes. You have to work it out for each individual case. You will find these tables in any gas handbook.

MR. ADAIR: Our men were under the impression that they could regulate the oxygen by the cylinder valve.

MR. SMITH: It is impossible to accurately regulate the pressure of oxygen by mere manipulation of the cylinder valve. In the case of welding work such a crude method of regulating the oxygen pressure would result in bad welds and there would be the hazard of building up the cylinder pressure in the hose if the oxygen control valve on the blowpipe were closed. As to attempting to regulate the supply of oxygen through a pipe for taphole work such practice would be uneconomical and would involve hazard in that the cylinder valve might be carelessly operated and excessive pressure carried in the hose, causing it to rupture. As stated before, I am of the very firm opinion that when oxygen is employed for clearing tap holes in furnaces the oxygen supply should come from a number of cylinders manifolded together. The manifold should be equipped with a master regulator and the outlet of the regulator should be piped up to a convenient point near the furnace.

MR. J. A. DAWSON: The gentleman that spoke a few minutes ago brought out a point which is vital to everyone engaged in the steel industry, that of opening tapholes on open-hearth furnaces with oxygen. Mr. Smith stated that the tanks should be manifolded and pipes brought up to the furnace. I should like to ask if there is anyone engaged in the steel industry who has such equipment and what the results have been?

We are using oxygen for opening tap holes. I have been trying to get them to put on regulators. At our blast furnace, about a year ago, we had a very serious accident. The pipe they were using to open the tap hole plugged and the man at the pipe called for more oxygen. As a result, they turned the valve and the whole thing blew apart; it ignited the man's clothing and he died. We put regulators on the equipment at the blast furnace and it now works very fine.

TANKS SELDOM IF EVER OVERCHARGED

MR. F. C. MILLIS (Wisconsin Steel Company): Is there a possibility of the safety devices in the factory where the tanks are filled going

wrong and overcharging the tanks? We had a regulator explode, causing a man to receive burns about the face. Investigation showed that it was either scale in the tank that, by friction, created a spark, or that the tank was overcharged. I am referring to oxygen cylinders.

MR. SMITH: The careful supervision given and the high-class workmen employed at oxygen plants are such as to make it practically impossible for a cylinder to leave a plant with over-pressure.

MR. A. D. RISTEEN (Travelers Insurance Company): You can make all the rules you want, but the fellows handling these things will throw them off the trucks just the same. I have seen a great deal of that around places where I know the men have been told they would lose their jobs if they threw them off; they do it just the same.

MR. KUECHENMEISTER: Tell us about the danger of manifolding acetylene tanks.

MR. SMITH: I am not in favor of manifolding acetylene tanks except under exceptional circumstances. The coupling of two or three tanks is all right for occasional use, but it is not good practice, in my opinion, manifolding a bunch of cylinders.

MR. KUECHENMEISTER: At what pressure will acetylene explode without outside flame?

MR. SMITH: It won't explode without heat. It should be remembered, however, that acetylene at over fifteen pounds pressure to the square inch will explode if heat is applied without any air or oxygen being mixed with it. At a pressure below fifteen pounds per square inch acetylene will not explode if heat is applied unless air or oxygen is mixed with the acetylene.

Thereupon the meeting adjourned.

Cement Section

August 29 and 30, 1922

A. C. TAGGE, Chairman

Vice-President, Canada Cement Company, Ltd., Montreal, Quebec.

TUESDAY MORNING SESSION

CHAIRMAN TAGGE: Gentlemen, we will call on Mr. J. Cuthbert to give us his paper as the first business of our Section.

SOLVING THE ACCIDENT PROBLEM IN THE CEMENT INDUSTRY BY EDUCATION

J. CUTHBERT, ASSISTANT SUPERINTENDENT, CANADA CEMENT COMPANY, LTD.,
PORT COLBORNE, ONT.

I will give something of our experience at Plant No. 8, Port Colborne, Ont., an outline of our first organization of safety committees, and the subsequent changes which we made, as well as our reasons for doing so.

In June, 1921, our company decided to make a special effort to try and reduce our accidents and July was selected to start our campaign for a "No-Accident Month." Mr. Jacobsen very kindly came over and visited our Montreal, Belleville and Port Colborne plants, giving a very instructive and inspiring address at each place. I will admit that we had very little experience in accident-prevention work, so that we may claim to have started from the very bottom of the ladder; in fact, No. 8 had the worst record of any of the plants of the Canada Cement Company.

There was no tangible reason why our record should have been so bad as the conditions in this plant were no more dangerous than in any of the others. We were making guards all the time and we were posting the National Safety Council bulletins, but I must admit that we were only doing so as a matter of routine and were not putting any personal touch into the matter. When we had an accident the foreman had to give an account of it, but we could not understand why we were so unfortunate and had such a bad accident record.

Nothing in the way of trying to arouse enthusiasm for accident prevention had been attempted—we were paying more attention to pro-

duction and building up mechanical features than we were to the human condition of the plant. Our record was as follows:

Period.	No. of Lost Time Accidents.	No. of Minor Accidents.	Total No. of Accidents.	Total Lost Time.
Year 1920	48	22	70	906 days
1st 6 Mos. 1921.....	47	25	72	500 days

ORGANIZING FIRST SAFETY COMMITTEES

We had our first organization meeting June 17, 1921. Mr. L. H. McDonald, superintendent, acted as chairman, myself, assistant superintendent, as secretary, and we had with us the sixteen foremen of the plant. A central committee, composed of superintendent, assistant superintendent, the foreman of the machine shop and the foreman of repairs, was appointed. The objects of the campaign were fully explained and the full co-operation of all the foremen solicited. Mr. Cam, our electrical engineer from Montreal, who was to take charge of the campaigns in the different plants and give as much publicity as possible to the work was also present.

Our next step was to analyze all the accidents from 1920 to date, both by departments and cause, giving the name of the injured man, his injury, the date, the cause and foreman's name. This data was given to each member to digest and at the following meeting a general discussion was had. It was soon discovered that only one accident out of the entire number could have been prevented by the installing of a guard. Everything indicated that our campaign would of necessity be one of education. A suggestion box was installed and, as is the usual case with all campaigns, the replies received consisted largely of advocating the placing of a guard here, changing a platform there, putting on a new roof, getting new chain blocks and similar matters. In order to cope with some of this work four men were detailed to the making of guards, etc., so that we might prove to the average workman that we were sincere in our efforts to prevent accidents.

We held meetings every week and discussions on plant conditions were invited, the members being encouraged to speak freely without fear of offending the superintendent, assistant superintendent, the foreman, or the men. In this way a good many unsafe places and dangerous practices were brought to light. In order to get everyone talking and thinking safety homemade bulletins, in addition to those of the National Safety Council, were used and new bulletin boards were made and installed in the most conspicuous places around the plant.

The plant was thoroughly inspected and as many of the dangerous places as could be discovered at the time were carefully noted. The work of rectifying these hazards was carefully planned and systematically carried out. The foreman of each department was encouraged to go ahead and make up guards, using the operating and repair men at their disposal at times when they were not rushed along other lines, and in this way a great deal of very useful work was accomplished.

The record for July, August and September, 1921 (the first three months of our campaign), shows that we were not making the desired

progress in our accident-prevention work. During these three months we had: Lost time accidents, 12; no-lost time accidents, 10; a total of 22. Days lost, 245.

WHY SUCCESS WAS SLOW AND THE REMEDY

We were not satisfied; we were not getting results. Numerous guards were being made, but we were not arousing enthusiasm in the average man—we were only reaching the foreman, so we decided to try another plan. The plant was divided into sections, each foreman having a committee of his own, he to be its chairman. Weekly meetings of these committees were arranged and a meeting of all the committees was held every two weeks. The total number serving on the safety committee was thereby increased from sixteen to fifty. Our idea was that if you could get the man interested, get his confidence, get him to talk, you could very often explain away difficulties which in some cases existed only in his mind and you could also get ideas for overcoming of dangerous practices. If you do not encourage the man to express himself you do not learn of these things until an accident has happened or you meet him at some time when he is not expecting you.

I attended all of these small committee meetings to start them going—this was the beginning of October, 1921—giving a general talk and explaining our ideas to them; encouraging the men to show initiative and take a personal pride in the plant and its record. Each meeting lasted about thirty minutes.

It was not my intention to attend these small committee meetings after the first time, but to wait and see how the idea developed. I am sorry to say that by the end of the month the interest in them had fallen very low. Since I had proposed these meetings I was not going to see them fail because of lack of interest, so I planned to again attend each of them the following month. I attended four safety committee meetings the first four days of each week and also the combined committee meeting every second week. I did this and I concluded that although you may be an enthusiast in safety work, the interest of the man could not be kept alive in the work through this method.

It was then decided to hold a combined safety meeting every week, which was to be attended by all committees, and each foreman could have a meeting of his committee whenever he so desired. At the same time we were running a cleanliness campaign, and another idea was tried out in an attempt to make these meetings as interesting and attractive as possible. Each foreman was asked to visit some department other than his own and to make a written report on the conditions he found there, both as to cleanliness and safety; also to offer suggestions he thought would make for better working conditions. These reports were handed to me before the weekly meeting, but the name of the foreman making a report on another's department was never divulged.

The interest aroused through this method was a wonderful help, both from a cleanliness and a safety standpoint. If a foreman was reported because of some material not being cleaned up or put away into its proper place, he would be censured by his fellow foremen, and you

can rest assured that the same thing would not be reported very often. This scheme worked well for nearly six months.

THE FIRST NO-ACCIDENT MONTH

In the month of October, 1921—the fourth month of the campaign—we had two or three cases of infection, which ran our lost time up rather high. In November we built a new first-aid room close to the office and employed a registered nurse. There is not the slightest doubt that the good work of the nurse had much to do with the success we attained after this date. The month of November was really a “no-accident” month, but owing to the wrong dating of a report of an accident, which happened on Dec. 2 (the case of a boy cutting his finger in the bag shed and losing four days), we were not credited as we should have been. During December the plant was closed down for extensive repairs and alterations and we really expected to have some trouble, in spite of the hard work which had been done to guard against possible accidents. We had only one case, that of a man slipping on a scaffold four feet from the ground and slightly spraining his left arm, losing one day. The total accidents for October, November and December were:

Lost time, 8; no-lost time, 3; a total of 11. Days lost, 181.

It was very encouraging to start off the year 1922 with a clean sheet and everyone resolved to do all in his power to keep up the good work. It is a long lane that has no turning and we thought that now we were on the road to success. Some of the old school who were skeptical about accidents being preventable by education were changing their minds. They were taking more care with the new man, teaching him how to do his work, explaining to him what he should do and what he should not do and showing him the safest and easiest way.

More ideas for homemade bulletins were coming in. In the machine shop the foreman made a simple but very ingenious device to assist in giving publicity to the good work. The machine is a revolving drum, with bulletins attached to it running slowly with enough of a bulletin exposed so that a person could read it easily. The interest aroused by this method was effective, and as the need for new and original bulletins became greater our next job was to supply the deficiency. We had a young man working in the tool crib and stores department nights who lost his right leg while employed by one of the telephone companies. He was of an original turn of mind and competent to carry on the work of making homemade bulletins; he was a safety enthusiast and on being asked how he would like to assist in our educational work he was only too pleased to have an opportunity to save some other chap from being as unfortunate as he.

We had a copy of the National Safety Council's slogans and this very useful little book was a good foundation for our work. After selecting the slogans, and reprinting them on large bulletins, they gradually suggested other good material and in the end he had a large amount of good local matter to work with. The interest aroused by this method was a great help and in the course of two or three months we had more

of the men in the plant interested in the work and some very good local bulletins were posted. From January 1 to June 30 of this year (1922), our record was as follows: Lost-time accidents, 11; no-lost time accidents, 6; a total of 17. Days lost, 145.

REWARDING GOOD WORK BY CREDITS GIVEN DEPARTMENTS

Considering that five of these accidents happened on the same day, and that two were fatal, we had every reason to feel very optimistic. (The accident referred to occurred while cleaning out a water tank.) We went through the month of February without a lost-time accident and April was a "no-accident" month—not even a minor accident requiring a doctor. From March 16 to May 20, sixty-four days, we did not have a single accident.

We have a system whereby, when a department goes one month without an accident, it receives a star, if it goes three months it receives one red star, and if it goes six months, it receives two red stars and so on. In conjunction with this system of stars for "no-accident months" by departments, each is penalized for accidents according to the number of men, the hazard, etc. The interest aroused by this method is very keen. The system was introduced in May of this year and made retroactive to January 1.

A specific case is that of a teamster who received a broken leg. He was under the jurisdiction of the yard foreman and engaged in cleaning up the yard. On the day of the accident he was sent to the ballground, and while on his way back the accident happened. The yard foreman thought that as he was doing something for a common sport that all departments should help to bear the loss, so after considerable discussion all departments agreed to share in the loss and to give him his star.

SHOWING RESPONSIBILITY FOR DEPARTMENTAL ACCIDENTS

Another case was more difficult to decide. An oiler in the kilnroom, in pulling a switch, had his face burned and was off fourteen days. In this case the kilnroom foreman claimed it was an electrical accident and that it should not be charged against the kiln building; the electrical department claimed that he was a kilnroom man, that he regularly performed this duty, and they had no direct control over him. The outcome was that the departments agreed to share the loss, but the electrical department claimed that if they were to be partly responsible for accidents to departmental men that this increased their hazard and that their penalty in points should be lowered. This was agreed to.

Our whole campaign has been so conducted as to keep all the workers interested. We have succeeded to a certain extent, as shown by the following results:

	Man Hours 100,000	Accidents	Accident Frequency
January to June, 1921.....	4.60	51	11.1
July to December, 1921.....	4.24	20	4.7
January to June, 1922.....	3.87	11	2.84

While our accident record was improving our plant was becoming cleaner and our production increasing; indeed I may claim that this has been our banner year.

DISCUSSION

CHAIRMAN TAGGE: Mr. Cuthbert's paper was very instructive indeed and two points, in particular, appealed to me. The first, was the plan for a committee to insure continued interest in the work, and the second, was the development of talent for the purpose of carrying it on. The meeting is now open for discussion.

MR. CARMICHAEL (Riverside Portland Cement Company, Riverside, Cal.): Many of the bulletins that we post are prepared in our own plant, which is a comparatively small one of 350 men. Our accident record of a year ago was not very good—it averaged about fourteen per month and on one occasion reached twenty-eight, with two fatalities. Our plan consisted of a central committee composed of the superintendent, assistant superintendent, mill superintendent, machine shop foreman and repair foreman. In October, 1921, we launched a special effort to cut down accidents; at the end of the first month had reduced the number to eight and the second month was gone through with a clear record.

After a time the men began to lose interest so we started planning something new in bulletins. These consisted largely of photographs with big lettering and the men were so pleased with them they sometimes cut out the pictures and carried them away. We have had but one fatal accident this year—a brakeman was caught between two cars and crushed. Our accident record is greatly improved over last year and we believe we are in a fair way to make it 100 per cent perfect.

MANY ACCIDENTS TRACED TO HUMAN ELEMENT

MR. MOELLER (Texas Portland Cement Co., Dallas, Tex.): We started our safety work some seven years ago with a staff consisting of the chairman of the committee and the foreman of the plant as permanent members and each month we selected two or three men from the general ranks—depending on the size of the plant—to work with them. Meetings were held weekly in the superintendent's office and matters of general interest were discussed. When the foremen found the men were losing interest in committee work we started a bulletin system and try to add something new to it from time to time to keep our men on edge for safety. We depend largely on our foremen to direct the work of guarding and housekeeping and they are quite successful in this.

I find that more than one-half of our accidents can be traced to the human element and one of the methods we used to overcome this class of accidents was to explain the insurance experience tables to the men. This caught their attention and was a factor in improving conditions. For the last two years our accident record has been very good. In January, 1921, we had two lost-time accidents and February, March and April were no-accident months. Last June we had one lost-time accident and two in July. With a plant properly guarded and the men working with you much can be accomplished. It is somewhat difficult to secure the

good will of all your men but with everyone at the safety meetings and working in harmony much can be accomplished. That is my experience.

MR. ROYER (Ocean Accident Guarantee Corporation): During the last two years we have made investigations which I am sure will interest you in your problems of accident prevention and education. To ascertain the causes of accidents is a difficult matter. Our records at one time indicated that accidents were largely due to machine hazards but after analyzing a number of them I found accidents were occurring on machines guarded in accordance with all of the standards and a further analysis showed that the fundamental cause of many accidents might be due to poor housekeeping, carelessness, etc. How are you going to prevent men from coming to work in tattered clothes or poor shoes? If a man has a careless attitude his working place is bound to be littered, unkempt and ready for accidents. It is a hard problem. The only answer is to see to it that the men in your plant who have the most influence over their fellow workers are with you, and when a man doesn't care for himself or the plant or anyone it is up to the men of influence to see that he mends his ways.

Regarding the psychology of the safety campaign: We all work very much in accordance with the things and people in whom we are interested and maintaining interest is so serious a problem that it is practically impossible to keep your men in line unless nearly every one of them has been assigned to some specific duty. Your accidents will continue after you guard your machines and will only stop when your educational campaign embraces all the men employed by your company.

MAJOR RENINGER (Lehigh Portland Cement Company, Allentown, Pa.): Our safety committees were first organized in 1915 and continued until the war came and disorganized conditions—for a time the work lagged somewhat. Now they are at work again, but we have placed more work on our foremen as they are men of ability and if they are interested it is much easier to get the rest of the men in line. I heartily agree that 10 per cent of the problem consists of guarding and 90 per cent is educational. We have proved this in our plants. Another feature is the problem of the man's home life: You can't guard against the worries of a man's mind if he has a sick baby at home or business matters trouble him—his mind is not on his work; something slips or goes wrong and an accident occurs.

PROPER SANITATION ALWAYS BRINGS GOOD RESULTS

The company has the first responsibility of seeing that everything possible is done to make the plant safe. When this is accomplished it is time to seek the co-operation of the men. For instance, one of the first things we did was to eliminate the old method of washing up in a bucket—we put up wash houses and installed up-to-date toilets. It had a wonderful effect on the men and made them more approachable on accident prevention work. We have not eliminated accidents—there is a lot to do before that is accomplished—but we have reduced them considerably.

Last year we put on a campaign in June for all our fifteen plants and brought our lost-time accidents down to 152 days. For June of this year

—not including one injury in which recovery is incomplete—we have lost only 53 days. We held contests and awarded a pennant to the mill having the lowest number of accidents (this year a large American flag) and will give a trophy to the plant making the best record this year. The effect of the trophy has stirred up a lot of enthusiasm.

We furnish bulletins from the main office and make others in the several plants. Two years ago, when we started this work, I asked for artists in the plants but could not find one. Today we have found artists and poets and writers and are getting along nicely. One of our fellows in a western plant visited the superintendent one day and said: "I have been thinking of the safety meetings and have written a couple of songs." Mr. Jacobsen looked them over and found they were very good.

The way to success lies through education and this can be best accomplished through efforts in your own plant. We tell our safety committees, "You fellows go ahead and start the work—we will help work the thing out according to your ideas." We put up it to them to conduct their own safety meetings and we help by sending out new bulletins. We also use moving pictures and things of that sort; at Oglesville we show the films in a park. We have schools where we teach English to our foreign workmen and the classes meet from 7 to 9 o'clock four times a week. We also find that the work of the committees in teaching sanitation, fire prevention and good citizenship helps to keep our men interested and has a good effect in keeping down accidents.

KEEP MEN IN GOOD PHYSICAL AND MENTAL CONDITION

MR. MORGAN: I have been at the Dixon plant for thirteen years and have only had one serious accident in that time. The last speaker referred to the value of pleasant home life. If your wife feeds you well in the morning and sends you away in good shape the chances are you will return the same way, but if a man is worried it always shows in his work. We who come from the smaller towns know most of our employees and how they live and this is of value to us in planning our work.

MR. HUTH (Universal Portland Cement Company): Without a doubt education is the big thing after we have provided all the guards possible. When taken on for employment, every man is given a book of safety rules and regulations, and the foreman, after a reasonable time, gives him an examination on this book. The foreman who does his duty the way he should has an influence with the men that no other person could have, as he has more personal contact with him. A safety man sees an employee perhaps once in two months, but the foreman meets him every day, and for that reason the foreman usually gets better results in giving safety instructions. Mr. Reninger is quite right when he says about 10 per cent of the whole work can be done by guarding and the rest is accomplished through education.

GEORGE ROSS (Missouri Portland Cement Company, St. Louis): During the past season about 90 per cent of our accidents were due to the large labor turnover. The old men do not get hurt, it is the new men we have not been able to reach that suffer injuries.

MR. A. A. HUCK (Canada Cement Co., Ltd.): I am ashamed really to tell you our record, that is, prior to 1921. We injured as high as fourteen men a month and killed one or two a year. After we organized our safety committees in July, 1921, we improved our record materially. This was accomplished by antagonizing our foremen so that they would go after their men. This may not be a wise system in all cases, but it worked very well with us because for some reason we had a lot of hardheads at the plant, many of whom had been there for fifteen or twenty years. They would say, "I have done this work this way for twenty years and I am safe." In many cases they were foremen and that made a bad impression on the men. It was not until after we had the foremen interested that we were able to reach the men—then it was easy.

In June and July we had no accidents, the last occurring on the 30th of May. Formerly we had twelve to fourteen each month; now our average is two. That speaks for itself. Educational work is very important, but guarding is necessary, too, as we have to show our men that we are interested and are not confining our work to mere talking to them. In all cement plants there are hazards where guards will prevent accidents and other hazards where guards will not prevent them. We must not lose sight of the fact that guards save the men. A man might think safety all the time, but sometimes he may not feel just right and then he is liable to get hurt.

GUARDS, WITHOUT EDUCATIONAL WORK, NOT SUFFICIENT

CHAIRMAN TAGGE: There seems to be a difference of opinion about the percentage of reduction in accidents that can be procured by education and that to be secured by means of guards. We should first install the guards and then, if the guards have not cured the trouble, education should follow, but the guards should be kept up and used; without them education is not sufficient.

MR. R. J. GREEN (Southern Surety Company): In relation to accidents prevented by machine guards and educational work, I have one or two incidents I would like to mention where the plants were fully guarded, or nearly so. One plant in Michigan had a 6 per cent charge against their unguarded machinery. I talked with the management quite a number of times and prevailed on him to employ a woman to act as chairman of the safety committee, which he did in 1919. This woman interviewed every employee that went to work and gave each a short talk on what the company expected of its employees. She also arranged for entertainments of various kinds—talks, card parties, dances—and in the early part of this year I received a report of this plant. They are getting a 26 per cent credit instead of the 53 per cent debit.

I have a cement plant in the upper part of the state where I have organized a safety committee and the campaign is now being carried on. The only accidents they have had recently have been ruptures. It is a hard matter to keep men from lifting heavy objects, so I visited the plant and I tried to demonstrate to all the employees how to use their bodies when lifting. It seems strange, but I asked how many of the

men had been told by their foreman or others how to lift and nearly every one of them said they had never been told. The last issue of the *National Safety News*, I think it was, gives a little picture dealing with this subject. This is an important matter, as I find that in many of the cement plants a great deal of trouble arises from this source.

NEED FOR SYSTEMATIC PHYSICAL EXAMINATIONS

Personal cleanliness and healthful living is an important item in any campaign. It may be of interest to learn that in one plant, fully guarded and where working conditions were quite good, the accident record was very heavy. A physical examination disclosed that 40 per cent of the employees were suffering from venereal diseases. When this was corrected the accident record showed a decided improvement.

MR. J. UHLMAN (Dixie Portland Cement Company): You have to handle this game according to the crew you have. Bulletins will not catch them, but you have to take it to them individually, even if you have to go to each individual, even if you have to carry it to them every day. We have had several minor accidents this year, but we are getting along. There are many ways to get next to a man, but you have to find out what he thinks and what he likes before you can really interest him. When you are going along with your education work you have to take care of unexpected things. A fellow may say to you "That is a dangerous place" and another will say "Show me how an accident could happen there." Then you will have to go to work.

MR. J. C. JOSSE (Continental Portland Cement Company): I would like to have a discussion on the hernia question.

WHEN RUPTURES OCCUR, AND WHY

MR. GREEN: A very prominent surgeon in St. Louis claims that heavy lifting does not cause ruptures and that a man may suffer in this manner from walking down stairs or from almost any cause—that lifting may emphasize symptoms not otherwise very pronounced. We had this forcibly brought to our attention by several ruptures occurring in a construction gang. We sent the men to a hospital and paid from \$180 to \$200 each for their treatment, but the injuries really did not occur while the men were in our employ. I looked into the history of several of these cases and found the men had symptoms of the injuries for several years. The surgeon treating the men said that our company really had been imposed upon, but we fixed them up and paid the bills.

MR. ROYER: Ruptures are liable to occur to men who are run down physically and I think this is one of the best arguments for advocating physical examinations. The cost of examinations will be offset, at least in part, by insurance rates. Men will say they have not been near a doctor in twenty years, but that may be the very best argument why they should have an examination made now. It will save the man money and may prolong his life.

MR. CARMICHAEL: In California every man seeking employment must go through a physical examination before he can secure a position.

MAJOR RENINGER: You want physical examinations for your men, but with labor as short as it is you have to take what you can get. Without any question every man who goes into a cement plant should be examined, not with the idea of rejecting him but for the purpose of trying to help him—to show that whatever his trouble may be that he can be helped. A physical examination would show that such and such a thing was wrong and you could send him to a doctor and get him fixed up. You would not put him on heavy work, because you would not put a man who could not work fast to switching cars. When you hire a man he goes to the timekeeper, who looks him over to get his height, weight and physical condition; he asks him whether he is ruptured and everyone says no, but a doctor will tell us that about 50 per cent of all men who apply for work are in such shape that they may suffer a hernia without very much cause. Most everyone has a weak wall and an unexpected strain or misstep or something of that nature may bring on a hernia. The subject has bothered us a good deal, but we do not know how to meet it fully.

In Pennsylvania all hernia cases go before a certain referee and we have been stuck and had to pay every time, because it is alleged to be "an injury arising out of the course of employment." We had one case where a man in the packing-house, in lifting twenty-five empty sacks and putting them on the table, claimed he suffered an awful pain, but did not report it. He came back several days later, claiming he was ruptured, and that it happened at such-and-such a time. The doctor found he had strangulated hernia. He called in the superintendent and said: "He must be operated on at once or he will die. He did not contract the hernia while in our service, but if I operate on him I am afraid that the man will claim he is suffering because of an injury he received while here, and if he dies his family will make a claim against the company." The man did die and we are paying a claim of \$4,250. We put it up before the Industrial Commission and they decided against us.

PROMPT TREATMENT ADVOCATED IN HERNIA CASES

Similar cases occur from time to time in our plants, several having occurred in Iowa. When we discover a hernia case I prefer to send the man to a hospital and pay for his treatment rather than to take the chance of his dying and the company having to pay compensation. I favor medical examinations, believing they are advantageous not only to the company but even more so to the men.

MR. GREEN: The war developed the fact that many of our young men who should have been physically perfect could not stand a he-man's job, so the first thing we did was to put them through a training course to build them up to standard. A physical examination will do much in industry to reclaim many of the men now unable to do a man's work. Failing eyesight may not be detected till a man has fallen downstairs and dizziness may incapacitate a man for his work before he sets about correcting it. Physical examinations should not be used to keep a man out of a job, but to fit him for it.

CHAIRMAN TAGGE: We will postpone further discussion until after we hear Mr. Jacobsen's paper.

ACCIDENT PREVENTION IN THE CEMENT INDUSTRY —RETROSPECT AND PROSPECT

MR. H. G. JACOBSEN, MANAGER, BUREAU OF ACCIDENT PREVENTION AND
INSURANCE, PORTLAND CEMENT ASSOCIATION, CHICAGO

The first time the cement industry heard of accident-prevention work was in 1911 at our semi-annual meeting in Kansas City. Mr. Nicholson, now president of the National Cement Company, brought the subject before the meeting, saying that inasmuch as a good many States were working on compensation laws it would be to the advantage of the industry to look into the matter and see if it would not be possible to prevent a good many accidents, thereby getting a reasonable amount of accident prevention and insurance work started within the Portland Cement Association. Mr. J. B. Lover, President of the Vulcanite Portland Cement Company, was the first Chairman of the Accident Prevention and Insurance Committee, the position which Mr. Tagge now holds.

HISTORY OF SAFETY WORK IN CEMENT INDUSTRY

At the next meeting of the association papers were presented on accident prevention and insurance. One was by Mr. J. G. Bergquist of the Universal Portland Company and another by Mr. Raynall C. Bolling, with the United States Steel Corporation. They were very excellent papers and aroused much interest at the meeting. For several years things went along very quietly. There were reports at the regular meetings of the association, but no real data to show whether progress was being made or not. It then was decided to get a real picture of conditions, that it would be necessary to gather reports of all accidents which happened at the various plants and study them in order to prepare statistics which would show the progress being made in the work.

The first study of accidents was for 1913 and it was weak in a good many places. For some reason we had an uphill fight all the time in getting accidents reported. We were told by men in charge that they had few accidents of any consequence—an accident at that time meant a man killed or an arm torn off—something of that kind, anything less than that did not count. I had a terrible time securing reports. I remember one company in particular: They sent in reports of only a few accidents, so I wrote asking if that was all the accidents they had had during the year. They answered "Yes, that was all they had." I wrote again and again and finally I got their report. It showed they had lost about 800 days' time. Undoubtedly there were a lot of such cases and it took several years to get all of our companies to report their accidents.

STATISTICS BASED ON ACTUAL MAN-HOURS

The first studies of accident figures were compared on a basis of production—so many million barrels produced and so many accidents.

That system was misleading, inasmuch as one plant is more efficient than another, not only from a labor standpoint but as to equipment, and one plant might produce a million barrels with considerably less labor than another plant; for that reason the comparative method struck us as being unfair. Then we commenced to compare statistics on the basis of men working at a plant, but that was found to be unsatisfactory, too, inasmuch as some men worked on a two-shift and others on a three-shift basis. Finally we reached the point where we decided to compare all our statistics on the basis of actual man-hours, for it does not make a great difference whether a man works eight, ten or twelve hours. That is the basis we are using now. It is rather difficult to go back as far as 1913 to see just what progress we have made, because we have not some basis of comparison for all of those years—we have the figures only for 1918.

In looking over those studies for the last four years we find that we have a very healthy condition. We are not prepared to say that we have decreased our accidents 75 or 90 per cent or anything like that, but I grant you a normal decrease. I would rather see it that way than something abnormal, which we could not keep up; we are working right along and in years to come we are sure to show improvement.

The past is gone and we cannot do anything about it, but we can do a lot for the present and the future. I visit different plants and get an insight into a lot of things that are lost to a good many people, even those in the industries. I have visited all our plants from coast to coast, from North to South, and know practically all the people—the superintendents and a good many of the foremen, the executives and so forth—and there is no secret as far as I am concerned about the work. I can put my finger on practically any plant and say how many accidents, within a reasonable degree, they will have next year, as it will vary only a few points one way or the other.

I was formerly an insurance man and in that business they talk about the "physical" and "moral" hazard. What is a "moral" hazard? It is not morality, such as the ordinary person thinks of. By "moral" hazard we understand positively the human element in connection with the risk; the human element is not only the employee, but also the employer, and possibly more the employer than the employee. There is no one in the cement industry who is not anxious to see accidents reduced, but possibly with some it is a passive rather than an active interest.

SUCCESSFUL "NO-ACCIDENT" CAMPAIGN WORK

It is wonderful to see what a plant can do if they have the co-operation of everyone from the top to the bottom. I have seen plants that an insurance man would not shake a stick at because he would be afraid of them. I have seen plants, perfectly guarded from top to bottom for years, still having accidents, not on account of any mechanical condition, but because of the human element which enters into everything at that particular plant; not only in faulty work but in operation, family questions, community questions, etc. For instance, about two weeks ago in Chanute, Kan., they were taking preliminary steps for a no-accident

campaign in September. They wanted to have some kind of celebration in advance, so one evening they arranged for a few boxing matches and a colored quartette; they had the town band playing for them. Mr. Hall from the Santa Fe was there to give them a talk and I did my best. Everyone working at the plant was there, including the superintendent, with their families and children, and a good time was had by all. I am sure that plant will come through very nicely in September because they all have the spirit and that is the main thing.

We have found the same thing in all our no-accident months—I don't know of a single one that has not come up to the 'scratch. Last year, when we started these campaigns, we were a little in doubt about how to go about it. We decided that advertising, taking the proposition to the men, was the thing, and not to lay too much stress on mechanical questions. We have varied our methods at different plants, but we have got wonderful results, some almost unbelievable. If this can be done for one month, why not for twelve months and why not forever? There is only one reason I know of and that is that after a time enthusiasm commences to lag a little, everybody commences to slip, and accidents show up unless one is always on the job with new ideas and new plans.

I believe that next year's study of accidents, which will be for 1922, will show a very material improvement over 1921, which was an improvement on 1920. This was only possible because, as is shown by this meeting, we are now able to get the active interest of executives and superintendents and other men who are leaders in industry. Without their help we could not have a meeting like this, we could not succeed at the plant, we could not make our work effective.

NOT YET SATISFIED WITH RESULTS ACHIEVED

We have held our district safety meetings in St. Louis, Allentown and Albany and are drawing quite a few cement people to those meetings; it is very encouraging to see our people warm up to the proposition. I look forward to see our figures for the future better than they are now; even if they are getting better they are not so very good—we have nothing to be particularly proud of. The fact that last year we had fifty men killed in a working force of about 30,000 is nothing to brag about. The Ford plant, with 40,000 people, did not have a single fatal accident in a year and the International Harvester Company, with 30,000 people, had only one man killed in twelve months—this shows us that we have far to go!

Our fatal accidents are largely due to the peculiar nature of our industry and it is hard to say just what we can do to prevent them. During the last three or four months we have had a string of most peculiar fatal accidents—men being electrocuted on 110-volt lines removing light bulbs, and things like that. You cannot prevent such accidents by means of guards. Only through a continuous campaign of education, I suppose, will we come to a point where we can get all of our men to think in terms of safety, so they will see danger in practically everything, and stop and think before they act.

A MAN IS SAFE AS HE WANTS TO BE, AND NO MORE

So far as I am personally concerned, I am not bothered about the problem of safety, because I really do not see much of a problem in it. A man is just as safe as he wants to be, and no more, and a plant is just as safe as it wants to be; it entirely depends on the standard they set for themselves. If we were satisfied, as we were years ago, with a record of having a couple of men killed every year, you can be assured that you are going to have just that many men killed, on an average, every year. On the other hand, if you say to yourself that you are going to cut out the accidents, you are going to do it sometime; it may take time, but you are going to do it.

One thing has impressed me quite forcibly lately, a lack of discipline in connection with safety—possibly it has more to do with our condition than we think, this lack of discipline. If a rule is issued not to do this, that or the other thing, and if that rule is violated, something must be done about it. A rule that is not enforced is a bad thing.

During a no-accident campaign at one of our plants they had only one accident; one of the foremen stepped on a nail and did not report it. He lost thirty days through blood poisoning. If one of the foremen does a thing like that what can you expect of the men? Because a man has been with us a good many years sometimes it is difficult to penalize him, but there ought to be a way by which the men can be impressed with the fact, if it is a rule to report all accidents as soon as they happen that that rule must be lived up to.

IMPORTANCE OF GOOD HOUSEKEEPING

Housekeeping and plant condition have much to do with accident prevention and I am glad to say that Mr. Moeller's plant down in Texas is one of our best. It is a pleasure to go there and see the flowers and the grass and everything kept in good shape. That impresses the men favorably and removes a lot of hazard; it is efficient in itself because the men go about their work in the way they should.

We have all had our troubles with safety committees and in discussing the problem to-day it seems as if we are still in doubt as to what such a committee should be and the work it should do. I have attended a good many safety committee meetings at cement plants all over the country; some of them have been excellent, but others have not been so good. In so far as the committee is concerned I believe we have used a wrong term when we call it a safety committee. The committee should always be composed of men who know more about that particular problem than anyone else—that is why the committee is formed, to gather information to be later distributed to the rest of the people in the organization. The idea of the safety committee of years ago was for a group of men to endeavor to find all the dangerous places in the plant and to suggest remedies to correct them.

DON'T WAIT FOR MEN TO COMPLAIN OF UNSAFE CONDITIONS

If the recommendations offered by the men were not carried out the work lagged and died. As far as guarding is concerned, I do not believe

it is necessary to ask a committee to tell you what to do about your plant in a mechanical way. It is the superintendent's and the foreman's duty to have the plant in such shape that no workman can find a reasonable fault with it. In a few cases workmen will be able to suggest new guards, even in a well regulated plant, but not often. I would rather have the committees referred to as safety schools or something to that effect, and instead of asking the men to tell you what to do I would rather have you tell them what they should do. Educate them and tell them how accidents happen, not only at your plant but at other plants. For instance, in the last year and a half we have had eleven electrocutions. What do you think of that, eleven electrocutions? They were not all due to carelessness; ignorance played a part for the reason that a good many people have not the slightest idea of what electricity really is. They know that when they push in a switch the motor starts to run, but that is as far as they go. To such a thing as an ordinary light bulb they do not give the slightest attention; that is not only true of workmen but holds good generally. Anything less than 440 volts is not considered hazardous, but every year people are killed with 110 in bathtubs, laundries and in other places where there is a good ground—it is just as bad as if they were struck by 3,000 volts.

KEEP EMPLOYEES POSTED ON WORK ACCOMPLISHED

We make a mistake in not keeping our employees posted on what is going on. Ask one of them, a foreman if you like, how many accidents occurred in the plant last year and how many days' time was lost. I will guarantee that you will receive few correct replies. You cannot expect much interest unless you give them all the data available—the more you put on the bulletin board the better. Keep your men posted on what occurs in their own plant, that always interests them more than the doings somewhere else. Tell them how many accidents they had last year, how many each month this year. They should have this information and it is surprising how little of it is broadcasted among the employees.

Information of this nature leads to educational work in which we are all deeply interested. It also serves to develop latent talent in the plant and to bring forward the men we are anxious to interest in safety work. In one of our plants we have an expert showcard and bulletin writer in the person of Mr. Uhlman. His bulletins are splendid and he has also built up a safety museum out of old tools and odd things he has picked up about the plant. Mr. Reninger's poet is another example. Mr. Ross is handy with his camera and Mr. Carmichael, out at Riverside, is getting out bulletins 100 per cent better than any we can buy.

NEW MEN WILL BE HURT UNLESS CAREFULLY INSTRUCTED

In so far as our work in the future is concerned and the results we can expect, this will depend entirely on the work that we do and the enthusiasm that we show at this time. We are going to get out of this activity just what we put into it. We must give the work our constant

attention, and don't forget the constant, because new employees come into our plants practically every day; in the course of a year some companies have a labor turnover of about 100 per cent or even more. That does not mean a change of the whole personnel, the turnover may take place in possibly only 25 per cent of the force, but those men are liable to get hurt, and it is up to the men in the plant to tell the newcomers what is expected of them in so far as accident-prevention work is concerned.

MR. JOSSE: I would like to ask where you got your man-hours?

MR. JACOBSEN: In January we sent out a questionnaire asking for this information. The man-hours cover the entire year, because we use all our accidents for that period. A shutdown is sometimes worse than an operating period, although not so many men are working.

DISCUSSION

CHAIRMAN TAGGE: Mr. Jacobsen has suggested a great many things; enough to keep us talking all day. He probably knows more about accident prevention than any other man in the cement industry. He touched on one point rather delicately, I think, and perhaps I am in a better position than anybody else to go into it a little deeper—that is, safety work going to the head office. That is where it should go. It is no secret in the committee on accident prevention of our association that it is much easier to convert the workmen at the plant than it is (sometimes) the superintendent, and much easier than it is the fellows in the head office. I know it is so in our organization except for one or two men in the office through whose hands the reports pass for tabulation and record. Aside from that, the accident condition of the plant does not come to the executive. Not so very long ago I was speaking to our president about a very serious accident in one of our plants; I supposed he knew all about it and was surprised to find that he had not heard of it although it happened a week before. Executives are not callous, although it is popularly supposed that they are only interested in the money end of it. They are anxious to prevent accidents and our accident work should be placed just as prominently before the head office as our costs. We have recently started a system of putting the accident record on the cost sheet. Executives study these sheets and if you place your accident record on the same sheet in the same place with your cost record they cannot help but see them and you will be doing something in the right line.

ENFORCEMENT OF SAFETY RULES IMPORTANT

One other point, the enforcement of the rules. We have a lot of posted rules about crossing over cars and the like. I think one reason for the rules is that foremen want to wash their hands of responsibility. They say: "We told him not to do that and if he does it in his work he should take the responsibility." I think it is just as serious, from the standpoint of plant discipline, for a man to violate a rule and get away with it without getting hurt as it is for a man to violate a rule and get hurt. The rules should be enforced.

WEDNESDAY MORNING SESSION

CHAIRMAN RENINGER: The first thing on our program is a discussion of electrical hazards.

DISCUSSION OF ELECTRICAL HAZARDS

MAJOR HENRY A. RENINGER, SPECIAL REPRESENTATIVE, LEHIGH PORTLAND CEMENT COMPANY, ALLENTOWN, PA.

A great majority of cement plants are in far better condition today than they were previous to 1915. Much of the equipment furnished by the various electrical companies is now provided with safety devices which eliminate many of the accidents which occurred some years ago. Most of the electrical apparatus is operated at less than 550 volts; however, a great many of the plants are using high voltages from the central stations and transforming it to their required voltage. In general, the higher the voltage the greater the protection necessary. I am afraid too little attention is paid to the lower-voltage currents, leaving many of the 110-volts contact points bare. Serious and even fatal accidents are recorded from 110 and 220 volts. One hundred and ten and 220 volts hitting a man when he is overheated and wet with perspiration, or where the floors are wet or damp, have proved fatal to men with weak hearts. Too much care cannot be paid to the placing of men on electrical work; they should be in good physical condition.

In cement plants, where we have the hazards of dust and dampness always with us, it is very advisable to place electrical machines, transformers, etc., in separate rooms and enclose them entirely and ample space should be allowed around these machines so that all conductors are easily accessible. All railings, platforms or any guard of metal construction should be permanently grounded when near electrical apparatus. Where apparatus has been placed in a separate room, the doors should be kept locked and every precaution taken to keep men unfamiliar with this work away from the machinery.

ALL WIRES SHOULD BE REGARDED AS ALIVE

The question of repairing electrical apparatus and wires is one which causes considerable trouble. All wires or machines, of whatever voltage, should be "killed," if possible, and under no circumstances should any repairs be made on live equipment carrying 2,300 volts or higher. The best instruction to give all men repairing electrical work should be that all wires are alive. Any switches which are thrown out for repair work should either be locked or tagged and no one should touch them except the foreman of the repair gang. The rubber shields for men working on poles or around wires should be used at all times, and all tools, such as screwdrivers, wrenches, pliers, etc., should be insulated before being used.

Hand Lamps.—When using hand lamps men frequently work in close places, often overheated, their bodies are moist by perspiration or dampness, and offer very little resistance to the flow of electricity. Fatal accidents have occurred from 110 volts under these conditions. All portable lamps should have armor cable with a fibre guard and handle.

For linemen the combination tool and safety belt should be used at all times. Rubber gloves are also a protection. Good shoes, waterproof if possible, with rubber soles and heels are always a great protection to men working around electrical apparatus.

In regard to lighting around the plants, electrical codes of the various states take care of this problem. The disconnecting arc lights are probably the best to be used around cement plants, for they are easily accessible for cleaning.

In regard to generators all of the moving and live parts should be guarded against accidental contact. This can easily be done by enclosing the rotary and exposed parts of the shaft by wire guards.

Grounds.—The current-carrying capacity of ground wires should be big enough to trip breakers, instead of burning at the grounds. No switches should be placed on ground lines. All metalwork in the vicinity of alternating ground circuits and conductors should be permanently and effectively grounded. All grounding connections should be as short and direct as possible and should be tested frequently to know that they are in working condition.

PROTECTION FOR SWITCHBOARD MEN

Switchboards.—All switchboards should have rubber matting in front of them and ample space so that a man can move back and forth without coming near the board. In the rear of the switchboards ample space should be allowed for a man to walk about without getting near any of the wires. The rear should be enclosed to keep out all except those men who are needed to work on the board. Exit should be provided at both ends, gates to open outward. Insulating covering, such as rubber matting, should be provided on the floors in the rear of switchboards. This covering may be laid on any good floor where the switchboard voltage is 2,300. Where the voltage is higher, insulated platforms should be used first and then covering. Cork carpet, linoleum and rubber matting have proven satisfactory insulating covering.

Fuses.—Open fuses should not be used. Another bad practice found in cement plants is the use of ordinary wire or nails in place of fuses between the terminals. The various new types of safety switches and fuse boxes have eliminated a great many electrical accidents; these boxes are so arranged that when they are open the switches are cut out and fuses can be replaced without danger. The question of switches, fuses, wiring, etc., is very well taken care of in the requirements of the National Electrical Code and the various lighting codes of the states.

KEEP UNAUTHORIZED PERSONS AWAY FROM EQUIPMENT

Transformers.—Transformers should be placed in a separate room and kept locked; however, we find a great many transformers set out in

the open. In this case all transformers should be protected with a high fence which will keep out all persons. Signs should be placed on the fences cautioning persons against the danger of electricity and warning them to stay away from the transformers.

With all the protecting devices which are now being placed throughout industrial plants we believe that education is far more necessary than guards, and we wish to impress upon all company officials that education of the foremen and the men should not be neglected. Signs should be used where possible and general talks on the hazards of electricity should be given to the men by officers or members of the electrical department or others thoroughly familiar with the subject.

All repairs should be made by the chief electrician or one of his men, and no employee allowed to make repairs around electrical machinery unless he is a member of this force.

One other thing of vital importance is the training of men in first-aid work. The electricians and foremen should be thoroughly familiar with the Schaefer method of resuscitation. Even though the plant is equipped with lungmotor or pulmotor, very often valuable time is lost in getting this apparatus to the scene of the accident and men should be instructed how to remove men coming in contact with live wires. Use the Schaefer method of resuscitation; many a life has been saved through prompt action.

DISCUSSION

MR. JACOBSEN: In practically all the reports I have received I am led to believe that a great many accidents could be prevented by the use of guards. We have new reports reading "Coming in contact with open switch, coming in contact with this or that electrical equipment." Evidently the equipment is so placed that a man can easily come in contact with dangerous conditions. Possibly if the switch was placed higher on the wall, or something like that, a guard would not be necessary, but I have seen a good many switches that were not placed high enough and were entirely open. If our members would give thought to the placing of such equipment as well as guarding it a good many of our accidents would be prevented. Possibly guarding may not be necessary if the equipment could be changed a little and not placed in such dangerous locations.

MR. HUCK (Canada Cement Company, Belleville, Ont.): The employees in the plant and not the electricians are the ones who have the most trouble. Our last serious accident occurred the 6th of last July; we have had several minor accidents but they were employees of the department. I am a strong believer in guarding such equipment. One reason is because electricity is invisible. Low voltage is dangerous as well as high voltage; all the accidents that have occurred in our plant are on low-tension lines, so it is evident that low-tension wires and low-voltage equipment should be guarded as well as high tension, because employees think that a 110-voltage is not dangerous. A short while ago I saw a fatal accident happen on a 110-volt current.

TEACH MEN TO BE CAREFUL ON LOW-VOLTAGE WORK

CHAIRMAN RENINGER: I have come to the conclusion, so far as our plant is concerned, that it is important to guard 110, 220, 440 voltage wires. Where you have 22,000 or 33,000 volts the men are afraid and will not go near them, but they are not afraid of the lower voltage.

MR. JOSSE: All of our committeemen should be familiar with the Schaefer system of resuscitation. A knowledge of the method proved of value in our plant a short time ago when an accident occurred to a man putting up conveyors. It had been raining and the 440-volt line to the dryer motor, 42 inches away and right on the wall, had become damp and one of the men happened to touch the wires. He had been told not to do so, but he thought he would try it. Then another fellow tried it and it knocked him down—he was out an hour and ten minutes. In a few minutes we were working on him with the Schaefer system; we also telephoned a chemical company in our vicinity and they came with a pulmotor; we had artificial respiration going right away. As a result he is well and hearty today. It is well to be prepared for emergencies.

TEACH FIRST-AID MEN PRONE-PRESSURE SYSTEM

MR. CARMICHAEL: I fully endorse what you say regarding the Schaefer system. We had received instructions through the Bureau of Mines and have a man down once a year to put our new men through their paces. I am trying to get other men in the plant to learn the first-aid system because in innumerable cases we have been able to save lives through the efforts of our first-aid staff. I do not favor a pulmotor because an expert operator is not always available and the machine may get out of order, whereas the Schaefer method is always available and will pull a man through if there is a chance for his recovery.

We had one man electrocuted because of pure, unadulterated carelessness. There was a pipe kiln about four feet away, and he took his air hose and was blowing the dust off, evidently thinking about something else, when the hose caught on the electric wire. He was dead when we got to him. Since then we have wired clear up to the top, so there is now no possibility of getting the hose caught at that point.

MR. BREWER: I have yet to see a bulletin, or other suitable information, regarding getting a man away from contact with a wire after he has been caught. Has anyone practical information on that subject?

MR. JOSSE: Most of our troubles are from switches; we do not have much pole work. Electrocutions usually occur when line men get caught on a wire. We never had a man caught on the wire, because all our wire work is done by outside men; I presume that is the case with most plants.

MAKE INSTALLATION AS NEARLY FOOLPROOF AS POSSIBLE

MR. REID (Bureau of Safety, Chicago): The problems of accident prevention in the cement industry are not materially different from those in the electrical or other industry; there may be differences in detail but the principle is the same.

Your electrical problems are exactly similar to the ones we have in our stations, sub-stations, ice plants and so on. First, the problem is to have the equipment installed in such a way that the employees cannot come in contact with any live part. To use a somewhat wornout expression we attempt to make it foolproof, but that is not always possible; so the next problem is to educate our men to a wholesome respect for an electric current whether of 33,000 or 110 voltage.

If you read the paper this morning you noticed that a man was killed in this city yesterday by a motor—the same sort of motor we use in ice plants and you use in cement mills. Yesterday a man in Chicago was killed on a 220-volt line. During the year 1921, and so far this year in the cement industry, eleven people have been killed by electric currents. We have no way of knowing how many lives might have been saved if there had been some person present who knew how to apply the prone-pressure method of resuscitation. Two or three or more of those lives might have been saved, but if only one it would have been worth while and paid for the effort and time necessary for every committeeman who works for the company to be properly instructed and trained. It is essential that every industry have its first-aid equipment and instruction in the Schaefer method should be the most important part of it.

If a man receives a broken arm or leg he is not likely to die before you get him to a physician. It is highly desirable and important that you have somebody at hand who knows how to straighten out the broken leg and tie a board to it to relieve as much as possible the man's pain until you can get him to a hospital or a physician. That is perfectly proper. The same is true with a broken arm or a cut and almost anyone of ordinary intelligence knows what to do in case an artery is cut. With a little training of your first-aid teams everyone in your plant should know what to do in a case of that kind, but most electrical, drowning or asphyxiation cases result fatally because by the time you get the man to a hospital or call a doctor it is too late to do anything. I never knew of a man dying from a broken leg or arm unless infection set in and you can usually take time enough to get the patient to a hospital, but in cases of electrical shock or suspended respiration, you must act at once if life is to be saved.

FIRST-AID MAN WORKED THREE HOURS

I know one man that came into contact with a 33,000 volt line. Of course he was knocked out, but there happened to be a first-aid man available who knew how to apply the prone-pressure method of resuscitation. That method was applied for three hours and twenty minutes before the injured man showed signs of life, but today he is as strong and healthy as ever and is one of the managers of our property. The only thing he has to show for the experience is a slight scar on one of his fingers. We have had men killed on a 2300-volt wire, we have had others killed on 440, on 220, and even on 110, so we teach our employees to have a wholesome respect for all electric currents, without regard to voltage.

In the event someone should come in contact with a live wire or live equipment, of course the first thing to do is to get him away from the

thing that causes the shock. You want to do that without injury to yourself. It is certainly a mistake to get between him and the ground. If it should happen to be a wire, which it frequently is, and you don't have any rubber gloves or insulated boots or shoes on, and you are not likely to have those, you can make use of a board or some other non-conducting material to knock the wire out of his hands. Sometimes it is necessary to use drastic methods to get the wire away. Two important items are speed and good judgment so as not to endanger the life of the rescuer.

HOW TO ACHIEVE ARTIFICIAL RESPIRATION

Cement people are like other folks in the safety movement; your interest in safety does not end when you leave the plant. Sometimes an opportunity comes to save life entirely away from the plant and having no connection with it. It may be a member of your own family, a neighbor or an entire stranger, but such occasions do arise when you can save life, and the thing is to know how to do it.

We won't waste time discussing the merits or demerits of any mechanical device. If mechanical devices for artificial respiration will do everything claimed for them, they would still be at a disadvantage as compared with the method we are about to demonstrate in that they are usually not immediately available. Many instances have happened where a mechanical instrument was sent for and when it reached the scene of the accident it was out of order; in some instances there was no person present who knew how to operate the device, and so it has been decided, after thorough research, investigation and experience that the best and most practical method of artificial respiration is the prone pressure method. This requires no equipment other than the hands of operator; there is nothing to get out of order and it can be used anywhere at any time.

THE DIAPHRAGM IS THE CHIEF ORGAN OF RESPIRATION

When a man gets an electric shock the nerves that control the diaphragm are paralyzed, it ceases to function, and the patient smothers to death. If you want to know what it means for a person to be deprived of air, just take out your watch and try to hold your breath for three minutes—then you will appreciate what a person is up against who has met with an accident which interferes with or suspends his breathing.

WORK TILL RIGOR MORTIS SETS IN

In case of an accident of the nature under consideration our first duty is to remove the patient from the cause of the shock, whether it be water, gas, dust, electricity or other cause; the second duty is to get air to the lungs of the injured man. Remember, quick action is the first consideration. See that there is nothing in the mouth to interfere with breathing (such as false teeth or tobacco) or anything that might get back into his throat. Then lay the patient flat on his belt and stretch his arms out over his head; then lift the left arm and put it under his forehead, to keep his head up off the ground. Loosen his collar and take it off quickly. Then straddle his thighs and push down on the lower ribs, just like pushing down on a pump handle. Don't put the pressure on the

small of the back, but at the end of the ribs, just as far out as you can without the hands slipping off. That forces the stomach, liver, kidneys, spleen and so on up against the diaphragm; the diaphragm comes up against the lungs and increases the pressure on the upper part of the chest. This forces the air out of the lungs and then you release the pressure on the ribs, they fly back into normal position like a piece of spring steel and the organs come down into their normal position; that creates a vacuum and the air follows. Keep that up twelve or fifteen times a minute; the normal man breathes about that often and we do not want to work faster than that.

There are four things to be kept in mind. 1. The position of the patient. 2. The position or posture of the operator. 3. The mode of operation. 4. The length of time required and the rate at which the pressure is applied.

As to the length of time that you should work: Sometimes we are instructed to work for an hour and a half, others say work two hours; again we are told to work at least one hour. There is just one rule as to length of times—work until the patient recovers or *rigor mortis* sets in. Do not bother about the clock; there is a life to be saved, if possible, and until the rigor of death sets in there is always a chance. Over in New Hampshire we had a case of gas asphyxiation; the doctor said the patient was dead but to take him to the hospital anyway. I had given instructions on resuscitation and a first-aid man had started work on the case promptly—he had been working half an hour when the doctor arrived. He thought the patient showed signs of restored respiration when the ambulance arrived so he got in and started for the hospital with the patient. He worked on the man while on the way to the hospital and after they arrived there. In all he worked more than an hour and a half but the patient recovered and in three or four days was back to work. Knowledge of the prone-pressure method and persevering work saved the man's life.

PRONE-PRESSURE, SIMPLE BUT EFFECTIVE

A somewhat similar case occurred in Texas, as the result of an automobile turning turtle. A young fellow was caught underneath and it was four or five minutes before he could be released. He was held down in such a way he could not breathe but the prone-pressure method was applied and in a short time he recovered, although to all appearance he was dead when taken from under the machine.

The method is simple and I will demonstrate it for you. It has proven successful in more than forty cases, in our own company, resulting from electric shock, drowning, gas and other causes for suspended respiration. (Mr. Reid demonstrated the Schaefer method with Mr. Jacobsen as patient.)

First stretch the patients' arms out, beyond his head, bend the left arm up under his forehead, to keep his nose off the ground—this is the proper position for the patient. The next thing is the position of the operator. He straddles the patient's thighs below the pockets, so that

the weight will be over the lower ribs. Then apply the pressure on the ends of the lower ribs with the heels of your hands, coming forward and pushing down slowly to give the air a chance to escape from the lungs. Then release the pressure (it is better to entirely remove hands from patient's body), allowing the lungs to automatically inflate themselves. Continue this, alternate pressure and release, at the rate of about fifteen times per minute until normal breathing is restored, or until rigor mortis sets in. This system has been endorsed by some of the most eminent physicians in the world.

MR. CARMICHAEL: Would it be proper to change operators?

CHANGE OPERATORS WHEN NECESSARY, BUT STICK TO WORK

MR. REID: That is one of the things you should practice doing, you can do it easily without losing a stroke, because you have four seconds between the downward pressure and the release. It is often done where you have two or three men and it is proper that it should be done in that way.

MR. SPENCER: We were instructed not to remove the hands from the patient's body, the idea being that you might come down too heavy on the man's body and injure him.

MR. REID: We have had only one instance of an injury to the patient on account of the pressure and that was where the pressure was improperly applied. The man had fallen and two ribs were broken below the shoulder blade; the operator got the pressure too high and shoved one end of a rib through the man's lungs. We have no case on record where anyone was injured by the prone-pressure method of resuscitation when properly applied. Come down slowly; be careful about jerking. Give the air time to come out; it takes some time to inhale and the same length of time to exhale.

In the event of a person apparently dead from drowning, the first thing is to get the person's body higher than the head, so the water will run out; then work on him as in the case of electric shock, as with gas asphyxiation, or when a man gets a blow on the stomach that knocks him out.

MR. MOORE: How is the method applied when a man's mouth and nose are filled with cement dust?

MR. REID: It does not matter whether it is water or dust, air or smoke; the first thing you do is to force the air out and that has a tendency to clear the throat and mouth. However it is well to clear the mouth of any foreign substances, tobacco, chewing gum, etc., and if necessary pull the tongue out of the throat. I do not know of any other method.

MR. JOSSE: If a man is covered with cement, naturally he has taken into his mouth and lungs all the dust they will carry. I have seen but one man in that condition, but his mouth and nostrils were filled with cement, my opinion is that his lungs were filled also.

MR. REID: Not necessarily, there would be some, but the little valve that closes the air passage ought to prevent any such condition.

MR. JOSSE: You think this system would be effective for that kind of injury?

SYSTEM EFFECTIVELY USED IN CEMENT INDUSTRY

MR. REID: Whether it is an electric shock, drowning, gas, or the thing you have in mind, neither the doctor nor the layman can tell for a certainty whether or not there is hope. The obvious thing to do is to give the patient the benefit of the doubt and work on him until you are absolutely certain there is no hope.

MR. R. B. INMAN (United Gas Improvement Company): Three or four months ago one of our men was smothered in what we call coke grease and in all my experience in artificial respiration I never observed a case where so much dust passed the epiglottis—the minute any foreign particle touches it the nervous system that controls our involuntary muscles comes into action. If you tickle a man with a feather the epiglottis immediately closes and shuts off his breath—nature is doing its protection work. The little hairs inside your nostrils prevent much dust passing and the membrane in the roof of the mouth also has a duty to perform—if the mouth fills up, as in asphyxiation by dust, there is an excess flow of saliva which causes the accumulation of dust to flow back into the mouth.

It is important to straighten out the tongue, especially in cases of drowning, and to scrape out any mucous that may form in the back of the mouth in cases of resuscitation. There is a tendency toward excess flow of saliva and the green mucous which forms may close up the passage to the windpipe, so use your finger to clean out the mouth and open the windpipe. In our place, in Pennsylvania, we had an absolute resuscitation after five and one-half hours of suspended animation.

Crews from our shops and offices make an inspection of our holdings throughout the country and have organized first-aid teams in each of our plants who are made familiar by talks and practical individual demonstrations with the Schaefer method of artificial respiration.

One of our linemen, working on a roof in Charleston, S. C., came in contact with a 13,000-volt line. He was apparently dead, but his helper had been instructed in the Schaefer method of resuscitation and immediately started to work. Our plant physician was called and soon arrived with a pulmotor. The doctor opened the wall of the man's chest and massaged his heart muscles. The man is alive and working at this time. The first and biggest thing is to get on the job immediately and apply the Schaefer method.

MR. REID: I am glad you emphasized what I said about clearing out the man's mouth. So far as the tongue is concerned, the instructions used to be to pull the tongue out and hold it with a nail or a pair of pliers, but we have almost ceased to do that as it is seldom necessary.

MR. JOSSE: The Union Electric Company of St. Louis lost a man about a year ago. He was electrocuted touching a live wire. Two men were applying first-aid when the doctor arrived, but he stopped their work, rang for an ambulance, and took the man to the hospital, where he died. Since then both the Union Electric and the Laclede Gas Com-

pany have given instructions to let nobody take a patient that has been electrocuted away from the first-aid man until the proper officials arrive.

CALL A DOCTOR—IN THE INTERUM PRACTICE FIRST-AID

MR. INMAN: That seems very well, and possibly it is the proper thing to do, but if a man dies his family might file suit for damages and there is always the possibility of your man being held for manslaughter, if you get a jury who are just of that turn of mind. The medical profession are in a position to say, if a man dies, that it is the result of natural causes, but if a layman assumes charge of any case, and the man dies on his hands, there is the possibility of serious complications, although you have been doing all you possibly could to save his life. I am quoting my actual experience.

MR. REID: We have had that matter up before our legal and medical departments and after all phases of the question were considered it was decided to issue the above instructions; we have not had any trouble so far.

Different kinds of masks have been recommended as being suitable for the gas industry, and also in ice-making plants. They are shown in the exhibit-room and the men in charge, no doubt, will be glad to give you all the information possible.

MR. JACOBSEN: The main trouble is getting your men to wear any kind of respirator and the one that suits a man is the one to use. We have had a good deal of trouble in that respect as well as with goggles. A good many men prefer to wear a handkerchief tied over their mouth with a piece of cotton inside; something like that. It is almost impossible to prescribe any certain kind of respirator or goggle.

MR. REID: I hope when you gentlemen come up to the Congress in 1923 you will give us your own experience and that you will not have to report eleven people were lost from electrical current during the year.

CHAIRMAN RENINGER: I want to thank Mr. Reid for his very instructive talk. We have learned a great deal and are appreciative. We are all rather negligent in instructing our men in the Schaefer method. (A rising vote of thanks was tendered Mr. Reid for his talk.)

MEN WORKING IN GAS SHOULD NEVER BE LEFT ALONE

MR. INMAN: We have first-aid crews in our office and shops and make periodical demonstrations. About two and one-half months ago we had a meeting at our Chamber of Commerce and gave a practical demonstration in artificial respiration. Three days afterward one of the men who had attended the meeting resuscitated his mother who had been overcome by gas. This young fellow had taken such an interest in artificial respiration (it was his first meeting, too) that he was able to save his mother's life. It is not only important to instruct your men regarding first-aid or resuscitation methods about your plant, but to impress upon them that the knowledge can be used in many ways and at many times in saving life.

We have dust hazards and the electric hazards in almost every plant. Men should never be allowed to work alone in gas-laden atmospheres.

If we have a man working in gas, we always send a man with him, so if anything happens he can either render help or go for assistance. In one of our plants is an ammonia tank and a man started to clean it. He opened the manhole cover, climbed into the tank and was overcome. Another man, wondering why he stayed so long, climbed into the tank to look for him. In all, eight men went into that tank; then another came along with an open head torch and exploded the gas. One of the eight men was killed, but the other fellows were saved. The first man was at fault in not seeing that his helper was properly on the job and it is to prevent similar accidents that men are detailed to work in teams wherever there is gas. The same precaution might be taken in certain classes of high-tension electrical work.

INTEREST EVERY MAN IN PLANT IN SAFETY WORK

CHAIRMAN RENINGER: These talks have impressed us forcibly as to the great value of the prone-pressure method. We have a few trained men at each plant, but it would be much better to have hundreds. I, for one, will try to impress on my people the value of the system as an aid to the plant physician and to the men.

MR. H. F. COOK: I am interested in the electrical industry and we feel that the prone-pressure method is the best. Our instructions come from the safety engineer and every man in our plant must familiarize himself with the method. We have stations, sub-stations and distributing stations and he told us, when we were first instructed in the prone-pressure method: "I want all of you to become thoroughly familiar with it. I don't want to pick out any one or two men, I want every one of you to understand and be able to use the system." As a result every permanent man in our plants are acquainted with it. We have had only one or two electric shocks in the last three or four years. One was a 50,000-volt shock where the man was knocked out, but brought back under the prone-pressure method. He lost a part of his hand, but he is living.

KEEP INEXPERIENCED MEN AWAY FROM FIRST-AID CABINET

MR. BREWER: We want to locate a steel-incased first-aid kit in the foreman's office. I would like to have the name of one that would be practical. (The information was supplied.)

MR. INMAN: Every company should have one or more teams instructed in first-aid work and care should be exercised in selecting the men as serious results occur when men attempt the work who are not well posted. I know of one case where a man tried to help one of his fellows who had received a slight eye injury. He had seen boracic acid used but through his ignorance he poured spirits of camphor in the eye in place of the proper remedy. The poor fellow was unable to see for several months. Unless men are carefully trained keep them away from the first-aid cabinet. Whenever possible call a doctor.

CHAIRMAN RENINGER: If you have an accident during the night shift, and there is a dressing put on, does that man report to the doctor the next day?

MR. BREWER: The man calls the chemist, if the accident warrants it, and the report is made to him. The next day we get a report from the foreman.

CHAIRMAN RENINGER: It is our rule, if a man has a slight injury, to send him to the chemist for a dressing; the chemist is thoroughly capable of handling any ordinary accident. Our doctors visit the plants at different times; some plants are visited every day and others on alternate days, depending on the size and nature of the plant. If the doctor goes to the plant at 11 o'clock in the morning, and a man gets a cut at 8 o'clock, the injury is dressed by the chemist, but at 11 o'clock he sees the doctor. If the injury happens after the doctor leaves, the man must report to him the following day, but he must have the doctor look at the injury, no matter how slight. We try to enforce this rule; the men have been educated to the fact that they must see the doctor, and the doctor makes out the report.

MR. BREWER: About a week ago a man came to the first-aid room; he thought he had a bit of emery or steel in his eye. The doctor looked in his eye but found nothing. The man went home and his wife must have had good eyesight because she found a speck of steel was in the eye. The man returned to the plant and the chemist removed the trouble. Sometimes these things are hard to locate.

MR. JOSSE: The way to handle an eye case is to send the patient to an eye doctor. This is our practice.

CHAIRMAN RENINGER: Every insurance company issues such instructions.

MODERN PLANTS RARELY SUFFER DUST EXPLOSIONS

CHAIRMAN RENINGER: The rest of our time will be devoted to a general discussion. Now is the time for questions.

MR. JACOBSEN: I have been talking about our absence of accidents, but just prior to the starting of this meeting I was notified that one of our men was killed by a dust explosion, the first in two years. We have been remarkably free from coal-dust explosions and I believe it is almost entirely due to the attention our various plants are giving their coal houses, so far as cleanliness is concerned. Once in a while we are bound to have a little trouble, but it is generally a flare and not really called an explosion. It does not make much difference whether a man is hit by a flare or explosion if he is hit. I wonder if it would not be possible to almost entirely eliminate the danger of coal-dust explosions if we really set about to do so? I have seen coal houses which it is possible to visit with a new straw hat and white flannel pants and come out without being particularly dirty. On the other hand, I have seen coal houses where I have actually been afraid to stay for any length of time—in one there was not less than three inches of dust over every platform and stair, on the floors, beams, and every place it was possible for the dust to lodge, and on the ground floor they had three salamanders going. Three years afterward I again visited the plant; the three salamanders were still going, but they had never had an accident—it may be due to the particular kind of coal used in that place. If any other plant;

with a different coal, had tried that stunt, they might have found themselves without a coal house some day. Very deplorable accidents occurred years ago, due to coal-dust explosions; in one case thirteen men were killed; and in another eleven. That was long ago but lesser accidents occur from time to time. Recently we have had very few fatalities from this cause, but there is a real hazard there—the worst in the cement industry.

I am more afraid of coal-dust than I am of dynamite, for the reason that men working in coal houses, generally, do not consider coal-dust as dangerous as they do dynamite. Everyone knows that dynamite is dangerous and realize the dangers connected with it; coal-dust sounds like something harmless, but is not so. The trouble is mostly due to uncleanness, and uncleanness is due to negligence. There is no good reason why a coal house should be as dirty as it often is. When you see elevators and conveyors practically open and dust flying out in spurts you know conditions are wrong. The remedy is not only an efficiency but a safety problem.

NEW TYPES OF EQUIPMENT ELIMINATES DUST

MR. JOSSE: We have installed recently a new coal house where there is absolutely no dust. We are using a 46-inch Fuller-Lehigh mill and pump. The mills have a suction device and instead of the coal flying out of every little crevice it is retained. The coal is taken in a conveyor to a cast iron pump in which there is a five-inch pipe. The screw carries the coal to the air, and the air takes it on the same principle as you blow it in your kilns. That gives you an absolutely dustless coal house. It is not possible, with some of our old equipment, to have a dustless coal house, regardless of what you do. We packed our elevators with felt, but we had dust just the same.

We had a man killed by a flare. What happened was this: When this flare came it ignited the man's trousers and he died from the effects of the burns he received. Coal is a real hazard, especially when using the high-gas coal coming from Kentucky and West Virginia. Illinois coal is pretty hard to light under any condition.

MR. A. GILLIES (St. Marys Cement Company, Ltd., Canada): We have a certain amount of trouble with coal-dust in our plant and, this last year, installed a pump system in connection with a 32-inch Fuller mill. We still get some dust; we encounter some difficulties in the conveyors, in the discharge end plugging up with coal, which requires repacking twice a day; even then there will be coal through the bearing.

MR. JOSSE: We took our pump apart, after running it two months, and there was not a particle of coal in the bar; the bearing even had the tool marks on it. They showed the bearing to us after the pump was installed, and there was no dust on it. You get the new style of bearing and no dust will come out of the pump; you will have no trouble. We have speeded up our pump to 1,100, to take care of six kilns, and we are getting another pump for an auxiliary. The pump carries about twenty tons in an hour.

HAZARD CAUSED BY OVERFLOW OF TANK

MR. INMAN: Dr. Harold H. Brown of Massachusetts, formerly connected with the Department of Agriculture, made a very exhaustive research on the subject of dust explosions. Last year, at the Congress, he gave a very interesting talk, accompanied with demonstrations. I think you will like Dr. Brown's paper.

CHAIRMAN RENINGER: Wasn't it Dr. Brown who said that everything in the world would explode?

MR. INMAN: Yes, he exploded rice, flour, sugar, wood, oatmeal and dust.

MR. TAGGE: We had a fatal accident in one of our kiln rooms recently; it was just a little different from what we are talking about, but no different, probably, from what some of you have encountered. There was the usual arrangement of tanks in front of the kilns, and screw conveyors above feeding into the various tanks; each having a gate to regulate the amount. The whole arrangement is well kept up, well designed, and I do not think we could be accused of carelessness or sloppiness in connection with it, except there is this weakness about it: The coal goes into Nos. 1, 2, 3 and so forth; in this case it is No. 17, and it is No. 17 tank that does not get enough coal, usually. A man is stationed up there on a concrete platform with railings, and it is his duty to distribute the coal to the different tanks. This man evidently went to sleep on the job, the tanks filled up and No. 17 overflowed. The evidence of his having been asleep was in the fact that there was a great accumulation of coal that overflowed from the tank onto the concrete platform, even over a little guard along the platform—this must have gone on for an hour or more. The dust was carried down into the kiln room and the draft carried it eventually into the kiln opening; it ignited and there was a flare. The man was burned to death.

There is a hazard right in the kiln room, aside from the danger of an explosion and we are trying to overcome it by an automatic alarm in the last tank which will show when it is filled to a certain point.

MR. JOSSE: We have purchased automatic shut-off valves and when they are installed on the pump it will do away with the human element. When the last tank is filled an electric appliance will throw a switch and your coal house will be shut down. We think the system is entirely reliable. It will overcome the hazard, save money and do away with the personal equation.

MR. HUCK: I think the greatest danger is in the drying of coal; in a great many cases it is dried too hot. That is a cause of fires.

NATURE OF COAL AN IMPORTANT FACTOR

MR. TAGGE: In the old days all coal houses were very dirty and dust was everywhere—the equipment was such that it was impossible to keep them clean. In some of the dirtiest of these houses we had no explosions while in others that were less dusty we had a good deal of trouble. Why was that?

MR. JOSSE: It may have been you had so much coal that you did not have the proper mixture and it did not explode.

MR. JACOBSEN: A question was once asked: Whether it would be better to clean a coal house two or three times a day, and then always have fresh, live coal, or leave it alone and have old, inert coal? There may be something to that. We all realize that the old equipment was difficult to handle, but when we get far enough ahead and can put in a coalhouse like the one Mr. Josse describes—he having practically rebuilt his plant—we will, no doubt, eliminate the hazard of coal dust. Those plants having old houses would do well to be very careful.

CHAIRMAN RENINGER: We have had a very interesting and, I believe, instructive meeting, and I wish to thank the speakers for their excellent papers. The meeting will now adjourn.

Chemical Section

August 29-31, 1922

S. H. KERSHAW, Chairman

Safety Engineering Division, Hercules Powder Company,
Wilmington, Del.

E. J. RIEDERER, Vice-Chairman

Director, Inspection Division, Atlas Powder Company, Wilmington, Del.

G. E. MINSHULL, Secretary

E. I. du Pont de Nemours & Co., Wilmington, Del.

TUESDAY MORNING SESSION

CHAIRMAN KERSHAW: During the early part of the year your officers, in executive meeting, agreed that the policy regarding membership matters should be to give 100 per cent service to the present members, rather than make a special drive with the idea of increasing the total number of memberships at a partial sacrifice of service to present members. Results of efforts to live up to this policy may be seen in the illustrated bulletins (twenty-one in all) which have been published in *The National Safety News*, along with several brief articles on subjects of special interest to the chemical industry. This form of service has been supplemented by the preparation of data bulletins, the first of which will soon appear in the "*News*" under the heading "Centrifugal Extractors."

It has been the aim of your Executive Committee, in preparing such bulletins, to make available to you condensed information on important specific subjects in such form as will enable easy filing for future reference. Bulletins entitled "Carboys" and "Handling Caustic Soda" have also been prepared and are now passing through a course of approval for publication. In addition, eleven other pertinent subjects have been listed and the work of preparing the bulletins assigned to officers of the Section.

Early in the year it was thought advisable to make some distinction between accident prevention and disease prevention matters as dealt with by our Section and an Industrial Poisons Committee was appointed to take up various phases of the latter subject. This committee has done

well by first taking up for investigation and study that time-worn subject "Respirators," about which very little valuable information is available. The results of the investigation, which will be reported to you by the Chairman of the committee during this Congress, should prove of great value to every member.

Some little time ago your Chairman was called upon to represent the Council on a committee of the American Society of Mechanical Engineers, appointed for the purpose of developing a national safety code for the identification of piping systems. One meeting of this code committee has been held thus far with very promising results and a second meeting will be held following closely after this Congress. This is a subject of great importance to the chemical industry.

I would further urge you to make full use of the privileges to which your membership in the Section entitles you. I have in mind especially the fact that during the year we have received but few requests for data on special problems confronting our members. I feel confident that the incoming officers will find it of great help to them in rendering service to know what your problems are and it will serve to bring about a mutual understanding.

Mr. L. A. DeBlois (E. I. du Pont de Nemours & Co.), reported for the Program Committee.

REPORT OF MEMBERSHIP COMMITTEE

MR. KEPNER: Beginning the year we had 123 members and, although the depression was great with some of the chemical concerns, we only lost four. We have, during the last four months, gained three members. Business is getting better and during the coming year we hope to launch an extensive campaign among the few remaining chemical industries that are not members. I will ask each member, some time during the year, to write to some friend in the chemical industry in the interest of our drive for new affiliations.

Some of our members have not gotten the best there is in the Section. Merely being a member of the Chemical Section means little, unless you make use of it. Write to the Chairman or to the Chicago headquarters and the Section will be glad to help to solve your problems. In the campaign for new members feature this service.

APPOINTMENT OF NOMINATING COMMITTEE

CHAIRMAN KERSILAW: I will appoint Mr. Crass, Mr. Vanatta and Mr. W. D. Keefer as a nominating committee.

Our first paper this morning touches the most important safety problem in the chemical industry. We all think of safety work in the chemical plant as dealing with chemical hazards. Mr. Whitman has prepared a paper which throws an entirely different light on this most important subject. As he is not present I have asked Mr. M. F. Crass of the Grasselli Chemical Company, Cleveland, Ohio, to read Mr. Whitman's paper.

SAFE HANDLING OF MATERIALS IN CHEMICAL PLANTS

W. G. WHITMAN, ASSISTANT PROFESSOR OF CHEMICAL ENGINEERING, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The problem of safety in a chemical plant is complicated by the variety of potential risks which are always present. A general classification would divide these into two groups: Those hazards incident to any manufacturing operation and those due primarily to the chemical properties of the material handled. It is rather surprising to note that, under normal conditions, the accidents which may be classed as truly chemical average less than one-quarter of the total. Despite this fact, the severity of injuries in chemical work runs higher than the average of other industries and figures by the Massachusetts Industrial Accident Board indicate a 50 per cent greater severity rating.

NON-CHEMICAL HAZARDS

The popular feeling that chemical work is dangerous is caused primarily by the record of explosions and other catastrophes in plants operated at forced production during the war. The facts justified this sentiment at the time, but under present conditions such catastrophes are rare and the safety engineer classifies most of his accidents as non-chemical.

In view of these facts, why is the workman subject to greater hazards in a chemical plant than in other industrial work? In general there is less machinery to be found there and mechanical accidents, such as occur in mills, are rare. The most logical answer is found in the layout and condition of the buildings and equipment. In many cases the materials handled or fumes from them are corrosive to a greater or lesser degree on any structural material that may be employed. Extreme examples occur in acid manufacture, where the manager may be obliged to practically replace his whole plant every two years. Such conditions invite accidents at every turn, and continuous care and precaution are required by the management and the workman. A guarded belt cannot be left unwatched—in a short time the guard will corrode, fall against the belt and be removed by some workman. Wooden floors and stagings become weakened as the wood and rails corrode, steel I-beams are eaten through, trucks and industrial cars rust rapidly—a hundred things are going to pieces simultaneously. The inherent hazard of these conditions and the accidents which result would not be rated as chemical in nature.

PSYCHOLOGICAL INFLUENCE ON WORKMEN

All this has a marked psychological influence on the workman, particularly if he is unskilled and ignorant. If the most effective way of preventing accidents is by education, the safety man has one of his hardest problems here. A laborer accepts conditions as he finds them—if he must push carboys on a broken-down truck, walk up shaky stairs with broken railings and dodge under unprotected belts, he takes it all as part of the job and his *morale* is materially weakened.

This ever-present problem for the safety engineer cannot be overstressed. It causes the common everyday accident, usually minor, and is never given publicity in newspaper headlines, but a yearly analysis of the accident record shows it in its true light as the major hazard to be eliminated. The treatment—by periodical inspections, foreman's reports and regular upkeep and replacements with new and better equipment—parallels that of any other industry, but the particular conditions require a diligence and conscientiousness beyond the ordinary.

CHEMICAL HAZARDS

Cases—The general principles involved in handling gases are well recognized. Those which are poisonous or disagreeable should be carried under suction to avoid leakage outward, while those which form explosive mixtures with air should be under a pressure greater than atmospheric. In most cases the suction or pressure should be as low as possible, in order to prevent excessive leakage in or out, since equipment and piping are seldom free from leaks. In certain cases, however, as in the handling of poisonous gases such as cyanide, the vital importance of safety requires that the suction be great enough to prevent the slightest possibility of outward leakage.

One frequent source of trouble is the clogging of gas lines, due to the presence of foreign material or to faulty engineering in unduly constricting the flow of gas at one point. In reactions where gas is evolved from a still or vessel it frequently happens that at some stage in the process the gas evolution becomes too great for the exhaust-fan capacity and the fumes are driven out into the building. This condition can often be avoided by controlling the reaction; in a furnace by cutting down or even drawing the fire at that time, in a kettle by cooling through the water jacket or cooling coils. For such processes it is advisable to have a recording chart showing the temperature inside the reaction chamber, using cards which have the ideal line for the run already drawn for the workman to follow. Draft gages should be located at the beginning of a pressure line or just in front of a suction fan, and readings recorded on a routine log sheet. Adequate ventilation for the worst conditions is essential and gasmasks should be kept in the foreman's office ready for use. It is unsafe to rely on natural ventilation when there is danger of gassing, since this is always subject to weather conditions. The type of ventilation to be employed is determined by the character of the escaping vapors. Normal ventilation is upward, but if the gases are much heavier than air, the currents should be horizontal and should draw them from the leaking equipment away from the workman. It will be found that frequent inspection of gaslines to lute up the joints is well repaid in better working conditions and higher plant efficiency. The presence of large leaks will be indicated by readings at the draft gages at the fan or blower, although a decrease of effective pressure may be caused by clogging in the line or by corrosion in the fan.

REPAIR WORK MUST BE CAREFULLY SUPERVISED

When repair work must be done on gaslines which are shut down, it is essential to pull air through for some time before starting the job. This precaution is advisable, even if the line is not to be opened, as otherwise the gas will no longer be under suction and will diffuse out. I have witnessed several such incidents where men were badly gassed in working around absorption towers which were shut down for the weekend.

Inflammable vapors should be carried under a slight pressure, and the necessity for careful leakage control is determined by the explosive limits of the vapor-air mixture. The evaporation of volatile solvents is discussed in a paper by W. K. Lewis, delivered before the Engineering Section of the Council last year. He pointed out the danger of evaporating inflammable solvents in closed rooms when air is present, and described the use of inert atmospheres such as carbon dioxide, nitrogen and flue gas. It is general safety practice to fence in any plant where inflammable gases and liquids are used and to require passes from the office for admittance.

Liquids—The pumping, handling and storage of liquids cause innumerable accidents from carelessness or the lack of proper equipment. Many of the liquids are corrosive to the flesh and most of them are slippery on the floor and dangerous for that reason.

FILLING AND HANDLING EQUIPMENT

In installing eggs for acid pumping, the airline should be equipped with a safety valve to preclude the possibility of excessive pressure, and earthenware eggs should be protected by reinforced guardboxes. The discharge pipe should deliver into a covered vessel or be equipped with an air relief pipe before entering on open tank. Glass and hard rubber piping cannot be run in exposed places, and glass in particular should be so guarded that breaking the line will not allow acid to spray over the workmen. Where rubber tube joints are required for glass piping, they must be periodically inspected and replaced long before they are ready to give way.

In filling and moving carboys the workman is subjected to burns from drippings and splashings. In this work the man always wears gloves; sometimes goggles and even masks are necessary. The difficulty of filling carboys without overflowing can be lessened by adequately lighting the work—preferably from the side—the overflow should drain away from the workman to a sump and the vapors should be drawn off horizontally. The flooring should be even and in good repair; where funnels are used to take the discharge from an outlet cock they should be as large as possible and of standard size, and all earthenware cocks should be held in place by bridles. It is necessary to make the operation easy and simple, since an awkward layout of the filling station is wasteful of money and productive of accidents.

Carboy trucking can be simplified by adopting the newer types of two-wheel trucks which carry the carboys ahead of the wheels. The old one-wheel barrow truck is a danger, particularly when it gets loose and is wheeled over uneven ground. Regular boarded truck paths should

be kept up and all carboys capped before moving them. Empty carboys constitute another hazard when they are left with a little acid in the bottom and the safest practice is to invert and wash them before stacking in the pile. When it is necessary to carry on control analyses in the plant, the worker should have adequate facilities in the way of an acid-proof stand, plenty of water and drainage capacity, efficient lighting, and enough extra space for samples, bottles, etc. The workman cannot take even the simplest Baume readings with any accuracy if he is required to use an old carboy as a stand and work in cramped and poorly lighted surroundings.

OVERFLOW TANKS AND THEIR OPERATION

Furthermore, it is often necessary to do this work with rubber gloves on the hands and, of course, a goodly portion of the sample will be spilled. The best procedure is to do all this work in a separate room, especially equipped for the purpose.

Among other hazards in handling liquids the habit of overflowing tanks is widespread. For example, a pipe carrying liquor to a distant plant is fed through a pump controlled by a workman at the feed tank. Too often the man at the discharge tank does not know that liquor is coming over until his tank overflows, and then the only way he can notify the pumpman to stop feeding is by closing the discharge valve. A telephone or bell system will overcome this trouble, but it is even better to install a pressure dial at the pump which reads directly the liquor level in the receiving tank. Several types of gages designed for this particular purpose are on the market. In cases where one man handles both the pump and the receiving tank the use of long auxiliary valve handles is advantageous. Many of the liquor accidents are suffered by repair men who are overconfident and careless. Specific rules governing repair work are necessary, such as shutting off and locking the valve above the work, completely draining out any retained acid, and releasing the pressure inside the line. An extra precaution which may be used is to blank off the line so that it is impossible for liquor to get down to the work. It is obvious that the men should always work above the pipe to avoid drips.

Molten caustic can most easily be loaded into drums by siphoning directly from the pot. The drums, carried by a chain from an overhead monorail equipped as a weighing scale, are lowered into a pit to be filled, so that the danger to workmen is lessened. Even then, the men must wear goggles, rubber shoes and rubber gloves, and the man controlling the siphon cock should be well outside the range of any splashing or overflow which might occur. Crystallizing liquors are often run in open troughs, rather than in pipes, and should be controlled by valves or plugs at the feed end rather than at the discharge, as otherwise the trough will freeze when not in use and spill its contents on the next run.

SLUDGE PONDS, DRAINS AND SUMPS

Serious explosions and catastrophes, fortunately, are less frequent in chemical work than they were a few years ago, during the war. The battle against these hazards is ably supplemented by the special bulletins

of the Bureau of Explosives and I shall not attempt any general discussion of a matter so broad in its scope.

It might be well to call attention to one danger not generally emphasized which is brought up in connection with the tremendous nitrate explosion at Oppau, Germany. The *Traveler's Standard* of May, 1922, describes this frightful catastrophe, when 10,000 tons of nitrate fertilizer were blown up, killing 500 people and injuring almost 2,000. The true cause of this explosion is unknown but a logical theory is advanced, based upon seepage of waste products into the soil. Whether this is the answer or not, the risk involved in carelessly throwing spent sludges and liquors out on the ground is real. Nitrate liquors in contact with organic matter are particularly dangerous in this respect. For this reason sludge ponds, drains and sumps for seepage should be located with due reference to the character of the waste, the kind of soil, the nature and direction of drainage and the location of other dumps.

KEEP EQUIPMENT LONG JUMP AHEAD OF BREAKING POINT

Chemical work is admittedly dangerous, but at the present time the main hazards are due to poor working conditions, caused by excessive depreciation and corrosion in the plant. Serious explosions are rare, but they are an inherent hazard which must be guarded against with all possible precautions. The everyday job of a safety engineer is to ensure that his equipment is a long jump ahead of the breaking point, that the men engaged in handling dangerous material are educated to their risks, and that they are provided with the safest equipment and all the protection obtainable.

DISCUSSION

MR. CRASS: As to drawing off acid into carboys, the usual practice is drawing from a cock, the nose of which is smaller than the neck of the bottle, so that as a usual thing it can be depressed sufficiently into the neck of the bottle to eliminate danger of spilling, except where there is insufficient light or the workman is not vigilant. If the workman is vigilant he can turn off the cock and stop the flow prior to the carboy being filled.

As to trucking carboys, I do not know where any such unsafe equipment, as he describes, is being used these days. In all the chemical plants I have seen they use the standardized two-wheel truck. There has been a change in the kind of carboy equipment supplied of late years and a good many companies have different sized carboys, making it difficult to have one standard truck.

FLOAT VALVES AND DANGER SIGNALS

Any workman who overflows a tank is subject to severe censure, because that is very bad practice. As a usual thing, in flowing acid, the workman who flows acid to the top of the tank gets accurate information regarding the acid levels in the tank, either by fluid in an automatic indicating gauge or by electric telltales which show the danger zone in the fullness or emptiness thereof, which are positive indications to the

acidman as to how much acid can be sent through. I have seen signals whereby they have a finger arrangement on the float valve; when the finger goes up and the float goes down, it lights a red light showing danger; when the finger goes down as the float goes up, as it reaches a point where the tank becomes full, say within twelve or thirteen inches, that in turn trips another electric red light. Those controls, or something similar, should be placed wherever there is the flowing of acid, and no man should ever think of blowing it out without having knowledge of the tank into which he is blowing, and the amount of acid in the tank.

CHAIRMAN KERSHAW: We are very fortunate in having with us today, Mr. C. D. Porch, manager, dye works, E. I. du Pont de Nemours & Co., one of the men who can tell us just about how far we can go when it comes to dealing with the human element. I understand Mr. Porch has made a very enviable safety record at his plant.

EXPERIENCE IN NON-CHEMICAL PLANTS

MR. PORCH: Mr. Whitman has gone into the matter very carefully. Some of his statements, however, evidently are based on experience gathered several years ago. Some of the conditions which he outlines have long ago been corrected in the modern manufacturing plant. Mr. Whitman makes the statement that in chemical plants today the severity is greater than it is in other manufacturing plants. I do not know the source of his information, but in our company this condition does not exist.

The following tabulation has been prepared to show a comparison of frequency, severity and lost-time rates on plants of the Du Pont company which may be classed as "chemical" in comparison with those of a non-chemical nature. In the former group we have included plants manufacturing high explosives, smokeless powder, charcoal, dyestuffs, paints, pyralin, cellulose products, and the laboratories, leaving in the non-chemical group the plants manufacturing black powder, caps, fuses, boxes and shooks, and the construction and dismantling operations. In order to eliminate a distortion of the comparative severity rate brought about by four black powder explosion fatalities, I have excluded these fatalities, which by the way, occurred on non-chemical plants:

	For Year 1921		
	Chemical Group	Non-Chemical Group	Entire Company and Subsidiaries
Average number of 3,000 hour workers.	3,484	1,389	4,873
Frequency rate per 1,000-3,000 hour workers, (excluding explosions)....	47.8	33.8	43.7
Severity Rate per 3,000 hour workers (excluding explosions)	6.3	8.2	6.9
Lost-time rate (injury factor).....	.274	.372	.301

While it is generally assumed that the hazards are greater on chemical plants than on non-chemical plants, it will be noted from the preceding tabulation that while the frequency rate in the former group was somewhat higher during 1921, both the severity rate (which is a better measure of existing hazards) and lost-time rate were lower—even when the four black powder fatalities are excluded.

OVERCOMING HAZARDS BY EDUCATING MEN

It is undoubtedly true that at the beginning of the war there were a great many accidents, due to the fact that the country at large was rapidly developing a line of business with which it had very little experience. New men were taken on in large numbers and new operations were started concerning which we had very little information. The chief manner in which those troubles have been overcome has been through education. Of course, any operator in a chemical plant, or any manufacturing plant, realizes that he must keep his equipment in first-class condition—that is a responsibility that rests with the manager of the company and it is up to him to see that his plant is in 100 per cent condition at all times. It is true that, in some of the smaller plants throughout the country, some manufacturers have not realized that it is a better investment to put money into safety equipment than it is to pay large injury indemnities. But I am sure those of us here today fully realize, now the safety movement has gotten such a start throughout the country, there is no excuse for serious accidents occurring from defective equipment, that is, due to carelessness. Responsibility for accidents of that kind can be definitely placed.

The matter of education, to my mind, does not rest entirely with the safety engineer. The safety engineer today, it seems to me, should be an expert, or some man who has studied the various hazards of the plant and to whom the various superintendents and assistants can go for advice.

On large plants we have a large force of safety engineers and inspectors and hold these men responsible for the physical condition of plants—the physical condition is up to the manager and the results obtained reflect the attitude he sends down through his assistants. It is through this system of education, this method of thoroughly teaching every man his work before he is allowed to go on to the job, that brings about the best results.

We have attempted, wherever we can, to eliminate carboys by handling corrosive materials in large quantities; wherever it is possible we handle it in safety tanks, or equipment of that type. Thus we have been able to get away from quite a few accidents.

HANDLING NITRO AND OTHER DANGEROUS COMPOUNDS

When we are drawing liquids to a higher elevation, such as the second or third story, where our receiving tanks are fairly small and where there is danger of overflow, we often equip the tank with an overflow line and allow any excess material to flow back into the container on the ground floor, near the controlling operator; where we flow materials from one point to another we very often use pumps which, if we have only one man on the job, he can start at the receiving point, using a remote control, and can thus control the amount of acid or corrosive material satisfactorily.

There is one class of hazards incident to our work that Mr. Whitman has not touched upon. I refer to the handling of nitro and amido

compounds. These are decidedly poisonous and in our business I suppose 50 per cent of the material handled would fall in that class. When we first started to operate we examined numerous accidents and we have reached the point now where they are very rare. During the last year we have had probably ten or fifteen medical cases—none of them serious.

We have gone into this matter very carefully with our medical staff. Our doctor has made a study of this matter and he has outlined a program which we follow carefully. He divides the responsibility for the control of these poison gases into three sections:

First: The responsibility that falls upon the management and assistants—the responsibility of supervision—and under these he classes safe equipment, sanitary working conditions, ventilation, etc., which, of course, are necessary in any plant where poisonous materials are being handled.

Second: Responsibilities placed upon the medical staff and the employment bureau. Men employed in this class of work must necessarily be in first-class physical condition and the employment department is responsible for the men in the plant. After the man is employed he goes to the hospital for a thorough examination. The medical staff is responsible for very careful study of the properties of various materials made and handled, those materials are classed as 1, 2 and 3.

THOROUGH CLEANLINESS NECESSARY TO PRESERVE HEALTH

When men come to the hospital they are given a thorough examination and, depending upon their physical condition, they are given classification. Men of No. 1 classification are allowed to work in plants manufacturing the more poisonous materials. A man who shows signs of a weakness of the heart or bad blood pressure—anything of that kind—is placed in a lower classification. They are not allowed to go into any plant manufacturing nitro compounds.

The medical staff is also responsible for the periodical examination of men employed in the handling of materials; if the man shows any signs of the effects of his work he is temporarily removed to a part of the plant where he is out of contact with such conditions. The medical staff follows up all the accidents even though of a minor nature.

Third. Responsibility that falls upon the operators themselves. We assume that men have been given a thorough training before they go into the manufacture of dangerous materials. They are taught, in the first place, to be very clean in their habits and they are instructed to bathe at the end of each shift. It is also necessary for them to be very careful about eating; when lunch time comes it is necessary for them to cleanse their face and hands thoroughly before they eat. They must go out of the building in which they work. They must be very careful about inhaling fumes of any kind, even steam, which sometimes appears to be not harmful, though it may contain small amounts of poisonous fumes.

It is necessary that the men report immediately if they spill any material on their clothes and to see that their clothes are washed at least

once a week. They should change their clothes each day before going home and discard their clothes every three months. If they spill material on their clothes it is necessary to discard them at once.

The workmen are instructed to follow these rules and the foremen and supervisors are instructed to see they are followed. But sometimes a number of employees get into trouble, even where the most stringent rules are in force, but if the rules are followed carefully the hazards are greatly reduced.

BLOW CASES SOURCE OF MANY HAZARDS

MR. CRASS: What methods are followed by the various companies with respect to the location of the blow cases?

CHAIRMAN KERSHAW: We could not obtain from our plant men, even those who have had years of experience in handling acid, any valuable information on blow-case explosions. Possibly the reason is that when the tanks were originally designed they were computed to stand a normal pressure with the proper factor of safety. Following that, the chances are they were given a hydrostatic test before being put into use. After they were put into use the corrosion that took place inside was so irregular that, when the blow case finally gave way, it simply broke out at one point and allowed the air to escape gradually and the chemical to run out on the ground. We have arrived at this conclusion: Make sure the original installation is correct, then go ahead and use the blow case; if irregular corrosion occurs we have nothing to prevent it. We can, however, arrange our blow cases so that if a bad leak occurs the acid will not flow into areas where it will be dangerous. From a safety standpoint a blow case in a pit is a mighty good proposition.

MR. VOORHIES: Our experience has indicated that blow cases do not burst unless some sudden decomposition takes place in them. They are a serious hazard, so serious a hazard that men ought to stay away from them during blowing operations.

During the war we had a very bad accident to a man who happened to be at a blow case—it was an overflow. As a result every blow case was railed off with a double fence and a warning sign was put on all four sides. Prior to that men were hanging their coats around blow cases and leaving their tool boxes beside them and eating their lunches there. It happened at one of our plants that the hazard of acid had been overlooked; they did not use much of it and had not had a serious case in some time. They had a blow case there and were engaged in a transferring operation—moving the acid into another tank.

As a general rule other employees are not admitted to the building, but some mechanic had been given permission to put his toolbox there. The blow transfer started at 10:30 a. m. and should have been completed around 12 o'clock. The noon whistle blew and men were in there eating lunch when, by a combination of circumstances, the acid overflowed on their heads and shoulders. Fortunately, they closed their eyes. One man, by sheer good fortune, just escaped a dose of acid fumes that would have killed him—he escaped into a small room and got out through a skylight.

ACCIDENT DUE TO COMBINATION OF CIRCUMSTANCES

That accident, like most others, was due to a combination of circumstances involving carelessness and neglect by a large number of people. In the first place, the operators left the cap off the line through which they give the fluid to the tanks. They had trouble with clogging of the line and they were afraid of pressure accumulating in the storage tanks: so, without saying anything to anyone, they left the caps off the lines—when the tanks overflowed the acid came through.

Another mistake was that the laboratories responsible for calculating capacities showed that the tank receiving the acid was given a charge too great for it to hold. No acid should be moved without laboratory approval. In tracing the cause of the accident it was found that: One man got married; a substitute foreman had taken his place, and the substitute foreman had assumed the whole operation had been approved. It never had been approved.

The answer is, of course, stiffening up on operation conditions and discipline. The acid tank, no matter whether acid is being blown or not, is dangerous, and no man should go near it except the operator; he should be given valves that it is possible for him to reach in an emergency.

CHAIRMAN KERSHAW: Quite frequently the most immediate danger connected with blow cases is not the design or condition of the blow case, but is the handling of the pressure—regulating the valve which is supposed to reduce the air pressure to the blow case. An old boiler shell makes a good blow case, but it should always be tested for proper working pressure. In order to keep down the air to a safe working pressure for such a blow case it is necessary to install a pressure-reducing valve and a safety valve.

SAFETY VALVES AND BI-PASSES

While the value of installing a safety valve has been recognized, in actual installations, in possibly six cases out of ten, the bi-pass around the safety valve is so arranged that if anything goes wrong with the pressure-reducing valve it can admit air to the tank. Furthermore, a great many reducing valves come with keys to enable regulation. They are supposed to be kept by the plant superintendent, the master mechanic, or some other person responsible for the safe operation of the tanks. Very often these keys get into the hands of men who actually operate the tank and who possibly do not know the safe working pressure for them, so when they do not get enough air to blow acid through a small line they open up the valve—a lot of them have found they can thus get the acid through a little faster.

We find that safety valves are often of the ball-weighted type. Just the other day I saw one of this type with a plank balanced on the weight. It had a cylindrical weight and there was a whole row of stones on top of the board. The pressure regulating valve and the safety valve were set so they did not, according to the ideas of the operator, allow enough pressure into the house. The real thing to do is to seal the safety valve so it cannot be tampered with, possibly putting it in a box, and to arrange the bi-pass so it does not bi-pass the safety valve.

IDENTIFICATION OF PIPE LINES

We will now throw the meeting open to a discussion of the identification of piping systems. I represented the Council on the committee formulating this code; we had a meeting in New York in June, at which several questions were raised, including this: Whether or not color schemes should be used for identifying pipe lines in chemical industries or whether they should depend upon some kind of markings which would appear in black and white—possibly the contents of the line actually printed on the line in the form of a sign. Another point was whether or not the National Safety Code should include conduits. We find in many plants that conduits run parallel with the pipe lines, yet when it comes to distinctive marking of conduits we are really getting into the electrical field.

I would like to go to the next meeting of the committee and present your ideas, especially as to whether or not color schemes should be used, whether we should have black and white markings or some other arrangements.

MR. POMCH: We use the color scheme quite extensively throughout our operating buildings, but we never carry it outside of the plant. We find that it works very satisfactorily. We use vivid colors and good paint, generally an oil-base paint, that will last for a long time, and never use the stencil idea. I believe I would prefer the color scheme and paint the whole pipe line.

Some of the paints are attacked and we have to paint a little oftener in some buildings than we do in others. At the present time we have not made any particular study of the type of paint, from a chemical standpoint, that is best fitted for the work. We have been doing this now for about a year and I do not believe we have painted more than twice.

CHAIRMAN KERNHAW: I will introduce our next speaker, Mr. Nichols.

INDUSTRIAL VENTILATION AS APPLIED TO DUST AND FUME REMOVAL

H. M. NICHOLS, MANAGER DUST COLLECTING DEPARTMENT, AND F. R. ELLIS, MANAGER HEATING AND VENTILATING DEPARTMENT, B. F. STURTEVANT COMPANY, BOSTON, MASS.

To quote an official of one of the leading insurance companies: "Industrial or occupational diseases are becoming recognized more and more completely as being compensatable. That is to say, the insurance carriers (and therefore the employers, since they have to pay the insurance costs) now have to consider not only the obvious immediate injuries to employees from hazards, such as burns from corrosive fumes or deaths from explosions of combustible dusts and vapors, but also the indirect and sometimes slow-acting internal injuries to employees, such as lead poisoning and other toxic actions in human organs and tissues."

It is, therefore, becoming a matter of economy as well as humanitarian motive to control these agencies so that they will not endanger the

health of the workers, and mechanical ventilating systems play an important part in such control.

GENERAL METHOD OF ARRANGING MECHANICAL VENTILATION

In this paper we shall treat of the general method of arranging mechanical ventilating systems for the removal of those dusts and fumes which, on account of their poisonous or irritating qualities, are a menace to health, and those which, when mixed with air, form explosive combinations. No attempt will be made to go into the constructive details of the various appliances, as these of necessity vary with the local conditions surrounding the individual case and for best results should be especially planned by someone experienced in the art. We will also undertake to summarize the principles governing the design of the various classes of applications.

The necessity for ameliorating the conditions created by machines producing irritating dust was recognized long before the days of liability insurance or of workmen's compensation legislation; in fact, the beginnings of the fan business were inspired by the necessity of finding some way to get rid of the irritating dust from buffing machines in the shoe industry. It was for this purpose that B. F. Sturtevant, the father of the industry, about 1860, conceived his first fan.

The treatment of this form of hazard, namely, all processes producing fine, irritating dusts from wheels or cutters, is today very much the same as the arrangement evolved in the application of this first fan. In this class come buffing, grinding and polishing wheel operations, also some textile, hat manufacturing machinery and sanding operations. Many classes of cutting operations may be treated in a similar manner.

ENCLOSE WHEEL OR CUTTER AS COMPLETELY AS POSSIBLE

In general, the wheel or cutter is as nearly wholly enclosed as possible by a metal hood which is attached to and becomes a part of the piping of the exhaust system; the hood should be designed to take advantage of any movement given the dust by the operation. Thus, if a cutter throws the dust in a horizontal direction, the hood should be so arranged that the dust will be thrown into it. Where the material is thrown vertically upward or downward the hood should be placed above or below the wheel or cutter. It is obvious that by carrying away the dust in the direction in which it is thrown the trapping and removal of the material will be the most effective.

It was only a small step from the removal of dust from buffing operations to the removal of refuse from woodworking machinery and while many woodworking operations do not produce refuse in a finely divided state, the handling of this class of machinery is very similar to the method of handling buffing machinery.

With another class of machinery it is not feasible to closely hood the machine, and in these cases hoods over or adjacent to the machines are provided to collect as much as possible of the impalpable material. In this class come such machines as rubber mills, package-filling machinery,

sandblasts, crushers, pulverizing mills and devices at the loading and unloading points of various types of conveyors. It is possible, in many cases, to completely enclose conveyors, in which case the best results, of course, are obtained.

TYPICAL EXAMPLE OF REMOVING DUST HAZARD

As a typical example of reducing the dust hazard, it may be of interest to mention the applications made in the granite industry. Surfacing and cutting machines, in many granite sheds, have been equipped with a hood attached to the cutting bar and connected to an exhaust system by means of flexible tubing. The dust formed by the surfacing tool is almost entirely collected, without inconvenience or hindrance to the workman.

The treatment of obnoxious fumes is similar to the collecting of dust. In all cases where it is possible to completely enclose the device producing the fumes the best results are to be obtained. This is usually possible in chemical laboratory cabinets and in many of the processes in the manufacture of chemicals. By far, however, it is more often necessary to place hoods adjacent to the machinery, which must be left open to permit its operation; in such manner are treated most dipping processes, both of acid and molten metals, sizing, cooking, dyeing, bleaching and the removal of fumes from various kinds of melting furnaces.

In treating the fumes, gases or vapors of these many classes, the hoods should be placed as close to the source of fumes as possible, with due regard to the movements of the operator. When the hood has to be placed at some distance above the machine it should be large enough to encompass an area of considerable extent, as diffusion usually is quite rapid. Further consideration must be given to the natural movement of the fumes; for those that are lighter than air the hood should be over or above the machine and where they fall to the floor the connection to the exhaust system should be underneath. The removal of the gases of combustion of internal-combustion engines in automobile factories was formerly accomplished in this manner, but more modern practice is to connect the engine directly to an exhaust system. In the Ford Motor Company plant, where the engines are tested on a moving conveyor, the exhaust is connected by a flexible tubing to a moving duct.

WHEN FUMES ARE DIFFUSED THROUGHOUT BUILDING

There still remains a class of ventilation for the removal of those fumes that are diffused throughout the building. This treatment is by dilution through general ventilation, either by a supply or an exhaust system. When the dilution is by means of exhaust ventilation, intakes to the system must be located with reference to the nature of the fumes to be eliminated. By removing a large volume of air continuously, infiltration through openings and around windows and doors replaces the air exhausted. This becomes a dilution method and the greater the volume of air handled the more complete the dilution, and, consequently, the more satisfactory the ventilation.

Ventilation by dilution is also accomplished by mechanically supplying fresh air, allowing the contaminated air to escape through a ventilator or monitor; frequently the results justify the expense of both a supply and an exhaust system. It is usual with supply systems to deliver the air near the floor, in order to maintain a breathing space clear of fumes and to float the fumes off through the roof monitor. The ventilation of lacquering and doperooms and some paintrooms is usually accomplished by the dilution method, and in this case the fumes, being heavier than air, are exhausted from near the floor. Foundries are best ventilated by supplying air near the floor and floating off the smoke and gases above the breathing line. Another class of dust and refuse removal can only be accomplished by intermittent cleaning; in such cases the work is not classed as ventilation.

PORTABLE AND INSTALLED VACUUM CLEANING SYSTEMS

By means of vacuum cleaning systems, either portable or installed, dust explosion and fire hazard is greatly reduced. It is generally believed that most dust explosions are cumulative in action. A small explosion may occur near a machine and its result will not be serious, but if such small explosion occurs in a room where the walls, ledges and beams are covered with fine dust the effects of the explosion may be sufficient to throw into suspension a large volume of material that had settled on roof trusses, wall ledges, etc. This dust is thrown into the air just in time to continue the propagation of the flame, with the result that an explosion of destructive violence occurs. By frequently cleaning a building, to prevent the accumulation of explosive dust, such hazard is greatly reduced. This applies to grain elevators, flour mills, starch and sugar factories, and frequent cleanings in textile mills reduces the fire hazard. At the present time a very large grain elevator is being supplied with dust-collecting systems and vacuum cleaning apparatus to eliminate this danger.

By means of air conditioning the explosion hazard can be reduced in industries where volatile explosive solvents are used and by proper humidification of the air static electricity can be prevented from accumulating and causing destruction when it is discharged. A moist atmosphere is a conductor of electricity and if machinery and shafting is grounded the static electricity can be carried off as it is produced; the dipping and coating rooms in rubber factories are so treated.

Air conditioning is further used to prevent dust in many industries. By carrying on operations in properly humidified rooms dust arising in the process can be greatly reduced. A most notable example is found in the stripping-rooms of tobacco factories, where, if the leaves are dry and brittle, a great deal of dust results; when soft and pliable, as they become in humidified rooms, much less dust is formed. The lint or "fly" in textile mills is also greatly reduced by proper humidity.

The disposal and recovery of dust or fumes are not treated here, as that branch of the art is a subject of such magnitude and importance that it should be treated separately. Fire dampers and explosion doors are employed in dust and fume removal systems, but as this paper is intended

to cover only the basic principles of such system, no details of construction will be gone into.

ENDEAVOR TO ENTRAIN DUST AT ITS SOURCE

It should be stated that the first broad principle, and the one of greatest importance, is to entrain the dust or fumes where they originate, if it is possible to do so. Do not allow them to escape into the atmosphere, for if they do it is much more expensive to remove them and they can never be as completely collected. By maintaining a negative pressure in a dust-producing machine inward leakage prevents the escape of dust through joints or openings.

Another rule of importance is to arrange the inlets to your conduit so that the natural direction and velocity of the dust or gas deposits it in the pipe and assists the air current. If the material naturally falls, arrange the intake so the material will fall into it. If the material rises, or is thrown horizontally, locate the hood so the material will rise or be thrown into it.

IN CASE OF DOUBT SECURE SERVICES OF EXPERT

In all cases where the sources of the dust or fumes can be fairly closely hooded, the observance of these two points, combined with proper piping and a fan of suitable capacity, will insure success. It is necessary to state the matter thus broadly because, in most cases, there is no theoretical way of determining the amount or velocity of air for a given connection. In many cases a certain size and form of hood, with a certain suction in the connection to it, has been determined by experiment and experience to give the best results on certain widely used machines. When a new form of machine or process has to be treated, a man experienced in the proper treatment of a wide variety of other machines and processes, by analogy, can tell pretty nearly what to do, but he cannot always tell another how to do it. In the case of dust or fumes that, for one reason or another, cannot be entrained at their source we must resort to the dilution or general ventilation method.

(After reading his paper Mr. Nichols exhibited slides showing several installations of ventilating systems.)

DISCUSSION

MR. T. C. KING (Maryland Casualty Company, Milwaukee, Wis.): I would like to put up to Mr. Nichols a little problem: The removal of acid fumes from pickling vats. We have an exhaust system and there is a considerable space between the top and the end of the vat on account of handling material. The exhaust works very effectually during warm weather, but on a cold day it is almost impossible to see in the pickling vat. Have you a solution for a problem like that?

MR. NICHOLS: I think it could be cured by putting an exhaust along the floor.

The Section then adjourned.

WEDNESDAY MORNING SESSION

CHAIRMAN KERSHAW: We have with us this morning a number of gentlemen representing different manufacturers of respirators; with your approval we will hear what they have to say. (Several gentlemen appeared before the meeting and exhibited different types of respirators, after which a vote of thanks was extended them by the members of the Chemical Section.)

CHAIRMAN KERSHAW: We will now hear the report of the Committee on Industrial Poisons. This committee has done excellent work during the year.

MR. A. L. WATSON (Hooker Electric Chemical Company): The members of this committee are Mr. H. V. Berg, The Krabs Pigment & Chemical Company, Newport, Dela.; Mr. E. H. Brown, American Cyanamid Company, Niagara Falls, Ont.; Professor C. E. A. Winslow, Safety Institute of America, New York; Mr. A. H. Nuckolls, Underwriters Laboratory, Chicago, and myself. Any credit which may be due for the preparation of this paper should be given these gentlemen, particularly Mr. Brown, who expended a great deal of time and energy in its preliminary preparation. I wish to take this opportunity, as Chairman, to express my appreciation for the co-operation which they have given.

DUST RESPIRATORS IN INDUSTRY

REPORT OF INDUSTRIAL POISONS COMMITTEE. A. L. WATSON, CHAIRMAN

Foreword

In the investigation conducted by this committee into the subject of dust respirators and in the preparation of this report it has been the purpose of the committee to accomplish the following results:

1. To emphasize the harmful effect of the condition which exists in industry of persons working in dust-laden atmosphere without being equipped with proper respirators which will prevent dust from being breathed in through the nose and mouth.
2. To endeavor to explain some of the reasons for respirators not being used more extensively, by pointing out the weaknesses of existing respirators.
3. To compare the values of respirators which are being marketed at the present time.
4. To bring out, if possible, the requirements which are necessary for respirators which will be looked upon with favor by the man on the job who is expected to wear them.

It is not the purpose of this report to discuss, from chemical or medical standpoints, the injurious effects which various kinds of dust will have upon the human system if inhaled, nor to consider the different types of dust with which we have to contend. Unfortunately, the committee did not have sufficient time to conduct experiments, nor to make a study of particular industrial processes where dust conditions exist. The report, therefore, will deal chiefly with respirators, as such, and in a somewhat

limited manner, because of the short time available in which our investigations had to be made.

Consideration is given only to the mechanical filter type of respirator designed to filter particles of dust from the air. The report does not consider face masks or hoods having a hose attached through which uncontaminated air is supplied to the wearer. There is no question as to the merits of this type of breathing apparatus when used under certain conditions and, of course, in instances where the wearer is not required to move about in too great a radius to make the use of a hose impractical. Neither does this report deal with gas masks, nor with self-contained oxygen breathing apparatus. These latter two are subjects which require a great deal of discussion and should be handled as separate propositions, in the opinion of this committee. It has no reference to any devices which are designed to afford protection from gases or acid fumes, and the committee wishes to emphasize that respirators such as are dealt with in this report should never be used where a gas or acid fume condition exists.

THE PRESENT SITUATION

The relation of atmosphere to human life has been the subject of numerous scientific investigations and it is admitted that there has been a vast amount of superficial observation (which serves no practical purpose) on the dust problem in industry.

It is assumed that those interested in the dust problem recognize the seriousness of the situation, particularly when we read that certain medical authorities estimate that in seventy trades more than 50 per cent of deaths between the ages of 25 and 44 are caused by respiratory diseases or their after effects. A situation such as this surely demands both individual and collective action, for it concerns not only the workmen who pay a needless toll in death and respiratory troubles, but it places a heavy burden upon industry.

It is assumed that we realize the serious effect upon labor-turnover which dusty working conditions will cause and the growing difficulty in securing men who will work in dusty atmosphere. This difficulty is aggravated by the fact that, through the Americanization movement, foreign-born workmen are being educated to expect and demand the kind of job where they do not have to contend with unpleasant and unhealthful conditions, such as contaminated atmosphere. Growing restrictions upon immigration are decreasing the supply of workmen who can be expected to take dusty jobs until industry is found fighting the dust problem with its "back to the wall."

It is further assumed, we recognize, despite the remarkable progress which has been made in eliminating dust, that we still have dusty conditions; dusts both toxic and irritating, which, when inhaled, will injure the delicate membranes lining the respiratory tracts and set up inflammation—that as a result there is lessening resistance to disease and, as a consequence, common colds, influenza, pneumonia and the causative organism of dread tuberculosis become present. Without question the solution of our problem would be to eliminate all injurious dusts from the air—to take the "dust" out of "industry." While there are unquestionably

a great many existing dust conditions which could be corrected by providing proper mechanical apparatus for removing the dust, it is unreasonable to expect that all conditions of dust-laden atmosphere could be economically corrected in this manner. Even where the best devices are in use, for dust reduction or abatement, accidents to apparatus occur requiring shut-downs and at such times other means of protecting workmen become necessary.

HUNDRED SPECIFIC PROBLEMS

So the fact remains that some types of respirators are a necessity at the present time, and we must bear in mind that there is no general respirator problem, but rather a hundred specific problems, each conditioned by a particular process and a particular type of dust involved. We cannot say: "If you have a dust-laden atmospheric condition here is a respirator that you should use." Each industrial process must be studied, first to determine whether the use of a respirator is a proper solution or whether there are convenient and economical methods for eliminating the dust from the air. In the second place, where it is found that respirators are needed, the type of respirator to be used must be determined according to the kind of dust to be eliminated, the severity of concentration and, of course, after considering the question of convenience to the wearer.

Undoubtedly you have read the expression used so often by compensation rating board inspectors in their inspection reports: "Respirators furnished, but not worn by all employees." This is the problem we are up against in industries where respirators are the proper means for eliminating dust from the human system. Workmen will not wear them. Many industries require men to wear respirators, but the rule is honored more in the breach than in the observance.

The question then presents itself: "Why should a workman be hostile toward a device which is designed ostensibly for his comfort and to conserve his health, and which is furnished to him without charge?" One pertinent answer to the question was given a member of this committee by a superintendent: "For the same reason you and I would not wear them if we had the same kind of a job." This statement, while it does not help toward a solution of our problem, is probably correct, for is it not a fact that the man who labors in a dust-laden atmosphere will prefer to take a chance on impairing his health (which to him is a matter of the distant future) rather than to suffer now the discomforts which the wearing of a respirator are said to entail?

If it is true that such an attitude prevails, it is a serious indictment against those of us who are endeavoring to conserve life and health and we should be inspired to bend every effort toward the improvement of present types of respirators, or the development of new ones, which will meet the least possible objection from the persons expected to wear them.

TYPES OF RESPIRATORS ON MARKET

There are many types of respirators on the market. Probably you are all fairly familiar with them and with their merits and defects. The

New York State Industrial Commission has said that some of them are almost useless. We shall consider a few of the available types which are among the best known and most widely used:

Exhibit No. 1 (pig-snout type): This is probably one of the most widely known respirators at present on the market. The body is of rubber and the filtering medium consists of a thickness of cloth in combination with a sponge. It is intended that the sponge should be kept moistened at all times while in use. An exhalation valve is provided on the side to assist natural respiration.

Among the objections to this type are that it is too heavy and too stiff. It is made only in one shape and it therefore becomes necessary to keep it pressed tightly against the face to insure against leakage. The edges are usually sharp, causing discomfort, irritation of the skin, excessive perspiration and consequent further irritation, and possible serious injury when dust collects around the edge. It should be noted that manufacturers of rubber respirators, in at least one or two instances, are endeavoring to mold a contact edge which is considerably thinner than the rest of the body, and with this thin edge flaring in a manner which tends to cause a more even, close, automatic contact with the facial lines. (Showing sample which demonstrates this.)

This type projects too far out in front of the face, obscuring the vision; it also interferes with the proper wearing of goggles. The head bands are not durable, requiring frequent renewal when used in certain kinds of dust which attacks the fabric. The relief valve becomes clogged, preventing proper seating, and thereby allowing dust to be inhaled. Too much attention is required in the way of cleaning, sterilizing, moistening the sponge and renewing parts.

Exhibit No. 2: This respirator is very similar in principle to the pig-snout type, but has some features which might make it more desirable under certain conditions. The body is also of rubber but is molded in such a shape that it does not project out so far from the face and therefore does not obstruct the vision as much as the pig-snout. It is made in three styles with body construction the same in each. One style employs a dry-disc cotton-filter medium and has no relief valve. The second style is essentially the same except that a relief valve is provided to assist natural breathing. The third style has a wet-sponge filter like the pig-snout. The manufacturers of this type of respirator recommend the use of the dry-filter style in preference to the wet-sponge style, because they claim that with it breathing conditions are more uniform than with the wet sponge, where evaporation occurs. We believe, however, that there is considerable to be said on this point and this report will touch upon it later.

This respirator is much lighter in weight than the one first exhibited and, therefore, is much more desirable from the viewpoint of the man who has to use one. The contact edges, you will note, are thinner than the rest of the body, affording some relief from the irritation to the skin previously mentioned. Long continued wearing, however, will cause irritation and perspiring, dust will collect around the edge and in this respect about the same objections prevail as in the pig-snout type.

IRRITATION OF SKIN A SERIOUS PROBLEM TO OVERCOME

It is well to mention that the matter of skin irritation, where patented types of respirators are worn, is really a serious one and is probably the strongest reason for workmen objecting to wearing them. At least one case is known where rubber respirators are furnished to workmen and where the men feel that they must wear them because of the severe dust condition. These men, it has been found, take their respirators home and have a piece of soft flannel sewed around the contact edges to prevent irritation. We would not recommend that respirator manufacturers do this because it would be extremely unsanitary unless frequent sterilization were practiced and we know that frequent sterilization will not be practiced in a large majority of cases. However, we believe it would be well for all manufacturers of respirators to take note of this most serious objection to their product and to bend their efforts at once toward the development of the most comfortable and least irritating contact edge that it is possible to produce. Some relief has also been secured from the effects of irritation by greasing the face with vaseline or similar preparations: It should be noted, however, that this cannot always be done satisfactorily, because certain kinds of dust will collect upon the greased skin and become hardened.

Coming back to exhibit No. 2, the relief valve will be found to be of a different construction from that shown in exhibit No. 1. The working part is extremely delicate and is sure to require frequent renewing under certain dust conditions. It is claimed that this valve has been tested in paint spraying operations and has withstood the test satisfactorily where other types of valves have failed.

METAL RESPIRATORS SUITABLE FOR MANY USES

With regard to headbands and attention required in sterilizing, cleaning and renewing parts, this respirator meets the same objections as those pointed out in the first exhibit, and the very light wires which hold the aluminum cap in position are not calculated to last long in the hands of an unskilled wearer. This type also interferes with the proper wearing of goggles, but not so much as the pig-snout type.

Exhibit No. 3 (aluminum body): This respirator has an aluminum body, a rubber pneumatic cushion edge, a fine brass screen in combination with a sponge to form a dust filter, and is provided with an exhalation valve. This style is also made with a dry disc filter. The aluminum makes a very light, yet durable body and the pneumatic cushion edge is comfortable and makes an easily adjustable contact with various facial lines. At least two different styles of relief valve are provided on this type of respirator, one having a metal body and metal or mica disc valve, and the other the all-rubber flapper style, like those used on army gas masks. There is a question as to the merits of and objections to these two styles of relief valves. The cost of this respirator is necessarily high in comparison with other types, but when consideration is given to the metal body, which should last a long time, and to the fact that most of the parts which are subject to deterioration can be replaced, it may be

found that the average costs, including renewals and repairs, will compare quite favorably. Practically no interference with the wearing of goggles will be encountered in some makes of this type of respirator.

This respirator requires similar attention to the other types exhibited so far as cleaning, sterilizing and renewing parts are concerned. In purchasing a respirator of this metal-body type it is recommended that consideration be given to the following points which the committee has noted in examining samples:

1. Weight of respirator. This point is of vital importance to the wearer.
2. Obstruction of vision. Some makes will be found more satisfactory than others in this respect.
3. Method of inflating the pneumatic cushion. Where a pump is required it will cause a great deal of inconvenience.
4. Location of relief valve. With this valve located at the top of the body of the respirator, there may be danger of blowing dust into the eyes during exhalation.
5. Method of fastening head bands. It is much more convenient to fasten bands at the back of the head if hooks and eyes are provided than with the pin type fastener where one end of the elastic must be inserted through an eye and two prongs then forced through it for securing.
6. Possible interference with the wearing of goggles. This, of course, is of supreme importance in selecting any kind of respirator, as invariably goggles must be worn in any atmospheric condition which requires the use of a respirator.
7. Extent of filtering area. It will be found that some makes provide a larger filtering area than others. Under some conditions, where the dust concentration is light and where the wearer is not subjected to hard manual labor, this point may not affect the value of the respirator, but where a workman's natural respiration is increased because of physical exertion and in an atmosphere containing heavy dust concentration the largest possible filtering area would be the most desirable.

HOME-MADE RESPIRATORS CHEAP AND COMFORTABLE

Exhibit No. 4 (improvised respirator): This is a home-made respirator consisting of a piece of muslin 33 inches long by 5 inches wide, with absorbent cotton filtering media 5 inches wide by 6 inches long, one-third ounce in weight, about three-fourths inch thick, and held in place by two small safety pins. The absorbent cotton is covered with a thin film of cheese cloth and the muslin strip is cut to allow free use of the eyes. The total weight of this respirator is two-thirds ounce.

This type of respirator was recommended by the bureau of inspection of the New York State Industrial Commission, in Bulletin No. 90, December, 1918, after a series of tests in which it was found that all dust was filtered out for a period of four hours or more. In these tests, dust-laden air containing a basic lead salt was drawn through the filtering media at a rate equal to the amount of air breathed by an average individual (about 15.6 cubic feet per hour). Careful analytical tests revealed no lead drawn through the gauzy material forming the filtering media.

This respirator is cheap, light in weight, does not obstruct vision, can be changed daily at little cost, and can be washed when necessary.

There is nothing to break, rust or wear out. It is claimed that it does not cause excessive perspiration, and absorbs what is produced, does not cause irritation of the cheeks, nose and chin, and can be more readily arranged to fit the face than the patented types. There is less incentive for a workman to appropriate the respirator of another. It was recommended that this type be accepted in compliance with rule No. 722 of the Industrial Code of the Labor Laws of the State of New York.

It is the opinion of this committee, based upon actual tests, that this improvised respirator will prove quite satisfactory under conditions where the dust concentration is not extremely heavy. There are, however, some dust conditions requiring the use of respirators where this type would be practically useless. It was shown by experiment that, placed upon men unloading cars of lime, they worked out very satisfactorily. The men apparently breathed comfortably and after being used a whole day there seemed to have been no lime drawn through to the inside. Many requests for them were received from the men after the samples had been tried, a considerable quantity were ordered and many are in use at present.

USE OF "MUZZLES" IN CERTAIN INDUSTRIES

On the other hand, when used in an atmosphere with very heavy dust concentration, the absorbent cotton became wet and matted from perspiration, saliva and moisture of the breath, and the dust soon filled up the pores of the filter, making it difficult for the men to breathe. The dust condition in which this latter test was made is very severe and no patented respirator has been found which would give satisfaction. The men wear improvised respirators, usually referred to as "muzzles." They consist of several thicknesses of flannel, folded to fit around the head and neck, so that the nose rests upon the top edges of the flannel. A piece of cotton sheeting covers the outside, wraps around the back of the neck and is tied in front. This type of muzzle is used quite extensively and seems to be liked by the men after they once learn how to breathe with it properly.

Cotton Waste as a Respirator: It is claimed, according to a discussion which took place at the Sixth Safety Congress, that simple cotton waste had been used with excellent results. It was stated that in a Brooklyn plant it had been almost impossible to induce the men to wear any kind of a respirator, but after showing them how easily cotton waste could be used, how it did not irritate the face, and how easily it could be changed, every workman was easily induced to wear it. It would be interesting to ascertain if any present have tried this scheme and with what degree of continued success.

Other Types of Patented Respirators: There are a number of other types of respirators on the market, all of which have undoubtedly been found satisfactory in some instances. We have endeavored to discuss in detail only the particular kinds which are most widely known and used. All of the others either employ practically the same principles as those exhibited here or are of a special nature and suitable for comparatively few dust conditions.

WET VS. DRY FILTERING MEDIUM

A discussion of the comparative values of the two types of filters will probably result in nothing, for it is obvious that each type is best for certain specific conditions.

The wet-sponge filter tends (to some extent at least) to cool the air which is breathed, and in this respect would be desirable in warm atmosphere. In a heavily laden dust atmosphere it will not become clogged with dust as readily as a dry filter. In most, if not all cases, it is easier and quicker to remove the sponge, moisten and replace it, than it is to remove a dry disc filter and put in a new one. It eliminates the necessity of keeping extra filters on hand. It will take up saliva and moisture from the breath without impairing its function. There may be some objection from the fact that the moisture in the sponge will evaporate and thereby increase the breathing resistance. We do not believe this objection to be a serious one. Dust, of course, will adhere to the wet sponge more than to the dry filter and there may be a question as to whether the sponge will take up more or less dust than the dry disc before the breathing resistance becomes objectionable.

The dry-filter medium will permit of uniform breathing until the pores become clogged. The number of thicknesses can be regulated to suit the conditions. The fibre becomes moist from the breath, causing dust to adhere and quickly closes the pores of the filter. This is objectionable from the standpoint of convenience and expense, but perhaps makes a more sanitary appliance than with a wet sponge. There are some known conditions of heavy dust concentration where the dry filter is practically useless for the reasons just mentioned.

Consideration of the different types of filter media only tends to strengthen the statement previously made, that where respirators are required each industrial process must be studied by itself in order to determine the proper type to use.

EXISTING TYPES NOT ALWAYS SUITABLE

In spite of the large variety of respirators marketed we find a great many men working in dusty atmosphere and using no filtering apparatus whatever; a great many more use handkerchiefs, rags, waste, flannel, etc., evidently in preference to the more pretentious types of respirators—placing comfort before efficiency in results. We believe that there are very few respirators being used as compared with the number of existing dusty jobs where they should be used, and it would seem obvious that the reason for this must be that available types of respirators do not satisfactorily meet the requirements.

It is the belief of the committee that manufacturers of dust respirators would render a real service, not only to industry and to humanity, but with profit to themselves, if they would concentrate upon the development of a dust breathing apparatus which would embody the following features:

1. Lightness in weight.
2. Automatic adjustment to facial lines.
3. Comfortable correct edge which will not irritate.

4. That would not obstruct vision.
5. That would not interfere with wearing of goggles.
6. That would not offer serious breathing resistance (considering increases in volume of breathing with physical exertion).
7. Relief valve which will not become clogged.
8. That would not interfere with chewing and spitting.
9. Relief valve located so that dust will not be blown into eyes.
10. Durable headbands, easy to fasten.
11. Inflation valve easy to operate (if pneumatic contact edge).
12. Durable adjusting parts.
13. Requiring as little attention as possible.

DISCUSSION

CHAIRMAN KERSHAW: We have heard a very fine paper and we appreciate the work done by the committee.

MR. M. F. CRASS (Grasselli Chemical Company): It seems to me the muzzle is a very simple and convenient arrangement and would be more comfortable than any other heavy respirator that could be used in places where men stuff handkerchiefs in their mouths. Wouldn't it serve when unloading brimstone, for instance?

MR. WATSON: I have no reason to doubt that it would serve such purpose. A great many experiments have been conducted with this type of respirator and many were found to result satisfactorily.

A MEMBER: How about a man drawing off sulphate of sodas. There is a very heavy vapor.

MR. WATSON: I would not recommend it for use in any kind of vapor.

MR. CRASS: Men on those jobs usually stuff handkerchiefs in their mouths.

MR. WATSON: I would say that this type of respirator would serve the purpose much better, because in using a handkerchief the nose is not covered.

MR. CRASS: You can't make the men wear respirators of the ordinary type. They use a handkerchief; a simple thing like that does not interfere with chewing and spitting, or with their eyes.

MR. WATSON: This type seems to interfere as little as any type I have seen with chewing and spitting. It costs 5 cents.

MR. H. J. SEGRAVE (Mine Safety Appliance Company, Pittsburgh, Pa.): It appears to me that a sweat-proof binding in the form of a pad around a rubber respirator might be comfortable and easily sterilized; something that a flannel binding would not permit.

MR. WATSON: I do not believe the type of binding you mention would be more comfortable than many already in use; the most comfortable contact edge so far produced is the pneumatic cushion.

REPORT OF NOMINATING COMMITTEE

Mr. Crass then reported for the Nominating Committee, recommending the re-election of Mr. S. H. Kershaw as Chairman, Mr. E. J. Riederer as Vice-Chairman and Mr. G. E. Minshull as Secretary. (The gentlemen were thereupon unanimously re-elected.)

CHAIRMAN KERSHAW: It gives me pleasure to introduce to you Mr. Charles F. Horan, Manager, Department of Hygiene and Safety, Hood Rubber Company, Watertown, Mass., who will give us a paper of great interest.

BENZOL POISONING, ITS OCCURRENCE AND PREVENTION

CHAS. F. HORAN, MANAGER, DEPARTMENT OF HYGIENE AND SAFETY,
HOOD RUBBER COMPANY, WATERTOWN, MASS.

Because of my belief that one actually obtains more real helpful information from the discussions following a paper of this kind than from the address itself, I shall endeavor to merely briefly outline the present situation regarding benzol and trust that the more detailed data, together with ideals of a constructive preventive program, will be brought out during the discussions. Before considering the matter of dangers incidental to the use of this material in industry, it would be well to have in our minds some idea as to what benzol is and how it differs from other materials which are often confused with it.

Benzol is one of the products of the fractional distillation of coal tar, the crude coal tar being derived either from the coking of coal in by-product ovens or from the manufacturing of illuminating gas. Among other products, such as phenol, benzol is recovered from the light oils which distill at temperatures up to 170 degrees centigrade. These light oils, after being purified by sulphuric acid, are redistilled and deprived of their basic constituents by extraction and the phenols are removed by washing with dilute caustic soda. The oils are then separated by fractional distillation into: (a) Crude benzol, which comes over from 70 to 130 degrees centigrade. (b) Solvent naphtha, which distills over from 130 to 170 degrees centigrade.

The crude benzol thus obtained, and which is composed mostly of benzol and toluol, is again distilled and the following commercial products of benzol obtained: (a) Pure benzol, a colorless volatile liquid which boils at 80.5 degrees centigrade. (b) Ninety per cent benzol, so called because 90 per cent of the product should distill at a temperature of 100 degrees centigrade. According to Rambousek this product is composed of from 80 to 85 per cent benzol, 13 to 15 per cent toluol and 2 to 3 per cent xylol. It contains as impurities traces of paraffines, olefines and sulphuretted hydrogen. (c) Fifty per cent benzol, which contains 50 per cent of bodies distilling at 100 degrees centigrade. This material contains only from 40 to 50 per cent benzol, the remainder being a very complex mixture of unknown hydrocarbons. The solvent naphtha derived from the first process is used extensively in Europe as a solvent for rubber. It contains no benzol, but consists of xylol and other hydrocarbons.

The fact that benzol is also known as "benzene" has caused it to be sometimes confused with petroleum benzine or naphtha (gasoline). It would be well for us to remember that: Benzol is "benzene." Naphtha is "benzine." Solvent naphtha is "coal tar benzine."

BENZOL DIFFERENT FROM NAPHTHA

Benzol differs from naphtha in that it is a definite chemical substance, being composed of six portions of carbon and six portions of hydrogen, while naphtha is a complex mixture of unknown chemical structure. Naphtha is merely a name covering a group of hydrocarbons which distill from petroleum, while benzol is a standard material of definite chemical structure. It is because of its being a uniform substance that has led to its increased use in industry.

Knowing something, therefore, of the chemistry of benzol and how it differs from other commonly used solvents, the commercial uses of the material are of importance. By far the greatest portion of commercial benzol has been used as a starting substance in the manufacture of coal tar dyes. It also serves as raw material in the manufacture of explosives, artificial perfumes, sweetening substances, pharmaceutical drugs and photographic chemicals. Its quick-drying properties lead to its use as a solvent in the rubber and artificial leather industry and in the manufacture of quick-drying paints; its ability to dissolve fatty substances leads to its employment in the dry-cleansing industry and as an extracting medium for fats in bones and seeds. Benzol also finds extensive use in the manufacturing of lac varnishes and in the extraction and purifying of asphalts, resins and alkaloids. It is an excellent solvent for removing the naphthalin contained in coal gas and which so frequently obstructs service pipes.

According to Kohler, more benzol is at present being used as fuel for motor cars than is consumed in the manufacture of coal tar dyes. Much of the gasoline sold under trade names contains up to 35 per cent of benzol. Another important use for benzol is in paint removers. Some of these preparations consist of benzol, paraffine and wood alcohol; benzol, alcohol and Venetian turpentine, or benzol, paraffine and acetone. Benzol is also used in the sealing of tin cans and in some processes in the manufacture of straw hats. It is a much more powerful solvent than naphtha and is now near naphtha in price, so there is a double temptation to use it in place of other solvents. From the standpoint of safety it is to be preferred to petroleum, naphtha or gasoline because of its low electric excitability; on the other hand, it is more poisonous by far than naphtha.

BENZOL DERIVATIVES WIDELY USED IN INDUSTRY

In addition to benzol, we find its derivatives are used extensively in industry. Nitro-benzol (oil of mirbane) is used as a starting point in the manufacture of anilin and is also consumed industrially as a perfume in the manufacture of cheap soaps. While nitro-benzol is not an explosive it is used in the manufacture of explosives to reduce the freezing point of nitroglycerin. Other nitro derivatives of benzol are used extensively in the industries of this country. It is evident from the foregoing that not only is benzol widely used in the industries at the present time, but because of the low price of this material and its high solvent qualities we shall presently find petroleum distillates supplanted by benzol in many additional industrial operations.

Poisoning by industrial processes arises, from the most part, by the inhalation of the fumes. Because of its fat-dissolving qualities, benzol may also be absorbed through the unbroken skin, but it is doubtful if this mode of entry presents a serious hazard in industry. Lehman has shown that a man breathing a mixture of benzol and air actually absorbs 80 per cent of the benzol inhaled.

There seems to be some difference in the toxicity of pure and commercial benzol. The older reports indicated that commercial benzol was more dangerous than the pure, but the experience in the rubber industry would indicate that this conclusion was unfounded, there seeming to be a direct connection between the boiling points of the benzols and their ability to do harm; the compounds of lower boiling points appearing to be more dangerous than those of higher boiling points. This is probably due to the fact that the amount of vapor given off by the low-boiling point benzols is greater, and thus a larger dose is breathed by employees exposed to the material. Considerable variations in individual susceptibility to benzol-poisoning exist, this being considered as the reason why the material has been used in some industries over a long period of time without serious symptoms having arisen.

DIFFERENCES OF OPINION AS TO DANGERS

Concerning this substance there is some division of opinion within the ranks of industrial hygienists as to its real dangers. There are those who consider the material with alarm and look upon all employees exposed to the vapors of benzol as being potential fatalities; there are others in industry who consider the vast amount of the material used and the relatively few cases of poisoning as evidence of lack of danger from benzol. These non-alarmists tell us that very few employees in industry are susceptible to benzol poisoning, and even in cases where little organized health protection is offered to employees using this material, cases of poisoning are rare and not usual happenings. They suggest to us that the statement "things are not what they seem" contains an element of truth; they remind us that industrial-accident statistics show the wheelbarrow to be more dangerous than the steam locomotive and the cement brush to be a greater fire hazard than the blowtorch.

In the central ground, and accepting the middle course, are those experienced industrial physicians and sanitarians who realize that the material is not nearly as dangerous nor as safe as some persons believe; that it can be used with relative safety only at the expense of the maintenance of certain precautionary measures.

Prior to 1914 several cases of benzol poisoning had been reported by Snelling. Three girls, aged from 14 to 16 years, were employed in a Maryland can factory in which the containers were sealed with a mixture of benzol, resin and rubber. Three other cases have since been reported from this factory. The most famous recorded cases of chronic poisoning were from a rubber tire factory in Sweden where nine young women, from 15 to 20 years of age, were taken ill with hemorrhages from the mouth, stomach, uterus and nose. Four of these girls died after an exposure to benzol lasting from three weeks to three months. In 1916 Dr. Alice Ham-

ilton reported fourteen new cases of sudden acute poisoning with seven deaths.

The reports of German factory inspectors for 1912 deal with three cases of poisoning, two of them being fatal. One man was employed in painting the interior of a barrel with benzol paint, another climbed into a washing machine in a dry-cleansing establishment and the third was employed in a distilling plant and forgot to turn on the cold water for the condensation. In 1918 British factory inspectors reported the case of a man overcome by benzol vapor while employed in a distillation plant. He was revived with oxygen and returned to work on the second day, only to be again overcome and die.

RECORDED CASES OF POISONING

A number of cases of benzol poisoning have been recorded where employees were overcome while cleaning tanks in which benzol has been stored. In one case a benzol kettle had been empty for twenty-four hours, was washed out twice with steam and allowed to stand, filled with cold water, over night. As the workman went into the kettle a strong steam of air was blown in through a pipe. In spite of these precautions the workman was overcome, but was rescued. One of his fellow workmen who assisted with the rescue was overcome and died within ten minutes.

One British case is recorded where a tank car was unloaded, washed with water, steamed out and then left, filled with water, for twenty hours; then washed twice with water, boiled for twelve hours and finally left for 10 days with a 16-inch manhole opened. A man who was then sent into the tank collapsed and, although he was revived in time, one of his rescuers died.

There have come to my personal attention, during the past six years, three fatal cases of poisoning to tirebuilders in a pneumatic tire plant; one fatal and one acute case to female operatives in a thread-treatment room in a cord tire plant, one fatal case to a laborer engaged in digging a trench along a leaking tank of benzol, a fatal case to a foreman in a rubber reclaiming department, three fatal cases in the coating-room of an artificial leather factory, and some dozen cases of less-serious acute poisonings in a golfball department of a small rubber industry.

CONDITION OF TEMPERATURE IS IMPORTANT

So far as age is concerned, the very young, the old and the female seem to have particular susceptibility to the vapors of benzol. Debilitated conditions, organic diseases especially of the heart and kidneys, addiction to alcohol and excesses of all kinds materially increase susceptibility. Vigorous muscular individuals with rapid circulation and deep breathing are overcome more readily by benzol fumes because of the rapidity with which the vapors are absorbed.

As we would naturally expect, conditions of temperature and humidity affect susceptibility to benzol poisoning. Thus on hot, humid days, or in interiors where the air is hot and stagnant, poisonings are more liable to occur because of the greater volatility of the benzol under these condi-

tions, and also, perhaps, because of retarded elimination, increased pulse rate, and hence the greater flow of blood through the lungs under these circumstances.

The symptoms of poisoning naturally vary according to the length of exposure, individual susceptibility and the amount of benzol absorbed. As Dr. Reifschneider will probably tell us of the symptoms of the poisoning in both the acute and chronic state, I shall pass along to the prevention of the poisoning.

From the standpoint of those engaged in safety work, the methods of prevention of benzol poisoning are of much more importance than any other phase of this problem. The first step in the prevention of the poisoning is to be found in the physical examination of each applicant for work and periodic re-examinations of those exposed to the hazards of benzol. Persons suffering from organic diseases, especially of the heart and kidneys (which diseases tend to retard elimination), should not be placed on occupations where the exposure to benzol constitutes an occupational liability. Physical examinations should include a differential blood examination, an estimation of haemoglobin and a determination of the coagulating time of the blood. Experience indicates that re-examination every four weeks is not too often.

FOLLOW-UP ALL SUSPECTED CASES

All cases of absence from work should be investigated if the absence extends beyond twenty-four hours. In event of the employee being away from his occupation because of sickness, he should be visited by a physician familiar with the early symptoms of benzol poisoning. Note should be kept of the state of health of the workers, the results of periodic physical examinations, the duration of symptoms and the treatment of illnesses that occur. Care should be taken to have the records complete and entries such as "coagulating time, normal," should be discouraged. Employees should be encouraged to use the factory dispensary in event of illness and it hardly requires to be said that medical aid should be within easy reach.

We have now come to the subject of the education of the worker. In the prevention of occupational diseases the co-operation of the employee is indispensable and is the most important condition of an effective defence. The best regulations and preventive measures are worthless if the worker does not observe them. The employee should be advised as to the dangers incidental to his employment and he should be acquainted with the symptoms which demand early medical attention; he should be taught the aims of the management with reference to the prevention of industrial poisoning.

FUMES MUST BE DRIVEN OFF AT BOTTOM

Dr. Hamilton reports a procedure at the Gary plant of the United States Steel Corporation in connection with safety in cleaning apparatus which has been used in the manufacture or storage of benzol: After washing out the empty tank and steaming it a cage of white mice is lowered into the tank. If the mice are overcome by the gas the flooding and steaming are repeated until the mice show no effects of the benzol. The use of

a portable electric-driven gasblower to exhaust air through the drain pipes of tanks has been of much value. Because of the benzol vapor being heavier than air, it is necessary to exhaust at the bottom of the tanks and drain pipes are conveniently located for this purpose.

AIR CHANGE THIRTY TIMES AN HOUR DESIRABLE

Where benzol is used industrially as a solvent it has been found necessary to install general room ventilation, rather than hope to confine the ventilation to a small number of exhaust hoods. In a scheme of general room ventilation it is well to again remember that benzol vapor is heavier than air and should be exhausted at the floor level. Our experience illustrates that an air change of thirty times an hour is desirable and that the flow of air toward the floor should be not less than six feet per minute. The British standards in rooms where aeroplane wings are "doped" concurs with our ventilation of thirty changes an hour.

In conclusion, permit me to say that with an efficient method of physical examinations, with regular re-examination, the changing of an employee's occupation as quickly as he shows either an abnormal reduction in numbers of blood cells or an unusual increase in coagulating time, together with adequate ventilation, benzol not only can, but is, being used without danger. If managements and employees are willing—and most of them are—to maintain reasonable safety requirements, benzol will continue to be a cheap and powerful solvent and need not be the cause of needless sickness or death to employees in industry.

CHAIRMAN KERSHAW: We are very much indebted to Mr. Horan for his paper. It is to be discussed by W. S. Paine of the Aetna Life Insurance Company, and by Dr. C. A. Reifschneider.

BENZOL POISON IN INDUSTRY

WALTER S. PAINE, RESEARCH ENGINEER, AETNA LIFE INSURANCE COMPANY.
HARTFORD, CONN.

The many uses to which benzol, a coal tar derivative (C_6H_6), has been put gives us a vital interest in this solvent. Because of its usefulness as a solvent this light fraction derived from coal tar has been used extensively in the following industries: In the manufacturing of rubber, paint and varnish, artificial leather, printing inks, synthetic resins and waxes, intermediates, dyes, motor fuel, asbestos boards, wallboards, brake linings, shoe polishes, leather, paper, disinfectants, also in cleaning and in petroleum refiners.

This range of industries, in which benzol is employed, should convince any one that it is advisable to give adequate time to discuss thoroughly the problem which this solvent has brought into industry.

Time and time again we find references to the small number of benzol poison cases recorded in industry. This incomplete record must not draw our attention from the seriousness of the situation, but the question which ought to interest us is this: Why have so few cases been

recorded as resulting from benzol poisoning? We may well inquire if cases directly traceable to benzol poisoning have not been attributed to other causes.

There are two viewpoints which have been brought before the public as to the disposition of benzol in industry:

(a) There are persons who think only in terms of its toxic effect upon the human system, as used in some industries, and believe that the use of benzol in industry is a disastrous innovation.

(b) The viewpoint of the manufacturers is that because of competition they must use this cheap and powerful solvent in lieu of more expensive and less efficient agencies heretofore employed by them.

The latter viewpoint is not void of humanitarianism, for in a number of cases which have come to our attention we have found that the employer has been vitally interested in eliminating this hazard, even at the expenditure of large sums.

There are a few pertinent questions which we, who have tried to cope with this hazard in industry, might well ask ourselves in the light of the expenditure manufacturers have made to retain this solvent in their processes of manufacture without its disastrous effect.

(1) Has a thorough investigation been made into this subject in so far as the medical point of view is concerned, or has a fair portion of the cases been diagnosed in such a way that it is difficult to discern the primary cause? In the twelve years since Selling raised the danger signal on this subject, how much real constructive and reliable literature has been added to the medical collection of facts on this poison?

SUBJECT REQUIRES CAREFUL STUDY

In looking into this phase of the subject, can we answer the following question definitely so as to aid industry in solving this problem?

(a) Can an individual be poisoned by absorbing benzol through the unbroken skin? Some state that benzol cannot be absorbed sufficiently as to be a serious hazard to the user, while others report actual cases which they feel confident occurred through this source.

(b) Is the hazard of breathing benzol when cold as serious as when the benzol is volatilized by heat? This is still an unsettled question.

There are a number of phases on the medical side of this problem to which Dr. Reifschneider will refer in his paper on this subject.

(2) Has the chemist who ought by this time to have dug deep into the chemical analysis of this solvent contributed his bit of knowledge to this work which will finally aid in solving the difficulties of using this poison in industry?

In answering this question may we state that, while trying to overcome this hazard on a specific risk, we found ourselves pouring out our troubles to one of the chief chemists of a large concern, who was supposed to be an expert on benzol. This chemist was unable to aid us, even though his failure to do so might mean discontinuing the use of a product manufactured by his own company.

By way of example, Von Schwartz in his list of vapor densities has placed benzol as 2.77 with air taken as unity. Because of this fact we have often seen the conclusion reached by some chemists, who have supervised corrective measures, that since benzol when cold is heavier than air, this state exists generally, regardless of a change in temperature. We have seen ventilating systems installed which have proved to be practically useless because careful consideration was not given to the fact that, when benzol is volatilized at specific temperatures, it begins to follow the natural tendency of lighter-than-air vapors, and, therefore, rises. A profitable contribution which the chemist can make towards the solution of this problem is a chart showing the vapor density of various grades of benzol at varying temperatures. The chemist, in co-operation with the physician, ought to be able eventually to establish the fact whether or not the real cause of this poison is benzol or the impurities contained therein.

ANALYSIS OF ALL DATA AVAILABLE MUST BE MADE

There are other problems which the chemist must finally solve before we shall be able to curtail to any great extent the disastrous effect of this solvent in specific industries.

(3) Perhaps the one who has been in a position to contribute the major portion of data which, at this present time, will aid greatly in bringing about corrective forces, and yet who has really collated the least amount of information on the subject, is the safety engineer. He is situated so advantageously in relation to this specific problem in his own plant that he ought to have by this time compiled detailed data to indicate the positive steps that may be taken to offset this hazard.

When a case in his plant arises that shows any indications of benzol poisoning symptoms he can at once chart all details as to the various phases of exposure to this solvent and, with the physician and chemist (if there is one employed at the plant), a series of cases can be so analyzed and charted as to be invaluable not only to his industry but also to industrial medical literature covering this subject. It is within his duties to aid in the layout of ventilating equipment, and by careful study he can procure detailed information as to results obtained under various types of atmospheric conditions.

Some will at once picture in their minds a raft of detail work and study which their specific industry will not warrant, but this is the only method of attacking this type of problem. Such an analysis will eventually save their concern money, for any makeshift method of handling this question not only will be expensive but will often prove worthless.

If this Section of the National Safety Council wishes to contribute a valuable piece of work to society at large we advise the following procedure:

(a) Select six active men from your membership who are in a position to collect and to collate data on benzol poisoning and let the committee be composed of the following

personnel—two physicians, two chemists and two safety engineers.

(b) Have this committee chart out a definite line of procedure which will be followed not only by this committee but by all other members of this Section who are in a position to furnish such data.

(c) Prepare for this Section a detailed report describing their findings and then offer definite recommendations to offset this hazard in industry.

These suggestions are made after reading all the material to which we had access on benzol poisoning, together with our experience on specific risks.

MECHANICAL SAFEGUARDS NOT YET PERFECTED

Our own experience on a specific risk may be of assistance to some one having a similar problem with benzol fumes.

The concern to which you are introduced will probably manufacture 80,000,000 tin cans this year for the packing industry. Visualize, for the moment, a tomato can consisting of a top and bottom and the cylindrical side. The top and bottom are stamped out and before they are spun into the cylindrical side a rubber compound is run in liquid form about the edge of the bottom and top to make the joints air tight.

The covers (top and bottom) are automatically fed into the machine where they are revolved on a center, and as they revolve a feed, very similar in shape to a patented pencil point, flows the rubber compound into the groove of the cover. A horizontal slide automatically pushes the covers to an incline slide, where they coast to the drying oven, which is oval in shape and about 4x6x3 feet in size. Within these ovens are revolving discs which are staggered to produce a continuous conveyor with a maximum amount of travel in the minimum amount of space.

Upon reaching the last disc the covers pass on an exit conveyor, which is about eight feet long, at the end of which sit two young women to detect any covers which do not contain sufficient amount of rubber compound to encircle the groove. These young women wear canvass gloves to protect their hands from the rubber compound as well as from the heat radiating from the hot covers. To make it easy to detect this compound at a glance a red dye is added to the mixture before it is placed in the container of the feed machine.

The solvent (benzol) must be driven from these covers during their passage through the ovens, so they are intensely heated by a gas burner which is placed in the ovens, in a separate compartment, below the revolving disc. A sheet iron bottom in the oven separates the dryer from the burner compartment.

Bear in mind that you have a poisonous solvent, very volatile, being driven from the can covers by an intense heat. The volatility of benzol gas can be best imagined when we realize that in a test of equal amounts (5 c.c.) of pure benzol and (5 c.c.) of heavy naphtha in an "albarene" stone dish approximately 4 inches in internal diameter, under similar conditions, the benzol will evaporate in twelve and one-half minutes,

while it will take fourteen minutes for heavy naphtha to evaporate. Note the speed of evaporation of benzol.

VOLATIZED BENZOL SEEMS CHIEF HAZARD

The fumes given off by the ovens penetrate the various air strata and thus, through the respiratory organs, attack those exposed who are susceptible to benzol poison. You will note the statement "susceptible," because it has been found that some of the employees had been exposed to the fumes for about nine years and had not experienced any symptoms of benzol poisoning, such as headaches, dizziness, weakness, and, so far as could be ascertained, any traces of purpura hemorrhagica.

But one bright morning the superintendent of the plant learned that about half a dozen employees exposed to these fumes were suffering from benzol poisoning. There was no shadow of doubt as to its cause. A careful survey was made of the whole situation and every nook where benzol was used received investigation. Dr. Reifschneider made a careful physical examination of all employees showing any symptoms of poisoning, and then took a blood count of each subject exposed to it. He will explain this to you in detail. Those employees exposed to the cold benzol showed no symptoms of poisoning, so our attention was directed to the ovens giving off the volatilized benzol.

Other industries carrying on like processes gladly allowed us to examine those ventilating installations which were based upon the theory that benzol at all times was heavier than air. Their system, though it reduced the fumes, was not really effective.

Returning to our oven problem, we made tests from the floor to roof and as we ascended we found the fumes more intense. On the roof, over the skylights, the fumes were very perceptible. It was, therefore, decided to exhaust the air through a ventilating system located at the ceiling.

Over each oven there was constructed a 45-degree hood leading to an eight inch duct, each hood extending twelve inches horizontally in each direction beyond the oven. From the edge of the hood at least a twelve inch apron extends vertically down the side of the ovens, bringing the bottom of the apron within sixteen inches, or less, of the floor. The 45-degree hoods were located as near the ovens as possible.

The reason for providing aprons hinged to the hood developed from the fact that on a humid night we found that with a tightly enclosed oven the benzol fired, and it was thought best to hinge the aprons so that they would, thus installed, aid the exhaust system and at the same time act as a buffer in case of an explosion. The explosive lower limit for mixtures of benzol vapor and air is 3 parts benzol and 97 parts air; the upper explosive limit is 6 parts benzol vapor and 94 parts of air.

PHYSICIANS, CHEMISTS AND SAFETY ENGINEERS TO ASSIST

At the time of installation of this system it was figured that we ought to have a change of air about thirty times per hour. I believe the mechanical engineer of the plant, who aided greatly in the

solution of this problem, contemplated using a fan which would give him nearer forty changes per hour.

To these mechanical features were added medical supervision, which must be the real test of the effectiveness of our engineering solution. These medical features can be provided in detail.

In closing, this fact confronts us: The price of gasoline has greatly increased during the last ten years, while the supply is ever decreasing and substitute solvents must, therefore, be provided.

Benzol has proved its usefulness as a substitute solvent in many cases and rather than rob industry of this valuable asset we must develop ways and means of counteracting its ill-effects upon humanity. This can be accomplished and the early date of this accomplishment can be hastened by an earnest endeavor on the parts of physicians, chemists and safety engineers to bring it to pass.

CHAIRMAN KERSHAW: We are indebted to Mr. Paine for the careful study that he has given this subject. We will next hear from Dr. Reifschneider.

BENZOL POISONING, ITS OCCURRENCE AND PREVENTION

DR. C. A. REIFSCHNEIDER, BALTIMORE, MD.

During the last eight months I have had the opportunity of seeing a number of cases of purpura hemorrhagica, due to benzol poisoning. These cases occurred in a plant which manufactures sanitary tin cans. About 450 hands are employed and sixty of these work in the coating-room (dope room). All the cases that I saw were confined to this department.

Pure benzol, being very volatile, is used as a solvent for rubber. The ends are put in the coating machine, which automatically carries them around and the margins are coated with a paste of rubber, benzol and analine. The ends are then passed through an oven where the benzol is evaporated and a solid layer of rubber and analine is left. These ends are fed into the machine by girls between 16 and 20 years of age, and after they come from the oven they are inspected by another set of girls of the same age. A few men are also employed in this room to remove the boxes when filled.

This room was 81x60x10 feet 8 inches and had only one fan. There were open windows on three sides. About seventy-five gallons of benzol were used daily when all the machines were running and all this was evaporated. The odor of benzol was very marked in the space immediately around the coating machine, while the same odor, though much weaker, was noticed throughout the entire room. The air at or just above the level of the floor was practically free from the odor of benzol, while that at the ceiling was about saturated with benzol fumes, thus proving that when benzol is heated its fumes rise and that any ventilating system in which air is drawn from the room at the floor level will not remove the fumes, since the specific gravity of heated benzol fumes is apparently less

than the surrounding atmosphere, consequently the upper strata must be ventilated.

All the employees in this department were examined and questioned and it was found that 48 per cent complained of occasional headaches; 36 per cent dizziness; 16 per cent pains in abdomen, and 12 per cent nosebleed.

We also noticed that these symptoms were more marked on damp days. One man had four severe nosebleeds and all four occurred on days in which the humidity was high.

LARGE PERCENTAGE OF MARKED SECONDARY ANAEMIA

Dr. Louis Krause and Mr. Fred Wiggers did not complete blood count on every one who worked in that department and, although we knew that a certain percentage of factory girls were anaemic, we were surprised to find that a large percentage had a marked secondary anaemia. Of the sixty employed:

2 or 3 per cent had counts of less than 2 million.
9 or 15 per cent had counts of less than 2.5 million.
13 or 30 per cent had counts between 2.5 and 3.5 million.

It is our opinion that these cases are the result of intoxication by inhalation, and to confirm our belief counts were made on the following who mix the solution and whose hands and arms come in contact with the solution, but who do not inhale the heated benzol fumes:

M. F.	4,700 WBC	5,780,000 RBC
J. K.	7,000 WBC	5,060,000 RBC
F. G.	13,500 WBC	4,600,000 RBC

The leucocytosis in the last case is accounted for by cracks and infections of ulcers of both hands and forearms, due to irritation of the benzol solution.

The symptoms of chronic benzol poison vary to a great degree. Some cases have a marked secondary anaemia without any symptoms; others developed symptoms in the following order of frequency: Headaches, dizziness, pain in abdomen, nosebleed, loss of appetite, monorrhagia, metorrhagia, purpuric eruptions, vertigo, etc.

1. One of our cases. J. F., age 42, foreman in the coating-room, developed a marked secondary anaemia; with the exception of an occasional headache, he complained of no other symptoms. RBC, 1,580,000. (Four weeks rest RBC, 3,500,000.)

2. A. C., aged 37, examiner, developed purpuric eruptions on both legs and arms. She complained of no other symptoms until she began to menstruate and then she almost bled to death. RBC, 2,200,000; WBC, 4,000. (Stayed off five weeks and fully recovered. Blood count; 4,200,000.)

3. The following case is one of severe benzol intoxication: J. J., age 15, occupation, examine ends; complaint, bleeding from the womb and weakness. Patient had always been healthy previous to employment. A few days after going to work she developed frequent headache, dizziness, and occasional nosebleed. About one week previous to admission to the hospital she began to menstruate. Flow was very profuse and became very weak. At the time of admission patient was very anaemic, bleed-

ing profusely from the uterus and also from her gums and mucous membranes of her cheeks. She had purpuric eruptions under the skin of all four extremities.

Blood count—

4.11.22	WBC 950	RBC 880,000.
4.12.22	Transfusion	400 CC.
4.13.22	WBC 1,200	RBC 930,000.
4.14.22	Transfusion	650 CC.
4.16.22	WBC 4,700	RBC 1,985,000.
4.17.22	Transfusion	700 CC of blood.
4.18.22	WBC 5,050	RBC 2,184,000.
4.20.22	Transfusion	700 CC.
4.21.22	WBC 5,900	RBC 2,320,000.

Patient is an anaemic white female, age 17 years, who was brought to the University Hospital on 3.14.22 in a very weak condition. She gave a history of having worked in the coating-room in a certain can factory and that she was taken sick ten days previous to admission with headache and dizziness. Four days ago she noticed bluish discolorations on the dorsal surface of her left hand and the following day similar spots appeared on all four extremities. The day previous to admission she began to bleed from the mucous membrane of her mouth and her gums and frequently vomited blood during the last twenty-four hours. She was also bleeding quite freely from her uterus. On the day of admission she had difficulty in swallowing and also complained of dyspnea.

FATALITY DUE TO BENZOL POISONING

On examination, patient was found to be in a very weak condition and had some difficulty in breathing. She was bleeding from her gums and the mucous membrane of her mouth, and she frequently spat out blood. She had purpuric discolorations on all four extremities, which resembled large bruises. She was somewhat tender over her lower abdomen. She was bleeding from her vaginal canal. Her hymen was intact. Her pulse was rapid and weak and her temperature was 101. Leuco, 600; RBC, 1,240,000; haem., 39 per cent. She was given a transfusion of 400 CC. of citrated blood. The day following the transfusion she seemed somewhat improved. Then her condition became worse and she died on 3.19.22.

1. Heated benzol fumes rise, notwithstanding claims of other investigators.
2. The atmosphere can be cleared by removal of the upper layers of the air and prevention of benzol poison assured.
3. Those having symptoms, when removed from benzol laden atmosphere, make uneventful recovery if proper treatment is instituted, as was proved by us in a number of cases. (The two fatal cases did not come under our observation until about two weeks after the onset of severe symptoms; they were in such condition that treatment was useless. If we had gotten these cases earlier, I think, under proper treatment, these patients would have recovered.)
4. Certain individuals are more susceptible than others. In our series there were three cases in one family; two proved fatal, the other

was removed when we found that he had a secondary anaemia and he developed no further symptoms. Young girls and pregnant women are very susceptible.

PROPER VENTILATION AND MEDICAL EXAMINATIONS NECESSARY

1. The first thing to do is to correct the ventilation system in the manner described by Mr. Paine. This was done in our plant four months ago and no new cases have developed since then.

2. Careful examination of those employed in that department and if any should show any one sign or symptom of benzol poisoning such as:

headache, frequent,	vertigo,
dizziness,	abdominal pain,
nosebleed,	lassitude,
purpuric eruptions,	menorrhagia or metorrhagia,

or in the absence of any of these if they develop a secondary anaemia they should be immediately removed from the department.

3. We have a check made every day and all absentees are investigated. If they are sick medical attention is given at once and it is my belief that if all cases of benzol poisoning were discovered early there would be no fatalities. Although some men claim that the condition is a progressive one we have proven this untrue in a number of cases.

4. All new employees should be carefully examined to detect any of the symptoms as described in paragraph 2.

DISCUSSION

MR. HORAN: The first portion of Mr. Paine's paper seemed to be composed of several questions. The first was: "Whether it was possible to absorb benzol through the skin?" We know that this can be done in the laboratory. We know that a piece of tissue can be exposed to the fluid benzol, weighed before exposed to the fluid benzol, weighed afterwards, and we know that it decreases in weight. We then take the benzol and work with it, and we find that the benzol has abstracted the fats from the tissue. We know because of its fat absorbing properties that benzol might be absorbed through the skin, but the possibility of this happening in ordinary industrial operations is remote.

The second question: "Whether or not benzol is more dangerous when heated than when cold?" If you heat a piece of fabric on which benzol cement has been spread the more you heat it the more you volatilize the benzol and the more of the material you get into the air.

His third question is on the density of benzol at various temperatures. I cannot agree with Dr. Reifschneider that the sense of smell is a bit scientific in the determination as to whether or not benzol is present in the air. It is perfectly possible to take some of the air and run it through petroleum oil, or some other solvent material, and determine definitely the amount of benzol in the air on the floor, three feet up, six feet up, or twelve feet up. Benzol at various temperatures has various densities. At 70 degrees Centigrade benzol has a density of .00324; air, at 100 per cent relative humidity at the same temperature, has a density of .001188. At 80 degrees Centigrade benzol has a density

of .00275 and air .001622. That is the temperature with the relative humidity of 100 per cent; that is the heaviest air you get in your work-room at that temperature—and if you actually had 100 per cent relative humidity, of course, you could not volatilize benzol. At 70 degrees Fahrenheit, therefore, benzol is 274 per cent as heavy as air; at 80 degrees it is 169.7 per cent as heavy as air; so that, irrespective of what your room temperature might be, within reasonable limits, benzol is not lighter, but is heavier.

You might have a condition where, because of the fact that the heated surface was generating a current of air upward, the draft would be sufficiently strong to pull the benzol vapor up, but as soon as the benzol vapor reaches the ceiling and gets out of the air current, the benzol vapor will fall, and it will fall by the breathing zone of your employee. If we are using benzol on this table, and the table is hot, the benzol vapor goes up to the ceiling and then comes down again and we have had two exposures.

HAZARDS FROM BENZOL AND BENZOL IMPURITIES

With a ventilating system that gives you an air movement of at least six feet a minute you can keep the air moving down and the benzol from going to the ceiling, because you would never get a movement from the ordinary heated surface that would overcome that downward movement of air.

His fourth question: "Whether or not impurities in benzol were more dangerous than the benzol itself?" We know that Bambusic has done quite a lot of experiments on dogs, rabbits and other animals with benzol, xylene and toluene—xylene and toluene are the only impurities you get in ordinary commercial benzol. The olefines and paraffins are of little importance from the standpoint of industrial benzol. We know from experiments that benzol is more dangerous than are xylene or toluene. I think it can be definitely stated, in reply to the fourth question, that pure benzol is more dangerous than impure benzol, and that benzol is more dangerous than either xylene or toluene.

MR. PAINE: I wish Mr. Horan had stayed until I finished the paper. He might have noticed what I brought out, following these questions. The question I raise is this: If, as a National Safety Council, we are going to lead the public, then let us lead them right. You may be right; you may be making assumptions, and there may be general conditions under which your figures have been calculated, that do not exist under other conditions. Therefore, I want to establish these figures. I have taken the same viewpoint that you have taken. We have met a practical problem. Your theory of ventilation has been applied. In three or four cases with which we are dealing it has proven defective; not theoretically incorrect, but not practically correct. Therefore, we have followed this other solution and so far it has given us a remedy.

If I were to write a paper on benzol I would go into the method of analyzing benzol. That is what I want done next year. I want a test made by a thoroughly scientific method, to determine the percentage of benzol from the floor to the ceiling. In regard to the absorption of

benzol, my statement was this (I took it from your paper): "Some state that benzol can be absorbed sufficiently to be an express hazard to the user." That is a question I want answered. I am not foolish enough to say that flesh cannot absorb it. What I want to have answered is this: Flesh will absorb that solvent, but will flesh absorb that solvent to the extent that it is injurious to the user? As to impurities I would refer you to document No. 107, published by the Massachusetts Department of Labor, in which it calls to our attention: "Are you over-emphasizing the poisoning influence of benzol, or are the impurities (which are given one after the other in that document) the cause of the poisoning?"

We admit tests that were made years ago under specific conditions the ones you have just spoken of, but our American conditions are some times so diametrically opposite that we want to bring the data up to date. I want to avoid safety engineering work with reference to ages past; let us do real constructive work, so we can say: "We come before you not only with our problem, but with our solution, and that on a scientific basis."

THURSDAY MORNING SESSION

Mr. M. F. Crass acted as Chairman. Dr. Yandell Henderson gave a most interesting talk on carbon-monoxide poisoning, and the use of gas masks in all industries where this poison was found; he also told of the use of gas masks in laboratories and in mines.

Mr. Earl Sweetland of the Pennsylvania Salt Manufacturing Company told of the use of gas masks in the bleaching industry, where chloride of lime is manufactured, and brought out many defects in the manufacture of present-day gas masks.

Mr. Segrave of the Mine Safety Appliance Company gave a short history of the manufacture of gas masks and very carefully explained the various parts of the masks and the make-up or "fills" of the canisters for different uses. One result of the intensive work of the army chemists and engineers (The Chemical Warfare Service, U. S. A.) was the development of the most efficient gas masks by any of the powers in the world war. Mr. Segrave also told of the effect of carbon monoxide and gave an actual demonstration of its effect on white mice.

A representative of the Potato Safety Appliance Company brought out various safety features of gas masks in various fumes.

During the discussion which followed, the main point brought out was the fact that many of the users of gas masks had experienced considerable trouble with stockinette covering, which rapidly deteriorates: the metal parts became corroded and the rubber in the headbands gave away. The manufacturers of gas masks present seemed grateful for the constructive criticisms of their various masks and assured the members of the Section that they would give these criticisms attention in the future.

The Section then adjourned.

Construction Section

August 29-30, 1922

F. A. DAVIDSON, Chairman,
The Patent Scaffolding Company, Chicago, Ill.

F. S. ROBINSON, Vice-Chairman,
Secretary, General Builders Association, Detroit, Mich.

W. F. AMES, Vice-Chairman,
Insurance Department, Mc Clintic-Marshall Company, Pittsburgh, Pa.

J. H. SCHULTS, Secretary,
James Stewart Company, New York City.

TUESDAY MORNING SESSION

CHAIRMAN DAVIDSON: The first item on our program is the report of the Chairman.

This year the bulletins have been taken care of in a better way. At the first of the year a regular schedule was mapped out by the officers of the Section and scenarios written for a number of bulletins. Photographs were then taken to illustrate the specific subject. If you have followed the bulletins this year I think you will agree that the Construction bulletins are improving a great deal. When that is added to the fact that instead of getting just a weekly quota of bulletins, you may now choose them from the samples in the *News* each month—which means that the construction companies can now get service on bulletins far superior to the practice in the past—I think you will agree with me that a decided step forward has been taken.

SAFE PRACTICE PAMPHLET AND SAFETY CODE

Our next step, in addition to the bulletins, is the pamphlet on "Uniform Accident Statistics for Construction Companies." This is a print of the reports that were accepted last year and the year before, and lays down the principles for any and all construction companies collecting their accident statistics on a uniform basis. This is now available for wide distribution and there is no reason for any construction executive or safety man not keeping his accident statistics in the uniform, standard way.

Third, and perhaps the most important in items of specific service for construction companies is the loose-leaf pamphlet, "Safe Practices on Construction Work." It is one of the best things ever worked out for use in construction work. It is based on and practically identical with the Safety Code of the Detroit General Builders' Association—a pioneer piece of work they did here in Detroit—and to me it seems remarkable.

I have a copy of a letter which is typical of a number that have passed over my desk: "Dear Sir—We received your copy of 'Safe Practices on Construction Work.' It is extremely readable and valuable and we believe our superintendent will like it. Kindly have the proper person instructed to forward us twenty-five additional copies." In the short time it has been out I have had several of these requests for a considerable quantity of additional copies. If you are not familiar with this pamphlet you should secure a copy; you can certainly make use of it.

The membership of the Construction Section is about holding its own. The Council, as a whole, due to the hard times, lost a few of its members last year, but is now building up again.

I will appoint as Nominating Committee Mr. Thomas Walsh of Wilmington, chairman; Mr. C. H. Almstead, of Dwight T. Robinson Company, Inc., and Mr. P. J. Shea, Fred T. Léy & Co., Inc.

Rather than wait for General Marshall we will start the program this morning with the second speaker. I take great pleasure in introducing Mr. John Nielsen.

PRACTICAL SAFETY METHODS OF A FIELD SUPERINTENDENT

JOHN NIELSEN, SUPERINTENDENT, H. C. CHRISTMAN COMPANY,
DETROIT, MICH.

Although there are still those who do not consider safety methods as being practical, the time is at hand when a construction superintendent will be judged as much from a safety standpoint as he will by his technical ability. I have seen much reckless construction work and have been a victim thereof; I have seen men mutilated and killed when ordinary precaution would have prevented accidents; therefore I am grateful to know that so much is being done in the interest of safety and the employers are taking such a prominent part in this work. During the late war I was connected with the safety department of a large shipyard. We had an accident which resulted fatally. Upon investigation we found the direct cause to be the lack of a railing protecting a dangerous stair opening. While we were correcting this evil one of the employees remarked: "Locking the barn door after the horse has been stolen." A safety engineer replied: "That is true, but in this particular barn there are more horses." Is not this just what stimulates our efforts in accident prevention—when someone has been hurt the desire to prevent a similar occurrence?

We all know that the standard adopted by contractors in judging their superintendents is their ability to erect their jobs at a minimum cost and it has often been difficult for the man responsible to the contractor

to see how safe methods could be incorporated among his schemes for keeping the cost where it should be. My experience teaches me that the success of a field superintendent depends entirely upon his ability as an efficiency man and, as I have come to look at it, one of the most important factors in efficiency engineering is safety engineering. We have seen that a man on a safe scaffold, with room enough to work, will accomplish more than a man on a shaky plank. The reason for it is that he can place his entire attention upon his work, where, on the other hand, the man on the unsafe scaffold will have to center a certain amount of his attention upon himself, due to the existing hazard. Really, the difference in cost between a good and a poor scaffold is very little.

I wish to call attention to the many good suggestions found in the safety code issued by the General Builders Association of this city and to mentioning a few instances which I believe are of special interest. First, I would like to bring home to you what I consider the most practical safety method on record—a method, I believe, that is being practiced to a great extent, but upon which strong enough emphasis cannot be laid, namely, *individual instruction in safe methods*. The field superintendent must understand not only how to create interest among his assistants and foremen but also how to secure the co-operation of his entire working force. Each foreman must be brought to feel the responsibility he assumes for the men in his charge. Therefore, the superintendent should make sure that his foremen are familiar with the safe methods set forth in the code in order to properly instruct and guide their men. When the men once realize the importance of making the job a safe one it is a pleasure to note their willingness to help and some of the best safety methods have been suggested by workmen. But the foreman must always be ready to show the men how to do each part of their work in a safe manner.

INDIVIDUAL INSTRUCTION OF SIGNAL IMPORTANCE

Individual instruction is of signal importance on a building in the early stages of the erection of each floor as so many unforeseen difficulties may present themselves and be a source of danger. The men must necessarily get up and work on a few stringers. There will be many openings, such as stairwells, elevator shafts, pipe shafts, etc., that cannot be guarded until the work progresses far enough for the job to take shape. Many cases will arise where hard and fast rules cannot be laid down, but the workman who has been trained to practice safe methods will understand in each case how to go on with the work in a way that will endanger neither himself nor his fellow workmen. It is a good practice on the part of the superintendent to touch occasionally on safety matters when he talks to the men.

It is surprising to notice how few of the men engaged in building work are familiar with the proper way of tying the most familiar knots or hitches. Any man working on a building should know how to tie a square knot, a bowline knot, a timber hitch and a halfhitch. Shoring of banks is an item that adds considerably to the cost of excavation, therefore it is noticeable on almost all excavation jobs that as little shoring as possible is done. When it is omitted the banks should be cut back to nearly the

natural slope of the soil to guard against slides, but much saving can be effected by leaving the slopes steeper and therefore there will always be a strong tendency to do this; more so if the excavation is in clay, as a clay bank under most conditions will stand very steep. Weather conditions play a very important part and if excavation has been carried on during freezing weather a close watch should be kept on the banks if soft weather sets in, as the parts penetrated by the frost invariably will slide when the frost has been driven out. If the thaw is accompanied by heavy rains a very dangerous condition will be created, particularly in case of a deep cut, if work must be carried on at the bottom. A slide always gives ample warning; smaller parts will loosen first and roll down, a crack will open up and gradually grow larger until the bank caves in—but it always takes several seconds and often minutes before the slide comes. Therefore, if work must be carried on under such conditions a man should be watching the banks closely.

"A" frames or breast derricks are often employed. Care should be taken in tying the guylines to get them in the proper position with respect to the "A" frame to prevent a pull to one side that easily might cause it to turn over. When erecting formwork for flat-slab construction the large holes in the dropheads should be covered, as there are always dowels sticking up through the concrete directly below these holes. A fall through such a hole is invariably fatal. A timesaver and a good practical safe method that often has been advocated in Safety First literature is the building of good, strong ladders, or, better still, temporary stairs. The latter cost little more and will soon offset the difference in cost by the ease they afford in getting up and down.

SUPERINTENDENT'S VALUE JUDGED BY HIS RECORD

There is one important cost item that is strongly affected by safe methods—the insurance premium. Whether to the industrial insurance commission or to a private company, the premium is in direct ratio to the amount of money paid out in insurance claims and as this involves a considerable percentage of the payroll it is obvious that the field superintendent who has the smaller loss caused by accidents is directly helping to lower the cost of the building to which the premium is charged. This may not show on the books at the field office but nevertheless the main office must judge each superintendent by the cost of his jobs and a lower cost to the contractor means more work in competitive bidding.

I have endeavored to put my experience in safety methods into practice on the new Masonic temple, the building on which I am employed as assistant superintendent, and I have never enjoyed such splendid co-operation from the superintendent and foremen as well as the men. Each one is anxious to do his share to make it a safe job and although we have encountered some hazardous work during the course of construction we have been complimented on making a good showing so far. We intend to keep it up for these reasons: It is satisfaction for a man to know that by preventing accidents he is saving someone, perhaps a whole family, from suffering. When each man realizes that the rest of the men on the job are having, in common with him, the desire to safeguard each other it

creates a better feeling. Men working in harmony and with the knowledge that everything possible is being done to make the job a safe place to work and with proper management give the best service.

Every argument is in favor of practical safety methods and the field superintendent who realizes that so-called humanitarian efforts are his best assets in his endeavor to produce at minimum cost will stand out beyond the superintendent who neglects this phase of construction work.

DISCUSSION

MR. R. E. PARIS (General Builders Association, Detroit): Do the men under your guidance use the Detroit Safety Code? Do they get any benefit from it and how do they take it?

MR. NIELSEN: They take to it splendidly. We make it a practice to have each foreman, once in a while, talk to his men about the code and point out to each man how to do his work right, if he is not doing so.

F. L. HURLBUTT (Patent Scaffolding Company, Chicago): When you started your safety work among your men, how did you attack the problem of getting their co-operation?

MR. NIELSEN: We got the foremen together at noon hours and talked to them. Then each foreman in turn got the men under him together and talked to them, or talked to them individually. Quite a number of men were reached in that manner. It is a slow affair, to get all of the large number of men employed on a building together.

MR. C. H. ALMISTEAD (Dwight P. Robinson & Co., Inc., New York City): What co-operation do you usually get from the foremen? Do they take very readily to the idea?

MR. NIELSEN: Yes, indeed they do. Of course, a man's job is his bread and butter, and he is interested.

R. B. INMAN (United Gas Improvement Company, Philadelphia): What are you doing in regard to taking on of new men? For instance, if you have had to transfer one of your foremen and he gets new employees, what do you do? Are they given individual instruction before they go on the job, or are they just allowed to absorb the code as they go along with the rest of the men?

MR. NIELSEN: We generally talk to each man newly employed. I make it a practice, when a new man is hired, to talk to him about safety and tell him to look out for certain things on the job; tell him what to look out for. Each foreman does the same. He watches very closely for a few days, until the new man gets the idea.

PASSING ON OF SAFETY INSTRUCTION

MR. INMAN: I think it would be a good suggestion if the foremen were gotten together at certain periods, allowing a certain interval of time between these little schoolings, so that when your foremen are transferred from one job to another, taking on a new force of men, they would be fully equipped to hand on this instruction, to dispense this knowledge to the new men.

MR. DONALD D. DICK (Dwight P. Robinson & Co., Inc., New York City): One of the most prolific causes of accidents has disappeared re-

cently, I am glad to say—that of puncture wounds from nails. What method do you use for cleaning up your nails?

MR. NIELSEN: We try, as far as possible, when we have a frame floor, to have the man in charge of the carpenters and nailers go over the floor and pick up such pieces of wood as have nails sticking in them; later on they clean up the floor.

MR. P. J. SHEA (Fred T. Ley & Co., Inc., New York City): What difficulty do you have, if any, in getting your men to wear safety goggles?

MR. NIELSEN: Our work necessitates very little safety goggles service. We simply insist, if the work requires, that he must wear them. We have them inspected also.

CHAIRMAN DAVIDSON: Do you use bulletin boards on the job, in posting safety bulletins?

MR. NIELSEN: We have not used bulletin boards, but we use bulletins and post them in conspicuous places. We paint signs on Safety-First subjects. These are displayed at different places in the building where the men must see them.

CHAIRMAN DAVIDSON: A number of contractors make good use of the job bulletin board and post their code or bulletins on them regularly.

MR. NIELSEN: We have placed our bulletins at the time clock or some other conspicuous place.

CHAIRMAN DAVIDSON: Do you find that the bulletins really do good—that the men read them?

MR. NIELSEN: Yes; I think that they do good; they keep the thought of safe methods before the men all the time. The men read them and you cannot tell them about safety too often.

MR. DICK: Do you have difficulty in keeping your foremen and men off material hoists?

MR. NIELSEN: We have not had any difficulty in that respect. I have not seen one case, on this job, of men riding the material hoist.

MR. W. D. HALES (Maryland Casualty Company, Baltimore, Md.): What is your procedure with men who either consciously or unconsciously violate your code while on the job?

MR. NIELSEN: We train each man to observe the code. If he repeatedly violates it, he is discharged.

USE OF GOGGLES IN CONSTRUCTION WORK

MR. A. E. DAVIDSON (Chesebro-Whitman Company, New York City): I was particularly interested in what Mr. Nielsen had to say on knots. You think every man in construction work should go through a course in learning how to tie knots? Or do you mean just certain men on the job?

MR. NIELSEN: I believe that every man handling ropes should know how to tie knots.

MR. DAVIDSON: I agree with you; there ought to be some real instruction on different methods of tying knots?

MR. NIELSEN: I think it would be beneficial.

MR. VERNE D. SUTTON (Postum Cereal Company, Inc., Battle Creek): I wonder if some gentleman in the audience, who has had experience along the line of goggles, could answer the question asked Mr. Nielsen.

Mr. Nielsen's experience did not permit him to answer as I personally would have liked to have the question answered.

CHAIRMAN DAVIDSON: The question was: How do you get your men to wear goggles on the work? That is a rather difficult question for a construction man to answer, as a rule, because of the very limited experience the construction industry has had on work where goggles are needed. I have one superintendent in mind who finally fired a man who refused to wear goggles. When the man asked why, he was told, "I fired you for the sake of your family."

W. H. MULLIGAN (Hydro-Electric Power Company, Toronto, Ont.): On construction work which we have done, we had trouble in getting men to wear goggles. In fact, they won't wear them.

MEETING EPIDEMICS OF EYE ACCIDENTS

MR. R. E. PARIS: With us the goggle proposition is a good deal like nail punctures. It all works in together. First of all, the foremen and superintendents are careful to instruct the men who are engaged on such work as requires the use of goggles. Those men are carefully instructed and told to wear the goggles provided for them. Of course, it is impossible to expect a foreman or superintendent to stand over each worker and see that he does wear them, but we have a corps of inspectors who keep their eyes open and if the men are not wearing the goggles it is immediately reported to the office on the job. The man who is wearing goggles is encouraged to wear them and the man who does not is taken off the work and someone else put on in his place.

We also have another check on that, because in our accident-accounting system, which is kept up to date, we can tell very readily if we have an epidemic of eye accidents. If they commence to come we redouble our efforts on that point. There may be two or three eye accidents in the course of one week, we will say, and that is a signal to get out on the rest of the jobs and redouble our efforts to prevent more eye accidents. That same thing is true about nail punctures, ladders, scaffolds or anything else. We watch the accident report as it goes on through the month, and if we have too many accidents of one kind—more than the normal number—we slip out on all the jobs and caution the men. We get out a bulletin on that very subject.

CHAIRMAN DAVIDSON: In Wisconsin, they have a provision in their industrial compensation law by which, in case the company has violated the law, the employer is obliged to pay 15 per cent additional compensation to the injured man. On the other hand, and very fairly, when the man has violated the provisions of the code, after the employer has taken care of his end of it, the employee loses 15 per cent. A Wisconsin inspector told me he used that 15-per-cent argument very effectively to get men to wear goggles. He put it up to them this way: "Your employer has given you goggles. If you do not wear them and you get anything in your eye, you may lose your eye; in addition to that, you are going to lose part of your compensation."

Somehow or other it seems that the loss of that 15 per cent can be urged upon a man even stronger than any injury. There is something

definite and tangible about losing so much money in the event of an accident that it gets home.

USE OF EFFICIENCY METHODS IN EDUCATIONAL WORK

F. L. HURLBUTT: I wonder why it is that the idea should prevail that Safety First work on construction is any different from the problems encountered in the average industrial plant. I was six years with the Du Pont Company, where we had a payroll varying all the way from 60,000 to 90,000 men, scattered over forty plants and as many construction jobs—the largest of which employed 30,000 men. Somehow there was an idea in our company, for a long time, that we could not tackle construction safety work, as we had and did tackle the operating plants. But we absolutely proved it could be done in a practical way without impossible hardships, by way of a logical practical program of working through the construction organization. We had a large safety organization, but the principle we employed was to keep it in the background and have the construction organization incorporate their safety program exactly as they did construction layout and their efficiency methods, and it worked. It cannot help but work.

CHAIRMAN DAVIDSON: We will now hear from our third speaker, Miss Townsend.

KEEPING RECORD OF ACCIDENTS ACCORDING TO CAUSES

MARY A. TOWNSEND, DIRECTOR SAFETY AND WELFARE, IRWIN & LEIGHTON, PHILADELPHIA

For many years Safety First has been a familiar term in industry, but it is comparatively new in construction. Formerly it was not only expected but *accepted* that a man would be killed to every floor in the erection of high buildings, but I am glad to say the builders today would be ashamed of such a record, especially those who are members of the Construction Section of the National Safety Council. We know that accidents are preventable and although there are many differences of opinion as to the most effective course to pursue to accomplish this, it is my purpose to show you how the keeping of systematic accident records is absolutely necessary if you would attain any measure of success.

To prevent accidents we must know how they occur and unless we have some record of the causes we are working in the dark. Of course, everyone has his own way of keeping these records—if he keeps any—but, seeing the need of a uniform system for the use of all members of the Construction Section, a statistical committee was appointed to make arrangements to meet this need.

The committee has reported to this Section of the Council and the method of keeping accident records recommended by that group of able men has been adopted and set up as a standard for all members.

WHAT QUESTIONNAIRE DEVELOPED

At a special meeting of the Construction Section in New York, Feb. 2, 1922, we discussed this standard of keeping records especially as to

the causes of accidents, and I was asked to write to all members to find out how many could tell us just why their men get hurt in the building game. The result of my investigation was that there were seven members who were classifying their accidents according to causes, five of whom were using the standard of classification adopted by this Section. It was most encouraging, however, to find that some who have not been attending the Congresses during the past two years were very much interested in what the statistical committee had done and requested copies of the report of that committee.

These are some of the things I learned from the records I received from the seven members to whom I just referred; namely, a larger number of our men get hurt through handling material than from any other known cause. To be exact, from the records I have:

Twenty-six per cent of the total number of lost-time accidents in construction in 1921 was caused from handling material.

Twenty per cent from falls of persons.

Twelve per cent from falling objects.

Eleven and one-half per cent from use of hand tools.

Eleven per cent from stepping on or striking against nails.

Only seven per cent from machinery and equipment.

And the remaining twelve and one-half percent from miscellaneous causes.

Knowing these facts, we have something tangible upon which to work in our efforts to prevent accidents.

EDUCATION OF WORKMEN ONLY SOLUTION

If we divide these known causes into two divisions, mechanical and non-mechanical, we will find that only seven per cent of our men are hurt because of unguarded or defective machinery and equipment. This is an eighteen per cent reduction of that cause of accidents in construction since 1916. This shows we have concentrated more or less upon that line of safety work because we knew so many men were formerly injured in that way. So, after all mechanical safeguards have been installed, there still remains 93 per cent of accidents which cannot be prevented by mechanical means.

There is an effective way of reaching such accidents, however, which is equally important, in my opinion, with the installation of mechanical safeguards; that is *education* of the workmen in the exercise of greater care for the avoidance of injuries to themselves and their fellow workmen.

In the experience of the firm by whom I am employed, we have seen a marked change in the attitude of our supervising officers on our various operations since they knew a record was kept of the cause of every accident and that if a man was seriously injured a written report is expected from the superintendent in explanation of how the man was hurt.

I send out monthly reports of every superintendent's record to the executives at the main office and to all jobs, so every superintendent knows what his competitor is doing, for that is what such a procedure

brings about; namely, a friendly competition among the supervisors of all works.

If all builders will keep a record of accidents, according to causes, we will then be getting at the root of the prevention of construction accidents, and all companies will reap the benefits which are sure to follow: that is, the reduction of the cost of carrying the accident burden in construction.

I wish we might instill this co-operative spirit into the minds of all construction companies.

DISCUSSION

P. J. SHEA: I should like to question the use of one form for both frequency and severity rates. A man is either at the bottom or the head of the list, according to his frequency record. He may have fifty minor accidents, which only make a lost time of fifty days. His name is at the bottom of the list. Another man may only have two accidents and he might have a death, and his name is at the top of the list. I don't think it is a fair comparison. I believe in separate reports. We always made them that way prior to the last Safety Congress, we went along with the ruling and put them on one form. But I don't think it is proper.

CHAIRMAN DAVIDSON: I think I can offer an answer to that: If you give Father Time a chance he will knock all those spots right out. You may occasionally run across a proposition where a man is willing to have a lot of minor lost-time accidents and be down at the bottom of the list, but not in the end. Of course, it should be clearly brought out that the severity rate is really the more important of the two. I did not find any difficulty in bringing that out. We never send the forms out alone; they are always accompanied by a letter. A great deal was made of the severity rate. If a man, by chance, was near the top, with a bad severity record, it was distinctly and clearly brought out.

For the purpose of your company, if you still feel it would serve your individual needs better, I would send out two reports; but for the purpose of investigating and compiling the data it is almost essential that it be boiled down into compact form, the way the forms call for individual statistic reports.

STARTING FIRES WITH GASOLINE

MR. R. A. BLOOMSBURG (Utilities Mutual Ins. Co., N. Y.): Miss Townsend mentioned one type of accident which has given us some concern, the starting of fires with gasoline. That seems an extremely foolish thing to do, but in the year 1921 we had two very severe accidents from that very cause. Ours is not a construction-insurance company, we carry that accident to the public utility risk. At that time, possibly, we were covering 1,000 men engaged in construction work, that is not directly connected with sub-stations. In the two cases mentioned one man was in the hospital four months and the other man lost part of his hand.

MISS TOWNSEND: I have a record of only one case in the three years I have been with Irwin & Leighton.

MR. HURLBUTT: I saw fires made in that manner on a number of construction jobs and we took all the means possible to stop it.

CHAIRMAN DAVIDSON: The Associated General Contractors represents the first genuine attempt on a large scale to develop real co-operation between construction people. The work has been very successful. No small part of that success has been due to the splendid leadership of General Marshall. He is a very busy man, but he managed to find time to come here to tell us about the relationship between the Associated General Contractors and the National Safety Council and why his association has endorsed the work. I take pleasure in presenting General R. C. Marshall, Jr.

WHY THE A. G. C. JOINED THE NATIONAL SAFETY COUNCIL

R. C. MARSHALL, JR.

Accident prevention, until some twenty years ago, received its principal impetus through laws instigated by employees or students of sociology and often bitterly opposed by management, but since then the situation has radically changed. We find that management itself is stepping far beyond the statutes to provide safe conditions of employment and to conserve the health and lives of workmen. This safety movement, which has been co-ordinated and extended by the National Safety Council, through the support of some hundreds of industries, embracing over three thousand companies, is now reducing the frequency of accidents in many lines of production and is lowering production costs. Its benefits to both employees and management have been proved by actual performance. The success and momentum, which the work has gained, is unquestionably attributable to three good and practical features of accident prevention. These features, which have been frequently emphasized by writers and speakers interested in safety work, are: 1. Mitigation of suffering and hardship to disabled workmen and their families. 2. Reduction of production costs. 3. The improvement of industrial relations.

CONSTRUCTORS DESIROUS OF IMPROVED SAFETY CONDITIONS

The first, a humanitarian benefit, requires but a moment's reflection to stir an appreciation of its need and justify the effort to secure it in construction. Constructors are desirous of reducing the physical suffering and poverty caused by accidents in their industry and any slowness in getting actively behind the move should not be attributed to indifference. If safety work is lagging unduly in the construction field it is due, in great part, to the fact that contracting is still, to a great extent, a one-man business without specialized departments, and the life of the individual heads of small and medium sized companies is a strenuous existence. Their energies, of necessity, have to be concentrated on the most tangible and pressing problems. The desire to alleviate the suffering is with them, as with other humans, but progress will doubtless be slow until the conception of safety work, as a concrete and tangible factor, is better understood. Having acquired an understanding of the methods

of tabulation, study, classification and application of safety measures, constructors both large and small can be counted on to more actively attack the problem.

The humanitarian aspect of accident prevention alone warrants the efforts already devoted to safety work, but it is also supported and justified, from the financial standpoint, by the saving due to safety or, in other words, the lowering of production costs. Actual experience has demonstrated that accident prevention cannot properly be viewed as an added expense, because, like the cost accounting system, it not only justifies the expenditure but also more than pays its way.

COSTS MUST BE MAINTAINED AT A MINIMUM

At the present time, and for some years to come, the lowering of construction costs is a problem to which construction companies must bend increasing energy. The inverse ratio of construction volume to construction cost is a simple economic axiom, and contractors realize that to maintain the volume they must resist the rising tendency of costs. The poor economic reasoning of simply passing the expense along has been shown up by the manner in which such procedure quickly checks demand, and the wiser course of keeping costs at a minimum now seems to be universally accepted. The problem, therefore, has become one of estimating at a profit without driving out the marginal buyer of new construction, and it means eliminating every unnecessary expense. In doing this the saving of safety work can assist in a number of ways, which may be outlined briefly as follows:

The reduction of accidents by an individual company enables it to obtain from the insurance companies a special rating on experience. This rating means that the company obtaining it pays a premium on its liability insurance that is lower than the standard rate. A representative of one insurance company cited a case, at the last annual congress, where one constructor obtained a reduction of 30 per cent. The accomplishments of Fred T. Ley & Co., which reduced its accident frequency some 85 per cent in three years, is a well-known instance to those who have followed accident prevention in construction. Another instance was cited at the Congress last year of a Massachusetts manufacturer who was saving over \$100,000 a year on insurance premiums. In construction, where the average premium may run as high as 8 per cent of the total labor costs, and as much as 20 per cent in specific trades, these economies are assuredly worth an effort.

There is also the item of direct labor-time lost due to accidents. Mr. Davidson of Dwight P. Robinson & Co., Inc., last year showed where this company, over a period of some three months, had spent about \$9,900 in lost time. Where the accident frequency is high this item assumes significant proportions.

WAGES BASED ON HAZARDOUS CONDITIONS

Wages themselves are based, to a degree, upon the hazard factor and, in general, increased with the frequency of accidents on the work. In reality the hazard rate means very little to the workman in the long run, as in case of disablement it is not sufficient to compensate for the

disability. This rate stands as an undue expense of the work. A better plan would be to reduce the hazard and eliminate the necessity for excessive-hazard wages.

Another wasteful effect of accidents is the indirect loss arising from poor efficiency and morale of the working force when disrupted by serious accidents. Moreover, for every man disabled another must be trained, and the cost of his training stands as a charge against construction—each such accident represents a more or less distinct increase in labor cost. A reduction of all of these items is not only possible but has been accomplished by individual companies through the application of safety methods. Reduction of cost and preservation of human welfare are the two most tangible benefits from this work, but the third, a less perceptible one, is of scarcely less importance and probably it is the most urgent. This is the improvement of industrial relations.

Industrial relations of which so many volumes have been written in recent years, and which were once considered a subject that had principally to do with educators and social students, is today a real factor affecting every manufacturer and every contractor. Though not a new problem it has, in recent years, raised many new difficulties in the conduct of construction operations. A glance over industrial history since medieval times is sufficient to demonstrate that as industry expands, and as the nation turns more from an agricultural to an industrial country, the complexities of industrial relations increase. Sooner or later these complexities must be ironed out by constructive efforts on the part of both labor and management and each step that management can take to make the interests of labor and itself coincident, constitutes a gain for both.

MODERN INDUSTRY NOT HARD NOR SOULLESS

When employees know that management is exerting an earnest effort to protect them from occupational accident a more co-operative spirit is certainly engendered. It eliminates, in a degree, the hardness and soullessness with which modern industry is attributed, and makes up in some degree for the personal contact that has been lost. It is questionable whether the blame for antagonism rests solely upon the employees when we recall that during the last generation those humanitarian measures of safety provision, now commonly accepted as reasonable and proper, were bitterly opposed by a majority of employers.

Safety work backed by management itself obviates the need of safety statutes which for years afforded practically the only means of instituting safety provisions. It not only accomplishes far more than can ever be required by law, but removes one important obstacle to mutual understanding. Safety work in construction, where the period of employment with individual companies is usually short, is believed to have produced a marked improvement in industrial relations between the employees and those companies who have carried on such work.

In the matter of holding an organization together during a period when labor is scarce the advantages of safety work become apparent. Those companies that have carried their safety promotion to an effective point undoubtedly find it an asset in holding their men. It is conceivable

that the time may come in construction, as in certain manufacturing industries, when workmen will be able to choose between the companies who make their work as safe as possible and those who disregard safety.

There is yet another consideration which all of us might consider who deplore the increasing cost of government: The drain on state and Federal income incurred through caring for persons disabled is something worth considering. Every disabled workman in the building industry, where the supply of labor is insufficient, adds to the labor problem, and every disabled worker in any industry takes one unit from the ranks of producers, and when his maintenance falls upon the community it adds an increment to governmental expense.

NATIONAL SAFETY COUNCIL DOING SPLENDID WORK

If a census of construction companies were taken to ascertain the attitude concerning safety work we should doubtless find that it is almost universally approved. Yet a great many companies have not undertaken the work. The difficulty, as already mentioned, is that they are not familiar with the means of carrying on this activity. They need further explanation of the subject and some standard, concise procedure for making investigations and interpreting the result. The National Safety Council provides the means through which contractors can learn and apply proper methods of accident prevention, but the standardization of safety work is yet to be carried out for the construction industry. In this work the assistance of every construction company is merited.

The Council is already rendering service which includes the following features: (a) A clearing-house for the exchange of safety methods, which affords distribution of approved practices to the various industries and to individuals in the same industry. The Construction Section carries on this work especially for contractors, by means of literature and posters explaining methods and devices applying to different classes of accidents. (b) Special investigations and original researches which are finding new methods of prevention and devising systematic means of recording accidents so that they may be controlled as a concrete factor in production. Some fifty or sixty pamphlets, the result of special investigation, which treat of specific measures of safety work—a number of which are applicable in part to construction—have been distributed. (c) A comprehensive information service which furnishes posters, job bulletins, descriptions of devices and emergency measures, together with news reports of the progress of safety work in many industries. Through these, some of which apply in part to construction and some of which are especially devoted to construction, contractors are able to gain information for conducting effective safety work.

The Construction Section has done valuable work and should be expanded in both service and membership, but until the membership is increased the service cannot be extended to cover adequately the four or five major divisions of the industry.

SERVICES OF A TECHNICALLY TRAINED ENGINEER DESIRABLE

Many special hazards are encountered in construction which should be called to the attention of superintendents and workmen by means of proper literature, job signs and illustrated posters. Moreover, each division of construction has its own peculiar hazards which need special investigation and presentation to the working force. These needs are understood by the officers of the Construction Section, who have given a great amount of personal time to the work, but they cannot carry out the necessary service without additional support from those who are to derive the benefit. Every member of the Section should act as a personal solicitor for membership, thus helping to provide the means for carrying on the work.

In view of the size of the construction industry and the special nature of its safety problems, one of the first steps that appears advisable from the contractor's viewpoint is the appointment of a special secretary or safety engineer to conduct the work of this Section. Such a man could assist the Associated General Contractors and other organizations in promoting safety and direct the special investigations that are needed. By this means the effectiveness of the work could be increased manyfold among contractors. The secretaries of contractors' organizations are comparatively new in this field of work and could work much more efficiently with the advice and assistance of a special secretary or engineer in the Construction Section of the Council. The Associated General Contractors desires to increase its co-operation with the Council and assist through its magazine, *The Constructor*, in giving publicity to the work. So far, however, it has lacked the contact of someone whose time could be devoted to co-ordinating the work. Obviously the officers of the Section cannot perform this function in addition to their other duties. The Associated General Contractors and other contractors' organizations can give effective aid in preparing the ground for more intensive membership work and through their publications can point out the effectiveness of applying educational methods to the working force. For example the Associated General Contractors will be glad, if the Council approves, to display as a regular feature of its magazine, samples of bulletins and other portions of the Council service and will continue to advocate the adoption of safety methods. In fact, the Associated General Contractors stands ready to co-operate in any manner possible but it believes the most effective co-operation can be offered through the direct contact of a safety engineer for the construction section.

DISCUSSION

CHAIRMAN DAVIDSON: We have been working along from a very small beginning and in some of the earlier years it seemed that our voices were crying in the wilderness. To have an assurance of co-operation from such an organization as the Associated General Contractors of America is a splendid thing. We have heard a remarkable address and I would be glad to entertain a motion that we extend our thanks to General Marshall for presenting this message to us. (The motion was seconded; put to a vote and prevailed.)

WEDNESDAY MORNING SESSION

CHAIRMAN DAVIDSON: We are very fortunate to have with us this morning, to present the results of his experience on Safety in connection with high buildings, Mr. W. E. Welch.

SAFETY WORK IN THE ERECTION AND DEMOLITION OF THE STEEL FRAMEWORK OF HIGH BUILDINGS

W. E. WELCH, SAFETY ENGINEER, THE TRAVELERS INSURANCE COMPANY.

My experience with the Travelers Insurance Company for the past twelve years has been in inspection and accident prevention work in connection with steel-frame erection for buildings as well as other classes of construction. While this experience has been largely in New York City, and I speak of conditions as found there, it is undoubtedly a fact that the same features will apply generally to other large cities in the United States. In talking of this accident prevention work, I will endeavor as far as possible to make my findings and recommendations clear to the non-technical man as well as the contractor and the practical engineer.

The contract for steel-frame erection for high office and mercantile buildings is obtained against severe competition. Often the time limit for the work is so short that erection goes forward under extreme pressure; added to this is the fact that all of the work is done among the most congested surroundings. These conditions together form one of the main factors leading to accidents. They are closely related to and must be considered with another main factor, that of equipment.

Where profits must be kept in mind, where there is pressure for completion of the work within a short time limit, where storage facilities are entirely or almost lacking, and especially where there is poor or insufficient equipment there is a decidedly unfavorable moral and physical hazard. These are conditions that the inspector and the safety engineer often meet with in their regular work.

We must continue to work under pressure because of the limit of time, and without storage facilities, but if we have suitable equipment we have gone far in overcoming one of the main factors responsible for accidents. There will be little likelihood of derrick collapse or sling rupture; the proper equipment will be used for every member being handled; sound and suitable lumber will be used for the erecting floor and for the making of scaffolds; suitable timber will be used for needle beams and supports for the derricks. The hoist itself will be of the proper size and will be properly installed for the loads imposed upon it. Where we have good equipment, properly designed for the loads to be carried, we have already solved, to a large extent, the problem of preventing accidents due to collapse or failure.

Next in importance to proper equipment are experienced supervision and experienced ironworkers. To anyone questioning the possibility of obtaining both of these our answer would be very positive. The contractor who has the money and the will to get suitable equipment will, in the main, have intelligent supervision and skilled ironworkers.

EQUIPMENT

The hazards occasioned by poor or insufficient equipment can be overcome by the use, proper installation and expert direction of the equipment brought onto any job. The steel guy derrick is to be preferred to the wooden type for a number of reasons. With steel there is less deterioration and practically all parts are visible for inspection. The steel derrick is lighter than a wooden derrick for the same load to be handled. The steel derrick is built in sections and can be transferred through the streets more easily and with less hazard; it is more easily handled while being erected and being taken down; when erection has been completed it can be lowered from the frame work in sections with less hazard. Finally, the steel derrick is far more dependable under heavy and sudden strains. All guys should be of plow steel. Both plain and galvanized steel cables are used for guys but I personally prefer the plain because there is some likelihood of the wire suffering deterioration during the galvanizing process. In any case, guys should be kept well oiled, and particularly so when placed in the storage yard.

The hoisting engine may be steam or electric driven. The electric hoisting engine is far more commonly met with in practice and is to be preferred for a number of reasons. It takes up less room, it costs less to operate and it eliminates the steam exhaust which is oftentimes troublesome. No water and no lubricators are present to be frozen in winter. There is no boiler, which would certainly explode if a load was dropped upon it, although in good practice this is a contingency that is rather remote.

In connection with the operation of an electric hoist, there are two or three safety precautions which I wish to make clear. These properly come under the heading of "Equipment," although providing them and keeping them in service are certainly matters of supervision: 1. There should be a suitable fuse or automatic circuit breaker adjusted to act at not more than 50 per cent overload. 2. Solenoid brakes should also be provided. Solenoid brakes are an additional safeguard applied to the armature shaft and operate automatically, but gradually, when the current fails for any reason and also when the hoist is stopped.

DERRICK FITTINGS SHOULD BE ABOVE SUSPICION

Galvanized steel clips should be used in securing the guys to the turnbuckle of the anchorage. Galvanizing is necessary to prevent the rusting of the plate and bolts. All wire rope for the topping lift and the main fall should be of plow steel. Here again, of course, proper and frequent lubrication is necessary to prevent undue wear and deterioration from the weather. It is highly important that all derrick fittings be above suspicion. The spider plate should be of selected steel, pressed into a shallow dish shape and heavily reinforced at the gudgeon pin hole. This hole should be large enough to allow the derrick to give slightly with the load, and should be chamfered so that it cannot cut the gudgeon pin sleeve. The shackles which connect the guys to the spider plate should be heavy drop forgings with screw pins. The mast top iron should be made of structural steel throughout and should be

fitted with an extra large gudgeon pin. This pin should be protected against excessive wear by a cast iron sleeve machined to fit with 1/32-inch clearance. Such a sleeve will distribute the pressure of the spider over the entire length of the gudgeon pin and will prevent cutting of the pin. The collars on top of the gudgeon pin should be drilled to allow the journal to be thoroughly lubricated. This will insure easy turning. The metal foot blocks should be of the ballbearing type, which will permit the loaded derrick to be easily swung by one man. The sheaves of all blocks should be lined and bushed with metal. The sling is without a doubt the most important part of the equipment of the contractor erecting high steel-frame work, from the standpoint of both speed of erection and accident prevention. All slings for the hoisting from trucks in the street, and for the setting of steel, should be of the best selected steel wire. The bridle sling to be used for this work should be of the double groove, equalizing thimble type. The loops should be spliced in the rope, with dropforged weldless closed socket and drop forged weldless steel hooks.

When we come to column setting we should insist on the use of an endless grommet wire sling with an equalizing thimble on one end of a toggle column setting sling. The toggle sling is an endless grommet construction with equalizing thimbles on both ends and with the addition of the toggle. The toggle sling is so constructed that the ironworker can trip and release it from the erecting floor. In using the column setting sling with an equalizing thimble on one end a 1¼-inch manilla rope is fastened to the sling and attached to the weight of the fall block. In addition a ¾-inch rope is attached to the back of the hook of fall block and manipulated by an ironworker on the erecting floor. After the column is set the fall block is lowered slightly and at times the hook releases itself from the sling and at other times the assistance of the ironworker on the erecting floor with the rope, which is attached to the hook, is required for this release. When the fall hook is free from sling a strain is taken by the derrick and one end of sling pulled through the end with the equalizing thimble, thus releasing the sling from the column. This last method not always successful and requires, at times, the climbing of columns.

Manilla rope slings find extensive use in erection, particularly in the setting of light floor beams. Manilla slings should be used for the setting of all floor beams up to 24-inch. For beams from 8-inch to 15-inch the slings should be of 1¼-inch rope, while for 15-inch to 24-inch beams the sling should be of 1½-inch rope. For beams 24-inch and larger bridle slings of 5/8-inch wire should be used.

Dry slings, and plenty of them, must be on hand. There must also be a full supply of wire slings of proper sizes for the weight of loads to be handled. It is not infrequent that a contractor has good equipment but not a sufficient supply.

The best of equipment should be used for anchorage and the utmost care must be exercised in setting it. Where high buildings are being erected we quite generally find very deep cellars and, in such cases,

the derricks are erected on timber towers. In several cases of recent construction there were five floors below the sidewalk level and the towers were 85 feet high. In buildings of this type the basement walls are of concrete and the anchorage for the setting of the basement steel is buried in the concrete of the walls when it is poured.

The most common anchorage consists of four or five coils of $\frac{5}{8}$ -inch or $\frac{7}{8}$ -inch wire rope, generally the best part of some discarded wire fall, half buried in the concrete with a pin through the buried end. Unless the coils are very carefully arranged and the pin properly set and buried there is grave danger of this type of anchorage failing under the strain of a load and causing the fall of the derrick. In every case where anchors are being placed the erection superintendent should be in direct charge. This work is so important that it should not be left to the direction of the superintendent of the concreters.

ANCHORAGE CONSTRUCTION

In the basement steel we find some of the heaviest members to be erected and as I always fear the failure of wire coil anchorages I strongly advise against their use. An anchorage of far better design is constructed as follows: Two $\frac{3}{4}$ -inch steel plates, 4 inches wide and at least $4\frac{1}{2}$ -feet long, are riveted together for about one-third of their length. The remaining two-thirds are spread so that the ends at the bottom are 6 inches apart. Through the lower end a hole is drilled and in this hole a 2-inch pin 18 inches long is placed. The upper end is, of course, drilled to hold the shackle. This anchor buried at the proper point and at an angle to take the pull direct from the guy will support a derrick handling loads up to 28 tons. Another type of anchor constructed on much the same principle, and good for at least 16 tons, is a bar of steel 42 inches long, 4 inches wide and 1 inch thick. This should be buried in the concrete for at least two-thirds of its length, with a pin 2 inches in diameter and one foot in length through a hole drilled in the buried end.

When the basement steel has been erected the derrick is located on the topmost tier in place and the columns of the erected steel are then used for anchorage. For securing the guys to these columns endless grommet selected wire slings, with equalizing thimbles, should be used. To each sling a turnbuckle is attached with a shackle and on the other end of the turnbuckle there should be a 4 or 6 inch sheave to eliminate a sharp bend in the guy. The guy is run through this sheave and the loose end secured to the straining part of the guy with wire clips. Four clips should be used as a minimum and five are to be preferred. To prevent any possibility of slipping of the guys through the clips, the loose end, which is not secured, should be turned down and fastened to the guy below the lowest clip. As a matter of supervision particular attention should be given to the placing of the clips. They should not be staggered, nor should the seat of the clip be placed against the loose end of the guy. Tests have shown that when clips are not properly placed on guy wires they may lose their gripping power by 30 to 40 per cent. The placing of

clips is not an unimportant detail and it should be assigned to an experienced ironworker who realizes the importance of doing the work right.

In attaching the guy to the derrick a thimble is spliced in the top end of the cable and secured to the spider plate by a shackle. A derrick secured in this manner is about as safe as it can be made. Six guys should always be used in handling members up to 20 tons weight. When heavier loads are handled seven or eight guys should be used. It will be noted that in the slings described all welds in steel forgings are eliminated. In steel erection an effort should be made to avoid all forgings in tension, and this can be done in nearly all cases with the exception of hooks and sockets. It is an old but still pertinent saying that "a chain is no stronger than its weakest link."

The wooden derrick block, no matter where located, should be secured four ways, either by wooden struts from each end of the block to a column or by wire rope. The derrick when located on the structure should be placed on at least four 12-inch square timbers, placed across the bay. Depending on the size of the bay and the weight of the members erected, wooden bents should be placed one or two stories directly under the derrick for support. To insure strength and rigidity the bay on which the derrick is erected, and surrounding bays, should be 100 per cent bolted and preferably 100 per cent riveted.

When we come to planking and timbers used for floors, scaffolding and needle beams, we again find a very close relationship between good equipment and good supervision. Not only must good equipment in the form of planks and timbers be provided, but the superintendent and the foremen must see to it strictly that nothing but sound lumber is used and that any which may be defective is discarded. All lumber and timber should be of carefully selected spruce. Needle beams should be 4x6 inches and 20 feet in length. Planks for the erecting floors should be 2x10 inches and 20 feet in length, while planks for riveters' platforms should be 2x3 inches by 13 feet in length.

SUPERVISION

While this is not by any means all the equipment needed or ordinarily used in the erection of steel-frame work of high buildings it is impossible in the length of time to go into greater detail. In taking up the subject of the elimination of preventable accidents it will be noted that where there is good supervision there will be a strict enforcement of rules requiring the use of only proper equipment as well as control over the action of the workmen themselves.

For directing the movements of the loads being hoisted and the safety of the members a well-defined signaling system is necessary. For 90 per cent of the time the hoisting engineer is out of sight of the signal man, who is located on the erecting floor. Signaling is done by means of bells. Two large gongs, at least a foot in diameter and of different tones, are fixed vertically on a board immediately to the left and in front of the engineer. The cord for these gongs should be $\frac{3}{8}$ or $\frac{1}{2}$ inch, so that there will be little likelihood of breaking. One gong is to be used for the topping lift and one for the main fall. These signal cords should be fully pro-

tected against any possibility of malicious or accidental interference and this can best be accomplished by placing the cords in a 2-inch iron pipe running directly from the hoisting engine to the erecting floor.

When hoisting is being done from the street and until the load has been raised to a considerable height—twenty stories or more—the signalman on the erecting floor cannot properly take care of it. It is then necessary to do the signaling from the street where the ironworkers are hooking onto the loads on the trucks. In this case an electric signaling device is best, and ordinarily we find a dry battery with a bell, the bell being placed in front of and at the right of the engineer operating the hoist. There is then no possibility of confusion of signals.

The load should be in charge of the men on the street while it passes through the roadway protection shed and past the masons who are working on the outside walls on suspended scaffolding. From this point on the signaling should be done from the erecting floor. An important precaution, and one that is probably very seldom neglected, is the fixing of a line at one end of the load so that it can be properly guided. The main fall cables should be protected by substantial wooden framework about 7 feet high at each floor where they pass up through. These cables should also be boxed in where they pass through the floor arches, to prevent wearing.

When we come to riveting we at once encounter the problem of the placing of the heater's platform, and the hazard due to the throwing of hot rivets from the heater's platform to the riveters' scaffolding. The heater's platform should be at least 8 feet wide and 13 feet long and should be placed on the beams as near as possible to where the riveters are working. The throwing of hot rivets has caused many severe and painful accidents. From the moment erection is out of the basement and as soon as other trades are following up the erection the throwing of rivets should be absolutely prohibited. They should be passed directly from the heater's platform to the riveters' scaffold. Only in this way can we minimize the hazards to the workmen below and to the public on the street. The protection of the public using the streets immediately adjacent is very important and is a thing which should be given very careful attention. There must always be a shed over the sidewalk and where buildings more than twelve or thirteen stories in height are being erected there should be a shed and wire mesh protection extending over the entire street. Such protection will take care of small objects falling from the building but, of course, will not protect against a derrick collapse or the fall of heavy material. For this we must depend on skilled and careful ironworkers and on the best of supervision.

SKILLED AND EXPERIENCED IRONWORKERS

In erecting steel frame work for high buildings it is necessary to have skilled and experienced ironworkers. It, of course, does not necessarily follow that skilled and experienced ironworkers will always do their work in the safest manner, yet the man with the intelligence that must go with the skill can be made to realize that it is to his own interest to take care to avoid injury both to himself and to his fellow workmen.

In working towards the prevention of accidents it is not so much the idea to weed out careless workmen as to see that safe working conditions are provided and that the supervision is such that the habitual chance-taking and careless men will not dare overstep the safety rules that have been laid down. Without discussing the subject of supervision it is sufficient to say that the ironworker, like any skilled mechanic or tradesman, is amenable to the proper direction of his superiors.

ERECTION ROUTINE

As soon as any part of the framework is erected it must be plumbed and aligned with wire cables. The riveting is then immediately started. As soon as sufficient rivets have been set to hold the framework solid the derricks are re-erected on the topmost tier. As soon as the derricks are in place this tier is then covered with loose plank, carefully laid together. This is known as the erecting floor. Columns are then received for the next two or three tiers. Sometimes columns are fabricated for three stories, but two stories is more often the height. All members are marked at the fabricating shop and must be distributed according to the plan of the building and erected only at the right place. As soon as the columns are set the floor beams are installed. In this manner the erection continues until the top of the steel framework has been reached.

DEMOLITION

Demolition of steel-frame buildings is practically the reverse of erection, insofar as the steel itself is concerned, and there is a close parallel in the accident-prevention work to be done in the two cases. The disconnecting and all handling of the steel members and lowering to the street is done by ironworkers ordinarily employed on erection. In addition to the hazards incidental to this work we find those occasioned by the tearing down and removal of the other materials of which the buildings are constructed. These materials greatly increase the confusion and hazards incidental to demolition and call for the best efforts of the safety inspector and the men in charge.

A word about the type and construction of the buildings being torn down will doubtless be of interest and not out of place. Steel-frame buildings are of such recent construction that they are being demolished not on account of deterioration but to make room for larger and higher buildings. It follows that more of the wall-bearing type of buildings are being removed than of those constructed with steel frames, although as a matter of fact wall-bearing buildings are being taken down for the same reason and not because they are unsafe.

The wall-bearing buildings being demolished in New York City are located in the downtown section, are seldom over twelve stories in height and were constructed during the period of 1888 to 1890. The walls are very thick, averaging about 32 inches at the street level and tapering to about 16 inches at the top. They were built with one-story cast iron columns for interior bearing and wrought iron floor beams. The iron members are all bolted together. Because of the presence of cast iron columns and iron beams some of the demolition work in connection with these buildings must be done by ironworkers.

For the demolition of the steel frame practically the same equipment is used as for erecting and I would again emphasize the importance of the contractor having good equipment and plenty of it. The derrick with its fittings, guys, bridle slings, anchor slings, wire rope and manilla slings should all be of the general type and kept in the same good condition that I have previously described. Toggle slings are used only in the setting of columns and are, of course, not needed here. The same type of hoists are used and signaling is done in the same manner. The equipment for heating and riveting is eliminated, but in its place we have the oxy-acetylene outfit for the cutting of rivets and sometimes the cutting of members. The selection of the proper oxyacetylene outfit and the care and precautions to be taken in its use, are not problems peculiar to the demolition of steel-frame work. While I will not attempt to discuss these things here, they are matters that should receive the proper attention on every job.

In taking down the steel in a building the derrick is always placed at the floor below the roof where the columns are connected. The derrick may be one, two or three floors below the roof. The derrick must be anchored with the same care as is done for erecting. The hoist is located on the grade floor. Here again is needed the same substantial guarding of the cables where they pass through the floors as described before for erecting. The signaling is done by cords connected to gongs. The signal cords should be run through separate 2-inch iron pipes, but in the case of demolition they should pass down on the outside of the building.

The contractor engaged in steel wrecking must take into consideration the stability of the building walls in all his work. For this reason he must have a different experience, and perhaps more experience, than the steel erector. In the demolition of steel-frame buildings, as in the erection, a number of factors must be taken into account and must be closely watched if we are to eliminate accidents. The best of equipment must be provided and must be properly arranged and set up. It must be kept in good operating order. Supervision is vitally important in seeing that the right equipment is correctly used, that there is no overloading of floors and that in making every move the workmen observe every precaution to safeguard themselves and others. Finally we must have expert inspection service to constantly check and aid the supervision in all measures for the promotion of safety.

DISCUSSION

CHAIRMAN DAVIDSON: A number of years ago it was very difficult to get the special slings. I recall a construction manager telling me that he had endeavored to get them but could not.

MR. WELCH: They can be obtained by giving an order a short time in advance. There is one company that specializes in that particular sling.

MR. W. O. KIRKPATRICK (Building Inspector, City of Flint, Mich.): Mr. Welch has spoken very thoroughly on ideal conditions for large buildings, but in my town we encounter the smaller types; three, four or five stories. We have hand signalling. In some cases we have old

equipment and it is hard to know whether or not it is in good condition. I wonder what you would suggest for the small-town fellow?

MR. WELCH: You don't need an equipment of the same type for four or five-story buildings as you would on a bigger building. You can supply yourself with lighter equipment, just as handy or perhaps handier, and have it good, than you can with heavy equipment. Your process of erection, floor covering and accident prevention can be just the same whether you are going twenty stories or six. Of course, you can get sound stock for wooden derricks and have it properly selected and taken care of, and if you do that you can use the wooden derrick; but, as I say, I prefer the steel lattice derrick.

CHAIRMAN DAVIDSON: We will now have a paper by Dr. Irving Condit.

INDUSTRIAL SURGEON AS SAFETY ENGINEER

DR. IRVING CONDIT, CHIEF SURGEON, GENERAL ACCIDENT CORPORATION,
DETROIT, MICH.

It may seem from the title of my paper that I am of the opinion that a doctor should be an engineer. Such, however, is not the impression that I wish to convey but I do wish to emphasize some of the relations between the industrial surgeon and accident prevention.

It might be well, first, to define an industrial surgeon: "The physician in industry is one who applies the principles of modern medicine and surgery to the industrial worker, sick or well, supplementing the remedial agencies of medicine by the sound application of hygiene, sanitation and accident prevention, and who, in addition, has an adequate and co-operative appreciation of the social, economic and administrative problems and responsibilities of industry in its relation to society." This definition was formulated by the Conference Board of Physicians in Industry and quite thoroughly covers the activities of the industrial surgeon.

It has been my good fortune to have had a great deal of experience in the practical application of co-operation between doctors and laboring men. My first experience was with one of the large railroad systems of the West and I was very much impressed at that time by the large number of problems that came up in the handling of accidents. These problems have increased rather than diminished with our more complex manner of living and the institution of compensation laws. At that time the expense of maintaining medical service was borne by the men and each man, in proportion to his wages, paid a monthly fee. This was deducted from the man's wages and went into a fund for maintaining medical service, hospitals, etc., for his care in case he sustained an accident while in the line of duty.

PUBLIC ACCIDENTS WERE CONSIDERED MOST IMPORTANT

Very little if any attention was given to welfare organization during this period. It is true, however, that the railroads were among the first to see the advantages of accident prevention, but they did not, at first, give as much attention to this service for their own employees as they

did to protecting the public; this was, of course, of primary importance to their own existence. Nowadays more attention is constantly being given to the protection of the man employed by the industry with which he is connected.

A physician doing industrial work must, of necessity, be acquainted with the working conditions of the men whom he is treating. He must have some knowledge of the nature of machinery in order to come to a satisfactory conclusion regarding his diagnosis and treatment of cases. He can determine, many times, the nature of the injury by knowing something of mechanics, of how the accident happened and what caused it. I do not believe that a doctor should make any attempt to learn the application of mechanical safety devices—that is a specialty in itself and should be left entirely in the hands of the safety engineer.

The doctor's field in safety work is one primarily having to do with the human element in its relation to safety work and he often has an opportunity, through his contact with the men, to inject into them a sense of the value and some of the reasons for applying the principles of safety to their work. As an illustration, while dressing an amputated arm, or some other serious injury, I have heard other men who were in the room or passing through make some remark about the manner in which the man received the injury and the seriousness of it. I know that, even without using the injured man as an example, the incident has caused considerable thought in their minds and that the effect has been that they have determined to be more careful; the sight makes an impression which is hard to erase.

It seems to me that there is a side to safety work that has not been emphasized sufficiently and that is the proper handling of accidents after they have occurred. This has usually been termed first-aid work, but the man's future life often depends on how he is handled and who handles him at this time and only the doctor who has a properly trained organization can accomplish a maximum of service at this time. This has not been termed "safety work," but it could be so called with propriety.

VALUE OF FIRST-AID INSTRUCTION

Let me give a concrete example; I will try and show briefly how we handle accidents on general building jobs. It is necessary to have a central medical office, fully equipped to render modern surgical treatment, open twenty-four hours a day and with a sufficient staff to constantly maintain the service. Next in importance is the education of superintendents, foremen and time-keepers in the purpose of the organization, the methods of handling accidents and some instruction in first-aid work. We found the best method of doing this was to have weekly meetings, at which the different companies were represented in turn by their superintendents, foremen and time-keepers and the men were invited by us and their company to attend the meetings. The doctor then explained to the men the plan of the organization and the object of the methods that were to be employed in handling cases. At this time first-aid instruction was given. We found these meetings very valuable: They not only served to increase the knowledge of first-aid principles, but were the means of

securing personal contact and acquaintanceship between the organization and the representatives of the companies. We found that the men took considerable interest in these meetings and that it was reflected promptly in increased efficiency in the handling of accidents. We also noticed that these men carried the propaganda of accident-prevention out to the jobs with them.

There is a certain psychology of attitude toward accidents that changes when one is instructed on how to handle them. Instructions on the handling of a broken leg and a description of what must be done to prevent hemorrhage, etc., makes such an impression on the foreman that he is more careful himself and of those he may have working under him. I believe that first-aid instruction is true safety education and the doctor almost daily has opportunities for popularizing such work.

In the days when most industrial work was done under some form of contract, a great deal of dissatisfaction was caused by the manner in which men were handled by contract surgeons. Poor treatment and neglect were common occurrences and in a great many instances the physician was in a position to do almost as he chose as there was no welfare department and no organization on the part of the men to protect themselves. The character of medical service has improved steadily, along with better working conditions.

INDUSTRIAL PHYSICIAN NOW IN BETTER STANDING

There was a time when the physician doing industrial work was not accepted in good medical societies but the work has come to be of such economic value to individuals and corporations alike that the industrial surgeon is fast approaching a point where he will receive proper recognition. The service that is rendered an injured man nowadays is remarkable in its scope and range of treatment. No one, even those with unlimited funds, receives better attention than an injured man does today if employed by any large company having a proper medical organization. There was a time when, if a man suffered a broken leg, the surgeon into whose hand he fell, was mainly interested in collecting his fee. Today that feature has been eliminated and the surgeon's whole idea is to obtain as perfect a result as possible and he spares no effort or expense to do so. The injured man has the best of hospital attention and often X-ray pictures are taken to make sure that the bones are properly reduced—not so long ago it was hard to find an employer willing to pay for more than one X-ray picture and frequently not that. Nowadays, after reducing a fracture, a picture is always taken; this guarantees a result that can be determined in no other way. This is true of every kind of an injury and specialists of the highest grade are always called into consultation when the individual case demands it. Equally progressive methods are used whenever necessary and this, to my mind, is one of the best forms of safety work, although it is not accident prevention.

DISCUSSION

A MEMBER: I think the doctor brought out one point that every one of us can utilize to good advantage. I have used it myself, without know-

ing it; that is the point of using instruction in first aid as a means of education and of elimination of accidents, because the man finds out what an accident means. To illustrate my point: I find that if I have trouble in making a man wear goggles, one of the very best things to do is to carry a glass eye in my pocket and try to sell it to the fellow who won't wear goggles. That glass eye will be ready for use when he needs it, that is my argument.

DR. CONDIT: I am glad you got the point. It is very clear in my mind, but it is a point that might well be overlooked. Similarly, you have difficulty when you try to tell the average man the danger of an infection. Therefore, if you have a man in your care who has a finger or an arm infection—an arm particularly full of drains—you can show that bad arm to a man, let him see the result of the infection, and in that way impress upon him the necessity of having all injuries taken care of at once.

A MEMBER: At our Schenectady plant we were having more or less trouble getting the men to come in for small injuries. Several years ago the Safety Council put out a very gruesome picture of a hand affected by blood poison and we put up a lot of these pictures through the plant. The hospital was flooded next day and their records show that first-aid attendance for minor injuries jumped 150 per cent immediately after the posting of those pictures. The picture caused considerable unfavorable comment at the time, but it did the business just the same.

GIVE INDUSTRIAL PHYSICIAN MORE POWER

A MEMBER: Dr. Condit, you mentioned that a few years ago the situation was different with the industrial physician, because he had a lot to say about a man going back to work. I would like to ask if that should not be the present status? I think the doctor should be given more authority in that direction. I think it should be within the industrial physician's power to say whether or not a man is capable of going back on his job.

DR. CONDIT: That is very true. The industrial surgeon has the power, but here is what you are up against:— You discharge a man from the hospital and instruct him to report for work, but he does not do so. What happens? He goes to another doctor. What happens then? That doctor tells him he cannot work, because he is collecting a fee from the man. The industrial accident board listens to the man's claim and you have to get five or six more doctors to re-examine and X-ray him; go all over him. When you are all through you have incurred an expense of \$300 to get the man to go back to work. The industrial surgeon has the power, but he cannot make it stick.

DR. W. L. FENTON (Consumers Power Co., Jackson, Mich.): I wish to again emphasize the human element. If you know the man, can call him by his first name, and show that you are interested, saying: "John, you are going to feel a little stiffness for a few days, but you go to the shop in the morning; you can go over there and do work without hurting your arm," John will go to work nine times out of ten.

GETTING MALINGERERS BACK TO WORK

MR. SHEA: I would like to ask the doctor what experience he has had with injuries to the back and head; also in getting malingerers back to work.

DR. CONDIT: A man who has a fractured skull, a little crack with no depression showing, nevertheless is sick and cannot go to work. We also have trouble with back strains. I have a man who has a slight lumbar-sacro strain and he has been off for two years, but I don't think there is anything wrong with him now. The industrial accident board says there is. He has seen fifteen doctors and none of them can find anything wrong with him, but he is not working. I can't tell you how to remedy this situation. I believe Dr. Fenton's idea of getting the confidence of that man is the only solution.

CHAIRMAN DAVIDSON: A few years ago a movement was started to standardize the various codes throughout the country. The American Society of Civil Engineers, the American Society of Mechanical Engineers, the Bureau of Standards at Washington, the National Safety Council, the insurance underwriters, etc., organized the American Engineering Standards Committee. The sponsorship for a safety code on construction work was assigned to the National Safety Council and a special code committee was organized at Milwaukee in 1920. Due to the depression that fall, whereby so many men were shifted from one part of the country to another and from one connection to another, it has become a difficult matter to make much progress.

PROPOSED SAFETY BUILDING CODE

During this year, however, the work was carried on to a point where a tentative layout was placed on paper; following that one committee meeting was held at which a number of revisions were suggested and incorporated to the draft which you hold in your hands. We are very glad to have Mr. Hartman, Secretary of the Industrial Commission of the State of Pennsylvania, with us to give a few remarks on codes.

MR. F. J. HARTMAN (Secretary of the Industrial Board of the State of Pennsylvania): The greatest problem we have on the question of codes is their enforcement. Mr. Davidson, your chairman, called attention to the fact that a good many agencies are interested in drafting safety codes. Drafting a safety code is one problem and enforcing it is an altogether different one and the danger is that too many people endeavor to draft laws. Henceforth, in Pennsylvania, in drafting a code, we will not attempt to adopt one bodily. We will take those offered and put them before a representative committee—consisting of employers, employees, insurance agencies, and engineering bodies—so that everyone will have a chance to express his views and offer helpful suggestions.

Another thing which might surprise you is that we find the most helpful suggestions come from employees—men who are trained in the school of experience. They are not expert engineers, in a technically educated way, and they may have difficulty with the language, but they know how to express themselves in plain words and they know how a thing ought to be said in simplest language. The real difficulty in enforcing

codes is in saying the right thing; in other words, definitions must be right, they must be simple.

CONFUSION CAUSED BY CONFLICT OF ORDERS

I would call to your attention the fact that the inspector must enforce the code as written. One of the great objections, in State work, is the different points of view that inspectors have. One inspector goes to a plant or a job and tells them to do a certain thing in a certain way. Another inspector will come along and tell them exactly the opposite—there they are, right between two fires. Presumably the way of doing it is for the inspector not to use his intelligence but to say: "The law is so-and-so and I haven't any discretionary power."

Offsetting that condition, if you think it works an undue hardship, you have the right of petition and the Industrial Board listens and gives you a fair deal. While it seems hard to put mandatory requirements into a code, it is easy to change it because when anyone has something new or better to offer it can be written into the code. The code must be flexible.

I have mentioned two types of industrial legislation and this question will be discussed more and more in the next few years. First, the type of industrial legislation enacted by a Legislature; with this we are all familiar. Second, the type of industrial legislation not enacted by a body of delegates—we ought not to use the word "legislation," but I don't know how else to express it.

One of the real troubles with legislation is that to repeal it or change it requires so much time. In a good many States, where the Legislature meets every two years, it is difficult to secure a change in an existing law. The new form of legislation, now in vogue—the making of codes—is given over to a board, and the board has power to change the provisions of the code from time to time, and you do not have to wait two years. That is one thing employers and employees are coming to; they are working toward a form of legislation which does not hamper their work.

ADVISORY BOARDS OF VALUE IN DRAFTING LAWS

Just a thought in connection with what we call up-to-date enforcement of codes: We have advisory boards in connection with all the codes in Pennsylvania and we are now drafting a building code—since 1910 they have been trying to get it through the Legislature. The bill has been introduced several times and each time, for some reason or other, it failed of passage, so the Industrial Board has taken upon itself the drafting of a State building code. Very few States have building codes—Wisconsin probably has the best; I know of only one or two others. For the purpose of studying existing codes and drafting one which might fit our needs we got ten representative men together as a master committee. One of the difficulties we meet in trying to secure legislation of this nature is that we do not always have adequate power. We cannot put across the same laws in cities of the first and second class so you will see the foolishness of attempting to draft a State-wide code if the big cities do not take it up.

We overcame that difficulty by getting each of the mayors of the first, second and third class cities to appoint a member of the committee. Of course, each mayor appointed his chief of the building bureau. They sat with us and gave us the benefit of all the information regarding enforcement in their cities. We interested the architect, the contractor, the employer, the employee, the insurance man, the engineer, etc.; and in that way we are working out a building code. It will take us a year or more to finish it, but I believe the thing which must be stressed is that we are drafting it from the standpoint of enforcement more than from that of information.

EDUCATION MATTERS WRITTEN INTO CODES

CHAIRMAN DAVIDSON: It would be very interesting if we had some of the individuals here who take an opposite view from Mr. Hartman as to the extent to which the code should go into details. Mr. Hartman has had more experience; nevertheless we run into some debatable ground. I have in mind a man who is a great believer in education; he believes the code should contain matter that is educational, because of its value. When the first codes were issued, in New York and Pennsylvania, I was with a large engineering company, and we were able to distribute codes from other States to our superintendents who were working in Kansas, Florida and all over the country where they had no codes — they used them simply to secure safe and valuable data. They were text books, you might say, for them. The object of putting that data into the code is to form the basis for a reference work and guide.

It is drawing near the time for adjournment and I will ask Mr. Shea to report for the Nominating Committee.

REPORT OF NOMINATING COMMITTEE

MR. SHEA: The Nominating Committee have recognized the ability and good service rendered by the present officers and have nominated the same officers. The only exception is in the case of Mr. Schults who has resigned on account of press of other business. I take great pleasure in nominating the present chairman, Mr. F. A. Davidson, Patent Scaffolding Company, Chicago; Vice Chairman, Mr. W. F. Ames, McClintic Marshall Company, Pittsburgh, and Secretary, Mr. C. H. Almstead, Dwight P. Robinson & Co., New York.

MR. SCHULTS: I second the report of the Nominating Committee. (The question was put by Mr. Shea and unanimously carried.)

CHAIRMAN DAVIDSON: Thank you, Mr. Shea, for conducting the vote. I appreciate very much the kind words of the chairman of the Nominating Committee regarding the present officers.

Before adjourning we should pass a resolution of thanks to the General Builders' Association of Detroit for the splendid manner in which they have acted as host. I would be very glad to entertain a motion that such a resolution be spread upon the records and a copy be mailed to the General Builders' Association here.

MR. SHEA: I offer a motion to that effect. (The motion was seconded and, on being put to a vote by the chairman, prevailed.)

Education Section

August 29, 1922

A. T. MOREY, Chairman,

General Manager, Commonwealth Steel Company, Granite City, Ill.

DR. E. GEORGE PAYNE, Vice-Chairman,

Professor of Educational Sociology, New York University, New York City

CARL L. SMITH, Secretary,

Manager, St. Louis Safety Council, St. Louis, Mo.

CHAIRMAN MOREY: I am connected with a large industry and we so often feel that if we could catch the children while they are young and get the right safety ideas instilled into them, when they enter industry later on they will have a groundwork and a foundation for building safety. There are some 20,000,000 children of school age in the United States and about 1,000,000 teachers. I doubt if we have reached a million of those twenty million children so far; I doubt if two per cent of the teachers—yet we have made progress.

This Section has been organized for several years and instead of looking at the stupendousness of the problem we are trying to take it in its little beginnings and work consistently and insistently on it. We have gone forward to a certain extent. St. Louis, Detroit, Cleveland, Milwaukee, Youngstown and other cities have done creditable work. We want to hear from some of those cities today as to what they have done with their school children.

Our Secretary had to attend another meeting and he asked me to combine his report and the Chairman's. His written report is as follows:

REPORT OF OFFICERS

Following the Educational program at the Tenth Annual Congress of the National Safety Council in Boston, last fall, an avalanche of requests for information as to how to include various subjects of accident prevention in the curriculum came to the officers of this Section. Partly because of no central bureau, with the necessary help to compile data and material needed to help visualize the progress in school safety already made, the officers of this Section found this demand for information rather burdensome. The need, however, was quickly met by

Arthur T. Morey, Chairman of the Section, and David Van Schaack, Chairman of the Public Safety Section, who underwrote the expense of maintaining a full-time clerk and stenographer to assist the officers of the Section in collecting data and school safety material. Since that time the Aetna and Travelers Insurance Companies have generously borne this incidental expense in connection with the work of the Section.

It was realized that the first thing to do was to communicate with all city school superintendents and find out just how much was being done in the furtherance of school safety. It was recognized that certain cities had included safety instruction as a definite part of the curriculum, while others were giving only sporadic safety instruction, but just how far organized safety instruction in the public school had progressed was a question. The decision of the officers of the Section was unanimous to send to all school superintendents a complete questionnaire which would give us this information in detail. The following questionnaire was sent to school superintendents:

1. Do you teach accident prevention in your schools?
2. Is the instruction carried on as a regular part of the subjects taught?
3. To what extent do you rely upon the lecture method?
4. Do you have a minimum of time each week devoted to accident prevention?
5. Do the children have the opportunity of organizing themselves under the direction of teachers for safety work in the school and community?
6. If you are not teaching safety, do you expect to?
7. Would you like to know more of how safety instruction may be given as a part of the curriculum?
8. Are you aware of the value of the safety motive in stimulating interest in school work?
9. Remarks.

DEFINITE PLAN FOR PROMOTING SCHOOL WORK

This survey was conducted with gratifying and surprising results. Three hundred and eighteen cities replied and fifty stated that they were giving safety instruction partially but had adopted no definite plan of teaching it as a part of the curriculum. Twenty-five cities replied stating that they had established safety instruction on a definite basis and as a part of the curriculum, and 243 requested more information in the form of concrete examples of school safety work, asking aid in introducing the subject in the curriculum of their schools. At the outset you will see that the Section was confronted with a lot of detailed office work. All of these requests were acknowledged and material in the form of safety essays by school children, bulletins from drawing classes and other data was sent in response.

Dr. Payne made numerous trips about the country and gave personal assistance. Realizing the necessity of providing further direct assistance to these communities, another conference was held with Messrs. Arthur T. Morey, Chairman of the Section; David Van Schaack, Vice-President of the National Council, in Charge of Public Safety; Charles B. Scott, Vice-President of the National Council, in Charge of Local Councils; W. H. Cameron, General Manager of the National Safety Council, and Fred M. Rosseland, Chief of the Public Safety Division, attending. At this conference a definite plan of promoting school work throughout the American continent was presented by the officers of the Section and adopted by the committee.

Following is the plan:

1. Send out questionnaires to all school superintendents in the United States, inquiring the status of education in accident prevention and offering the assistance of the Education Committee in organizing work along that line.
2. Follow up with a second questionnaire and letter to those who do not answer the first questionnaire sent out.
3. Write to some business man, a member of the National Safety Council, in each city or town, asking him to get in touch with anyone who fails to answer the second questionnaire and thus get a report of the possibility of instituting safety work.
4. Answer all inquiries for help, giving the assistance desired insofar as is possible through correspondence.
5. Have certain schools put on a demonstration program in all parts of the United States. There should be from 50 to 200 schools demonstrating the work, covering the whole territory. A feeler has been sent out to three superintendents, inquiring whether they would be interested in undertaking such a program; they have all replied in the affirmative.
6. It will be necessary for this committee to provide these superintendents with the means and methods of carrying on this demonstration. This may be done in several ways.
7. Send out a person who is familiar with the work to help institute it in these demonstrating centers. Such an arrangement has already been made in a number of instances. Dr. George S. Counts, professor of secondary education at Yale University, has been called to Bridgeport to help institute the work. Dr. Noonan, professor of elementary education, New York University, has helped in some New Jersey cities. Mr. Andrews of the Boston Normal School; J. W. Ireland, superintendent of schools, Frankfort, Ky.; W. C. Richards, superintendent of schools, Ardmore, Okla., and W. M. Alexander, superintendent of schools, Moss Point, Miss., have undertaken this work in their communities.
8. Send out literature, reprints of articles, posters, scrapbooks and other material directly to superintendents to indicate to them the type of work that is being done elsewhere.
9. Line up speakers for the state teachers' associations and teachers' meetings throughout the country. These speakers may be supplied from the centers where the work has been instituted.
10. Arrange a conference at the National Educational Association for the discussion of problems growing out of our experience. Representatives from the various centers carrying on the work would provide the nucleus for a good meeting.
11. Get various branches of the Department of Labor to undertake the promotion of the work in the various states, as has been done so effectively by the State Department of Labor in Ohio, and as is now being undertaken in Oklahoma and in Pennsylvania. These departments of labor in the various States should be used to the fullest extent. In some cases at least they will provide the expense. Oklahoma has sent a representative to several cities to help institute the work.
12. Publish articles in education magazines.
13. A bulletin of the United States Bureau of Education may be prepared and secured for a nominal price for distribution.
14. The Education Committee should serve as a bureau of exchange of materials from various schools. The materials should include posters, letters, describing the work, scrapbooks, descriptions of the work of school organizations, photographs of school activities, etc.
15. Each school undertaking the work should become an experimental center in which new methods and new materials may be developed. The results of these experiments may be exchanged through the Education Committee.
16. Secure the help of the Junior Red Cross, which is decidedly interested in school accident-prevention work.

SAFETY WORK STARTED IN 759 CITIES

While it has been impossible to carry out parts of the plan, due to the lack of necessary funds, the committee feels that a great amount of valuable assistance has been given and the Section now has a fundamental program of organization by which to carry out its activities. Then began the work of writing individual letters to state, county and city school superintendents and localities where the committee felt safety had not been effectively introduced. With these individual letters an exhibit of school safety material was sent, which put in the hands of the school superintendents concrete examples of school safety work by the children. In every case an earnest reply of appreciation was received

and the exhibit of the safety material was especially appreciated. So many requests were received for additional exhibits of the school safety work that this committee soon found the supply exhausted. Inasmuch as it was necessary to draw on the St. Louis school library for all of this material it was soon recognized that one of the most urgent needs of the Section was the maintenance of a school library at headquarters, whereby every city in the United States doing school safety work could send and receive samples of the work done by the children in other cities. Altogether it is estimated that the committee has had correspondence with 35 States, embracing 759 cities, as follows:

State	Sent	Rec. Reply	State	Sent	Rec. Reply	State	Sent	Rec. Reply
Alabama	28	3	Indiana	5	5	Pa.	50	15
Alaska	3	3	Louisiana	5	5	South Dak.	10	5
Arkansas	6	6	Maine	52	5	S. Car.	20	10
Calif.	15	15	Maryland	5	5	Tenn.	15	10
Colorado	10	10	Michigan	5	5	Texas	25	10
Conn.	12	12	Miss.	30	10	Utah	10	5
Delaware	3	3	Missouri	63	25	Vermont	10	5
Dist. of Col.	1	1	Mass.	146	50	Virginia	10	5
Iowa	3	3	New Jersey	10	5	W. Va.	10	5
Kansas	3	3	New York	50	10	Wash.	10	5
Kentucky	12	12	Oklahoma	46	10	Wis.	20	10
Illinois	12	12	Ohio	50	15			
						Total	759	318

SCHOOLS IN MANY LOCALITIES BEGIN THE WORK

Requests for help and information were recorded from each State in the above list. Some of the cities included in the 759 with which we had correspondence are as follows:

ALABAMA—Anniston, Birmingham, Opelika, Selma.
 ALASKA—Juneau.
 ARKANSAS—Stuttgart.
 CALIFORNIA—Chico, Fresno, Glendale, Los Angeles, Marysville, Monrovia, Pasadena, Oakland, Redding, Santa Ana, San Diego, San Francisco.
 COLORADO—Colorado Springs, Denver.
 CONNECTICUT—Bridgeport, Hartford, Meridian, New Britain, New Haven.
 DELAWARE—Wilmington.
 WASHINGTON, D. C.—Commissioner of Education actively co-operating.
 IOWA—Grinnell.
 KANSAS—Canute, Topeka.
 KENTUCKY—Bowling Green, Frankfort, Lexington, Louisville, Russell.
 ILLINOIS—Bloomington, Chicago, Fairbury, Granite City, La Salle, Rockford, Rock Island, Springfield.
 INDIANA—Indianapolis, Whiting.
 LOUISIANA—Alexandria, Baton Rouge.
 MAINE—Biddeford, Kennebunk, Westbrook.
 MASSACHUSETTS—Boston, Danvers, Everett, Gardner, Leominster, Lynn, Dartmouth, Newtonville, Pittsfield, Revere, Rockport, Salem, Somerville, Swampscott, Turner Falls, Williamstown, Worcester. Commissioner of Education actively co-operating.
 MARYLAND—Baltimore.
 MICHIGAN—Detroit.
 MISSISSIPPI—Moss Point, Vicksburg.
 MISSOURI—Clinton, Columbia, Hannibal, Kansas City, Macon, Marshall, Nevada, Jefferson City, Joplin, St. Charles, St. Joseph, St. Louis, Webster Groves, Springfield.
 NEW JERSEY—Asbury Park, Camden, East Orange, Haddonfield, Newark, Trenton. State School Superintendent actively co-operating.
 NEW YORK—Brooklyn, New York City, Rochester, Albany, Buffalo, Syracuse.
 NORTH CAROLINA—Raleigh.
 OKLAHOMA—Ardmore, El Reno, Lawton, Oklahoma City, Sapulpa, Shawnee, Wagoner, Tulsa. Department of Labor actively co-operating.
 OHIO—Cleveland, Toledo, Youngstown. Department of Labor actively co-operating.
 OREGON—Eugene. Department of Labor actively co-operating.
 PENNSYLVANIA—Harrisburg, Philadelphia, Pittsburgh. Department of Labor actively co-operating.

TENNESSEE—Bristol, Dallas, Knoxville, Nashville, Memphis.
 SOUTH CAROLINA—Charleston.
 SOUTH DAKOTA—Brookings.
 TEXAS—Dallas, Fort Worth, San Antonio.
 UTAH—Salt Lake City.
 VERMONT—Montpelier.
 VIRGINIA—East Radford, Lynchburg, Richmond.
 WASHINGTON—Seattle, Olympia.
 WEST VIRGINIA—Beckley.
 WISCONSIN—Madison, Sheboygan. Department of Labor actively co-operating.

RECOGNITION GIVEN THE MOVEMENT

The following is a sample letter of the hundreds that have been received by the committee during the past year:

October 24, 1921.

Dr. E. George Payne, President,

Harris Teachers College, St. Louis, Mo.

Dear Dr. Payne: Your letter concerning the National Safety Council received. I will say that I am in sympathy with the proposition that you mentioned, because I am one of those who believe that the more closely school touches life, as it has to be lived, the more vitally important is that school.

The literature which you sent is of interest to anyone who desires universal safety. I shall be glad to comply with your request. You spoke of my becoming the authority for this work in this section. Just how much territory does this section include?

While not all departures in education can be included in our school program, yet when one so important as this knocks for entrance, it seems to me that it should be admitted. When accidents can be reduced and health can be improved, social instincts can be stimulated, to be more effective and correct behavior instilled into the child, it seems that we are accomplishing things worth while. Please let me have any methods of procedure and I shall be glad to do whatever I can in the work and if possible work out the demonstration that you suggest. Yours very truly,

(Signed) J. W. Ireland.

Superintendent, City Schools, Frankfort, Ky.

Perhaps the outstanding achievement gained by the committee last year is the recognition to this important work by Hon. John J. Tigert, Commissioner of Education, Washington, D. C., who is on our program today. At his request a manuscript of 30,000 words was written by Dr. E. George Payne, Vice-Chairman of the Section. The pamphlet sets forth the history of the safety movement and the inception of school safety, the growth of the idea and the number of school children whose lives have been saved through accident-prevention instruction throughout the country. The committee feels that the publication and distribution of this pamphlet will have a tremendously good effect on education everywhere and will do more to further the teaching of accident prevention in the schools than any other contribution in the history of the safety movement.

COURSE OF INESTIMABLE VALUE TO TEACHER

To follow up the work and enable every school principal to gauge clearly what has been accomplished in his community, the committee distributed, together with a specially written letter over their signatures, a copy of a pamphlet entitled "An Analysis of Instruction for Habits and Practices in Health and Accident Prevention," by Dr. E. George Payne, Vice-Chairman of this Section. This pamphlet is in reality a scale for measuring personal and social behavior—habits and practices in health and accident prevention. It is of inestimable value to the teacher. It enables the teacher to grade the child's efficiency according to the number of points. The total number of points is 500 divided as fol-

lows: Food, 83; air, 30; drink, 25; exercise, 45; sleep, 28; posture, 15; cleanliness, 91; clothes, 34; indications of health, 4; safety habits, 75; social and civil habits and practices, 70. Total, 500. The measuring scale for safety habits is as follows:

IN THE STREETS—	Points
Look in both directions before crossing the streets.....	3
Go straight across the street and at the crossings only.....	3
Do not tarry in the street, but cross promptly.....	3
Help the little ones to cross the streets safely.....	3
Do not play on railroad tracks.....	3
Do not handle dangling wires or come into contact with electric wires...	5
Do not ride on the outside of street cars.....	3
Do not beg rides on autos.....	5
Do not climb on trucks and wagons.....	3
AT HOME—	
Be careful about the use of matches; keep them in a safe place.....	2
Be careful about the use of kerosene; keep it in a safe place; do not start a fire with it.....	3
Be careful always in using the gas range.....	3
Be sure electric wires are disconnected before touching them.....	3
Be careful about stairways and fire escapes.....	3
Do not climb on chairs, tables, and step-ladders unless necessary and then only after examination.....	3
Do not place heavy objects or sharp instruments where they may fall upon someone.....	3
Do not leave chairs or other objects where someone may stumble over them in the dark.....	3
AT SCHOOL—	
Do not hurry down the stairways.....	3
Do not run in the halls.....	3
Look before going in and out of doors and do not rush.....	3
Take one step at a time on stairways.....	3
AT PLAY—	
Do not run on busy traffic streets in play.....	3
Do not play near high places or on rough ground.....	3
Keep away from quarries.....	3
Total	75

THE AUTOISTS AND PEDESTRIANS OF TOMORROW

Any average person cannot but realize what a wonderful help this practical scale is to the teacher for measuring the effect of the instruction in accident prevention. If the pupil is able to measure up to the test and pass a good grade it but naturally shows that safety instruction has gone across, and if this is true it undoubtedly means that the child is more careful. Imagine what a wonderful effect such practical instruction will have on our communities in years to come when the school children of today are the men and women of tomorrow, or, in other words, the autoist and pedestrian of tomorrow.

This scale, with a special letter over the signatures of the committee and on the Section letterhead, was sent to every State, county and city school superintendent in cities having a population of 19,000 or over. Lack of funds prevented the committee from making a wider distribution. Never before has such a spontaneous response been received by the committee from any literature previously broadcasted. It has proven to be the best advertisement of the Council for school safety to date and the most appreciated data sent out by the Section. Hundreds of letters were received thanking the committee and requesting extra copies for local distribution.

Following is a sample letter:

June 29, 1922.

National Safety Council, St. Louis, Mo.

Attention Dr. E. George Payne.

My dear Dr. Payne: I am very much interested in the copy of the scale measuring the results of accident prevention and health. It is very suggestive and we will be able to make use of it. Sincerely yours,

(Signed) Merritt D. Chittenden,

Supervisor of High Schools, State of Vermont.

The greatest single recognition of the safety movement and for which the committee can at least indirectly assume credit is the call of Dr. E. George Payne to the University of Chicago to give courses on health and safety education and for a series of lectures in New York University for similar work. He has reached 1,000 school superintendents and principals, representing every State in the Union. In addition to this, New York University has created an important chair of safety and health education, thus placing the work in the second largest university in the country, or world for that matter, and giving definite recognition to safety work as a part of the curriculum.

In closing this report the committee desires to acknowledge and express its thanks to the executive officers and the staff of the National Safety Council for the loyal and splendid support given the Officers of the Education Section during the past year. Respectfully submitted.

ARTHUR T. MOREY, Chairman.

DR. E. GEORGE PAYNE, Vice-Chairman.

CARL L. SMITH, Secretary.

APPOINTMENT OF NOMINATING COMMITTEE

CHAIRMAN MOREY: I will appoint Mrs. J. P. Thomy of St. Louis, Mo.; Mr. J. C. Townsend of Grand Rapids, Mich., and Mr. S. W. Krull, principal of the public schools, Buffalo, New York, to serve as a Nominating Committee to consider the matter of officers of this Section for next year. They will kindly confer and let us hear from them later in the meeting.

It is now my very great pleasure to introduce to you Dr. Payne who has done a wonderful work in St. Louis and for the country as a whole. What a wonderful pleasure it must be to Dr. Payne to have the statistics of St. Louis, compiled some time ago, bring out the fact that his work has saved two whole schoolrooms of children! What better monument could any man want than that? What is being done in St. Louis is being done wherever this great work is being put forth. As I said, Dr. Payne, formerly principal of Harris Teachers' College of St. Louis, has accepted the Chair of Educational Sociology of New York University and we wish for Dr. Payne a wonderful career of usefulness there.

THE GROWTH OF THE SAFETY MOVEMENT IN PUBLIC AND PAROCHIAL SCHOOLS

DR. E. GEORGE PAYNE, PROFESSOR OF EDUCATIONAL SOCIOLOGY, NEW YORK
UNIVERSITY, NEW YORK CITY.

This is the fifth year that I have appeared before the National Safety Congress and the fourth time I have spoken before the Educational Sec-

tion and because of my many visits I feel some trepidation in coming before you this afternoon. I have chosen to discuss some aspects of the work as it has gone on and some of the things we contemplate for the future, as it seems appropriate to survey the situation and see where we are.

Mr. Connally, Commissioner of Labor of Oklahoma, sent a representative to study our safety work, and I had the opportunity of taking him to school after school, where we found the work going on with the same enthusiasm and every teacher feeling as she did in the beginning. That is the vitally important part of educational work.

I must recall to you, although it is not my purpose to discuss that aspect of the subject this afternoon, the experience of one individual. We attended a meeting of the safety committee, composed of representatives of the various rooms. They were discussing the problem of promoting safety in the school community. During the meeting one of the boys reported that one of the children of the school was in the habit of hopping on trucks as he came to and went home from school. On account of visitors being present they set the matter aside as they did not want to make an unpleasant impression, but the boy persisted, saying: "I want to know what you are going to do with this report."

They could do nothing but call in the boy from one of the lower rooms and ask him what he had to say. Of course, he was frightened and could not tell them why he did it. After some little debate they decided it would be wise to create a committee of boys, whose duty it would be to keep children from hopping trucks, and they appointed the boy as chairman of the committee. I have received thousands of letters from children in various parts of the city telling what they were doing in safety work. The youngsters are interested in the work, as is shown in the type of activities they are carrying on. They hold weekly meetings, discuss various matters connected with the movement and promote safety in the school.

PERSONAL VIEWPOINT OF THE TEACHERS

The second point I wish to touch on is the interest manifested among school people. The questionnaire we sent out showed something of the interest manifested by educators in all parts of the country. We did not take the country as a whole, but I had an opportunity this summer to come into contact with 1,000 superintendents, normal school teachers and others, representing every State in the Union, during my lectures at the Universities of Chicago and New York. We not only discussed the matter as we are considering it this afternoon, but in each case we had an opportunity for conferences in which the personal viewpoint was given a hearing.

One thing stands out in the experience of which I speak: Educational leaders among graduate students in leading universities are entirely sympathetic with this educational program, aside from the fact it helps the students. They welcome it as a point of view in education, because it means a development of control in the child that will help more adequately to meet the problems of environment; after all, is not that the

point of view of education? One of the most helpful things in safety work is that the educators and leaders of the country are ready to undertake a program such as this.

We have sent out numerous bulletins and many others have been published by the superintendents of schools during the year. In Chicago they have published a textbook on safety, for use in the schools. All over the country the school authorities have published pamphlets, reports and textbooks have been distributed that will better meet the needs of education in accident prevention along the line we have laid down in the Education Section of the National Safety Council. Summed up, out of the experience of the past we can look forward hopefully to the future.

What is our problem? In the first place, I would call your attention to the fact that the causes of accidents, because of the complexity of the life in which we dwell, are the practical result of twentieth century development. They are so recent that our practices, with reference to community relations and community conditions, have not the required capacity for protecting us against them. It is likely that by the time we have developed capacity for protecting ourselves against hazards as they exist today, we will have developed others that will need further educational work to protect us against them.

The various causes of public railroad accidents were developed in the last decade of the nineteenth and the first decade of the twentieth century developed the accident hazard.

The period of building street car systems was during the last decades of the nineteenth century and the street railway hazard has been with us since that time. Take the electric light and consider the hundreds of thousands of electric accidents, which, in one form or another, occur every year—a twentieth century growth. It is not of twentieth century origin, but the necessity for safety education for protection against its hazards is with us today. While gas has long been used it has become altogether a necessity in the twentieth century. Similarly, the automobile, which is piling up an increasing record of accidents day by day and year after year, is really a twentieth century development. We had an automobile race in Chicago in 1896, a race which called the attention of the country to the automobile in its infant days. The race course was six miles in length and the time was 60 minutes—there was not very much danger in auto racing at that time.

THE PSYCHOLOGICAL SIDE OF SAFETY

Similarly each mechanical device—and these account for 95 per cent of public accidents—is virtually a development of the twentieth century. Therefore, something needs to be done to develop capacities in the individual for taking care of himself with reference to hazards that create complex conditions of life on our streets and in our homes.

When we examine it from the point of the individual the problem becomes definite and simple, although from the mechanical side it may seem somewhat complex. We will, therefore, examine it from the psychological side, if you choose. It seems to me this sort of analysis must go on if we are to attack the problem in an intelligent way. First, the

analysis of causes of accidents, on the side of things that cause accidents; on the other side, of causes in the individual which produce accidents.

What are the causes in the individual? You can outline them as far as you care to go, but fundamentally there are three causes of accidents in the individual. First, inherited tendencies that are unsuited to a complex environment such as we have, and in which the child or the individual lives. For instance, the child has a marked tendency to play—we all recognize this is a necessity. It is necessary to give the child fresh air and vitality for his development, but when the child gets out into the yard and accidentally lets his ball fly across the street, he runs into the street for it; he comes into the path of a speeding automobile and an injury results.

Mother is busy and unable to care for the children at all times and, finding it impracticable to keep them tied to her apron strings, lets them go out into the yard to play; they meet with accidents and are hurt. Children climb trees and telephone or telegraph poles and come in contact with live wires—that causes accidents. I might run through the category of many inherited tendencies on the part of the child that are necessary for his growth and development and the natural expression of those tendencies resulting in situations which cause accidents.

Consequently, you have two problems growing out of these inherited tendencies. One is to provide adequate space in which the child can play and the other is to direct those inherited tendencies by training the child to take care of himself in the presence of dangerous situations.

The second fundamental cause of accidents is bad habits. Many of us grew up in an environment which did not possess the hazards which are present today, because the hazards are of recent development. If we did not grow up in that environment our parents did and we have acquired our habit from imitating those with whom we came into contact, namely, our parents, so we have acquired a whole host of bad habits which bring us directly, day by day, into paths of danger.

NEW GENERATION FACES GRAVE PROBLEMS

I am reminded of the situation which we discovered when we came to examine into causes of accidents. We found that, although perhaps only 3 or 4 per cent of the people cross streets at other places than the regular crossings, 75 per cent of those killed on the streets by automobiles were killed at places other than the crossings. I recall further, when the Local Safety Council attempted to put on a campaign to prevent people from crossing at intersections other than regular crossings, there was a terrible howl, because the public said the streets were for pedestrians—a case of not only bad habits but of ignorance.

I am glad to say the result of that campaign has been to make people exercise a great deal more care in crossing the street at the proper place. After all, the cause of bad habits arises from the fact that we have been brought up in a generation where it made no difference whether we crossed at the crossing or somewhere else, but today it makes a lot of difference.

The third reason, or cause, is simple ignorance. It is amazing to learn how ignorant people are on simple causes of accidents. A striking instance came to my mind only a few months ago: The father of an interesting family living in our district had gone out in the morning, leaving his wife and children happy and well cared for. Coming home from work in the evening he touched a dangling wire and met instant death. Why did he touch the wire? He did not know that hanging wire, with live ones overhead, is liable to come in contact with high-voltage electricity. So this old and respected citizen, an asset to the community, because of his ignorance, met death.

Turning off a faucet while standing in bath tub is an old story, but I need not elaborate on all sorts of accidents due to ignorance. We might ask ourselves: How are we to meet these problems?

There is just one way: We must redirect the inherited tendencies of children and the only way to do so is to educate the child. We must do this just as you would in any other respect, and since education along safety lines involves an understanding of the law of self-preservation it is necessarily of the highest importance—I need not stress that point with this audience.

REDIRECTING INHERITED TENDENCIES

If we desire the child to eat properly at the table we do not lecture him—we just keep at him at every meal until he masters the proper etiquette. If we want him to talk, we start with easy words—just syllables—and we take him step by step, day by day and month by month until he is able to talk. He develops speech out of inherited capacity, and he must develop a control that will keep him from danger upon the street in the community in exactly the same way; it is a problem and process of education. He has not learned that control from his mother before he comes to the school period and, therefore, that is the period where you have to do your work in accident prevention. The reason is apparent at once; the mother has not had the opportunity (even if she knew how) because mothers are generally ignorant of the specific causes of accidents. Their instructions are of the most general nature, therefore it is a problem of school education to redirect those inherited tendencies which make it possible for the little child to live in the complexities of our present day life.

How are we going to eradicate the bad habits of school children? The first problem is to put into them good habits by properly redirecting inherited tendencies. There is the place; take the child in the kindergarten.

Last year I told you of an investigation where we discovered that out of forty deaths in a thousand more or less serious accidents, where public utilities were concerned, they were produced by four causes: Skating or running into the street and being hit by street cars, climbing onto street cars, stealing rides on street cars, playing on railroad tracks and contact with live wires. Forty deaths in a period of three years from those four causes! It may be they were caused by ignorance or from inherited instincts or tendencies that cause children to engage in

these activities. You have to develop control in the child over his own behavior—such control that will lead him not to do specific things that are causes of accidents in the community.

How do we get rid of ignorance? Simply by analyzing the causes of ignorance. Where we analyze the causes, and they are definitely outlined, we have to develop in the children a consciousness with reference to those accident situations that will make the child protect himself in the presence of them. Whether it be one cause or another, it is a problem of education and you cannot get around it. However, it is not only a problem of education, it is one of school education, whether private, public, parochial or what not.

SAFETY A COMMUNITY PROBLEM

It helps to pave the way for the kind of education we want the child to absorb—it serves as a motive for stimulating the interests of the child in conventional subject matter. We are able to get more effective drawing, language, more effective work of all kinds than we could possibly do if we did not have the motive; that is the testimony of all teachers who have had the opportunity of using the accident motive as a means of stimulating interest in school work.

The problem of accident-prevention education, at the present time, is one of analysis, with reference to a specific situation and a particular community; no general analysis will be adequate for the country as a whole. While there are certain general causes of accidents that apply to the country as a whole, even accidents from automobiles are found, by analysis over a period of years, to change. Causes were about 50-50; that is, children were to blame about half the time and the automobilists were at fault in the other accidents. In half the cases the automobilist could not prevent the accident, no matter how careful he might have been—the children were wholly the cause. That might not be the case in another community; there it might mean lack of education on the part of the driver more than on the part of the child. Therefore, I say the problem of the community is a specific problem and not a general one.

Coming out of New York City on the New York Central the other day and looking down into those vast arteries of traffic between the high tenement buildings, with streets literally filled with children, I was impressed with the fact that the streets were the only places they could go for play and to exercise the fundamental instincts of childhood. The problem of accidents there is totally different than in a city or community where they have parks and playgrounds, where the children have space for recreation and the light and air necessary for proper development. As long as it is purely a local problem it must be analyzed as such. One of the problems, therefore, of this Section is to stimulate various cities to the type of analysis of which I speak and the adaptation of their work to the specific requirements of each case.

Another problem is to induce those who are responsible to adequately train prospective teachers in this type of work, so that every teacher who graduates and goes into the public schools may know how to instruct children in safety as well as other branches of education. It is being

done effectively in Detroit under Miss Beard and in several other of the larger cities, but we must not stop. We must see to it that the institutions training teachers for this important work do it effectively and that the matter be given proper attention.

IMPROVE TECHNIQUE AND METHODS

We must work out a more perfect technique, we have not said the final word in education for accident prevention. The fundamental point of view, which has been represented from time to time, is adequate and is the one that lines up with modern educational theory and practice, but we can improve our technique both in method, organization and materials we use in the process of instruction; we have hardly begun to concentrate the literature and experience now available. The problem is a bigger one than a mere question of education for accident prevention.

Unless we conceive it to be a problem for the education of life itself, a training in citizenship in its broader sense, for a better participation in a democratic form of government, we have missed the fundamental character of this new type of education. We are not teaching from textbooks dealing with democratic practices, but giving instruction looking toward an intelligent participation in community life in the years when we can expect the children of today to become parents in the community. The problem, then, is not merely one of reducing accidents, not merely saving human lives, but saving humanity in a larger sense, for a greater usefulness and appreciation in the practice of citizenship in the years to come.

DISCUSSION

CHAIRMAN MOREY: The greatest Teacher said: "By their fruits ye shall know them." I have told you of the record Dr. Payne made in St. Louis. I wonder if Dr. Payne will tell us something of his investigation of accidents in high schools where there had been accident prevention work and where there had not.

DR. PAYNE: Out of eighty-four accidents in seven high schools in St. Louis, thirty-four were in one school. In one school only one accident occurred. This was not due to a hazardous situation but the conscious attitude of students towards the situation; where they had given attention to it and where they had not; where they had, there were no accidents; where they had not, they did have accidents.

CHAIRMAN MOREY: There was a direct and immediate result from safety instruction.

A lady who returned from Europe to keep her place on this program shows a splendid interest in safety work. We cannot say too much about Miss Beard's work in Detroit. She is a woman of spirit and ability and has been made supervisor of safety by the Board of Education in Detroit. You will agree that we are making progress in our work when boards of education give recognition of this kind to the work we are engaged in. I have great pleasure in introducing Miss Harriet E. Beard.

HOW THE DETROIT SCHOOL SYSTEM IS CO-OPERATING TO MAKE DETROIT SAFE

MISS HARRIET E. BEARD, SUPERVISOR OF SAFETY, EDUCATIONAL DEPARTMENT,
DETROIT PUBLIC SCHOOLS.

I wish our schools were in session so that you might see the work they are doing. You would learn, I believe, that the teachers are the ones deserving of credit, because they are interested and doing such wonderful work. Knowing that you would be interested I asked some of the teachers and children to give a little play this afternoon. That will tell, better than any words of mine, the attitude of the children and how they are co-operating to make Detroit safe.

We try to co-operate very closely with the police department and, in turn, they assist us in our work. The police department gives us a report of every accident that happens to a school child; this is very valuable, as it comes from an entirely impartial source. They don't know just what we are doing in the schools, so they send us in the facts as they gather them. Our work is based on conditions that really exist in this city and not on theories. We try to make our program fit the needs of Detroit.

This is a very fertile field for accident-prevention work—my only wonder is that any of the school children come through alive. In one year sixty-nine people died of old age in this city. Think of it! People don't have a chance to die of old age any more.

The reports of which I spoke help us very much. We also discuss dangerous situations with the police department. Unusual situations are taken up with the secretary of the department and we come to a conclusion as to what measures can best remedy the situation.

MAKING FRIENDS WITH POLICEMEN

A special policeman, trained for the purpose, talks safety to the children in the schools; he has certain and definite points that he covers with children of different ages, and this practice is productive of good results. The children entertain a friendly feeling toward him and as they grow up will become law-abiding citizens. The children speak to the policemen on the streets and have made friends with them, giving them their respect.

You might be interested in learning how this came about. The children were talking about the duties of policemen and impersonating them and finally one teacher said: "I wonder if we could not have a real policeman come and tell us what his duties really are?" At the street intersection nearest the school is one of the "crow's-nests" from which traffic is directed, and one little boy spoke up, saying: "I could run over to the 'cuckoo's nest' and get the policeman." You see the friendly feeling the children have for the policeman. The co-operation of the police department is protecting children at school crossings. We also have the janitors on duty help the young children, while the older boys help at other corners. The policemen explain to the boys how traffic is controlled.

We do not put young boys on men's job and controlling traffic at street corners is a man's job, but we try to have the children help in every possible way, and they can help. They readily learn the policemen's problems and the policemen are helpful in training the janitors and the boys.

CHILDREN TAUGHT FIRE PREVENTION

We also try to co-operate with the fire department and this work suggests great possibilities. When you go back to your home city you will find that you spend about the same amount each year for teachers' salaries that you burn up. We need to exercise fire prevention fully as much as accident prevention in our work. Nine hundred American homes and five schools burn every day, so an insurance man informs me, so you see the need for co-operation with the fire department. Our firemen are well trained. We separate the children into groups, based on ages and the firemen talk to them on the prevention of fires and the turning in of alarms.

Every child should know how to turn in a fire alarm and we instruct them in that regard. In the splendid moving picture we have made you will see how the fireman comes in and talks to the children and shows them how to turn in alarms. Lest any of you should be under a misapprehension, I want to tell you that all of the details worked out in the picture are things actually taking place in the school. We selected the things that we thought would be of most interest and the things that would take most easily and you will see a great deal I have not time to go into detail about. Our co-operation with the department has been productive of good results.

You will be interested to know that in 1921 we had 508 less fires than had taken place the year before, with a saving to the city of \$1,000,000. There was also a reduction in the number of false alarms. When we started teaching school children how to turn in alarms it was suggested that the firemen would be busy all day chasing false alarms, but it did not work that way. We tried to teach them the principle of fire prevention.

We are also securing enforcement of the laws by our courts in better fashion than formerly. There is stern and vigorous prosecution of the people who drive recklessly through the streets. We are co-operating with the Detroit Safety Council, with the Detroit Automobile Club and the Federation of Women's Clubs. The latter body meets once every month, and they give some time at their general meeting to the subject of accident prevention and the work that is being done in the schools. Through "safe drivers' meetings" we also get co-operation and help. When they see children doing dangerous things they tell us. We co-operate with the Boy Scouts and the Girl Scouts and get excellent co-operation; Christmas time the Boy Scouts help at the street corners downtown, aiding the police in controlling the street traffic.

In prevention work there are two things I would like to emphasize: One is that we must have suitable material. Many books and pamphlets have been prepared and it is easy to secure material on accident prevention, but the teachers are not able, with all their other duties, to take

up the duties of accident prevention without definite material. This material must be gathered together for their use.

DEAL WITH POSITIVE QUESTIONS ONLY

We should avoid the negative and dwell on constructive features in laying out our program. We do not need horrible details in our work with children—the constructive study of saving human life always appeals to them. In addition to getting suitable material of a constructive nature, we must provide activities for the children. In schools where the children have organized safety clubs, traffic corps, etc., we have secured the best results. If the teacher only talks and the children do not have a part in the work we do not have the spirit and we do not secure the same results otherwise obtained. Children like to have tangible evidence of their membership in the club. Therefore, we have safety buttons or officers' buttons, and we find that does more to help safety work in the schools than anything else. The teachers are enthusiastic because the children make much better progress in their other studies. For instance, in the ungraded schools, where we have large and difficult boys to handle, we find that if we say to them, "Wouldn't you like to be on the traffic squad?" invariably they are pleased because they like the work and the responsibility. They make better progress in their other studies as a result. The teachers were at first dubious of the success of the course and they said: "We cannot give these boys responsibilities." I said: "Try it and see what they will do." As a result some of the boys are so interested in traffic work that they ceased to be troublesome. The traffic work gives us an opening wedge and we can work with the lads along constructive principles.

We have had a tremendous decrease in accidents. Before we began our school work ninety-six children of school age were killed in one year in this city; last year we had thirty, a decided decrease. As a natural reaction of our work in the schools, accidents in the home have decreased. Two hundred children of school age formerly met with accidental death in one year; last year we had one hundred and fifty, including babies scalded or burned. The school children carry safety into the home. It teaches them to be good citizens and citizenship is not learned from books. Helping the policeman teaches them to take on the duties of good citizens.

In one school I visited there was a courtroom and the clerk of the court was a lad 11 years old. Two boys came down to see me to talk things over. The oldest was 12 years old, born in Belgium; he came to this country when a little fellow. I asked him about his work. He told me that he was the captain; he took care of all the crossings for three blocks on either side of the school crossing. I asked him: "How long do your boys stay on the crossing?" "They stay until three minutes before the tardy bell rings. I am the captain and I blow the whistle." "Do you have a whistle?" "Certainly," and he pulled out the largest whistle I have ever seen on a small boy. He was only a young lad, yet he was directing the traffic for three blocks.

I asked the other boy—his name was Austin—about his work, and he drew himself up very proudly and said: "I am clerk of the court."

"What are your duties?" "When the children apply for citizenship in our republic it is my duty to question them." "What questions do you ask them?" "My first question is: 'What does co-operation mean?'" "That is a good question. What else do you ask them?" "I ask them: 'What does self-control mean?'" His other questions related to current events; he asked who was President of the United States, who was General Pershing, who was General Foch and where is he at the present time—Foch at that time was in the United States.

I then asked: "If you find they are worthy to be citizens what do you then do?" "I have them hold up their right hand, like this, and I say to them: 'Do you renounce the old form of teacher government and promise to do your best to make self-government of the pupils, by the pupils and for the pupils of the Pingree school a success?' And they say: 'I do.'" I asked: "Where did you learn that? Did your father take you to the Naturalization Court?" "No, I went myself."

I looked at that little boy in amazement. It was one of the most delightful experiences I ever had in this work. "When you have the next session of your court will you let me know?" I asked. "I should like to see the court in session." He said he would and I went. I could hardly believe what was actually taking place. I hardly believed they could do it, but they did. That is one of the most hopeful signs of progress in educational work.

We are handing over to the younger generation a world that is in a terrible mess. In Europe I have seen chaos, distrust and suspicion; the Germans are talking about the next war—and have not enough money to pay for this one. When you see these conditions you think: "The only thing we can plan for the children of this generation is to give them ideals to carry them through the difficulties that are before them."

BUILDING UP IDEALS IN YOUTHFUL MINDS

Teaching children that every human life is worth saving through accident prevention is giving them something to think about that books do not contain and something that they will not get even in the finest universities. Placing before them the ideal—that is the work we are trying to do for the children of Detroit; that is the kind of work to which the children respond to splendidly.

In the little play we will give you will see what the children put on for Fire Prevention Week. The teacher furnished the ideas, but the children wrote their speeches and did most of the other work. There was no expense in connection with it. The stage was arranged very quickly this afternoon, but it will be interesting to see just what they will do under the circumstances. All through the schools they put on these plays; it is teaching the children to be good citizens and, best of all, that is what we want them to become. (The play was then presented.)

CHAIRMAN MOREY: I wish we could drive home the difference between the positive and the negative in this sort of work. There is something constructive in this little play; it teaches the children safety and the right thing to do. Let me tell you about another school play.

The first tableaux showed a little boy with crutches; he had only one leg. He was sitting off to one side disconsolate, while children were playing all around him. The next scene was called "Doom." It represented a little boy in a group of children, with a handkerchief about his eyes—he was doomed because he was sightless for life. Next was shown "The Last Farewell." This was all enacted by children, you understand. Here was the mother and three or four little children; the father kissed them all good-bye and went to work. It is supposed that he was killed at his work, because the last tableaux was the "Song of the Shirt"—the mother was at her sewing machine trying to support the family by sewing shirts.

I talked to the principal afterward, saying: "Don't you see that you have done harm? You have not taught safety. Your audience of 800 people has gone home with a tear and a fear and a terror in their hearts; the mother to think that her husband may lose his life and she her means of support; the little boy and the little girl are filled with fear for the sake of their father. What have you given your audience that will help them along safety lines?"

TEACH SELF-CONFIDENCE AND ASSURANCE

"Fear in accident-prevention work is a crime," I said. "If you say: 'Johnny was killed yesterday; better look out.' 'Billy was killed hopping on a street car. Look out! Look out!' you get the child so terrified that he will not cross the street.

"The better way to do it is this: 'Johnny got hurt the other day. He did not do this right. This is the right way to do it.' You demonstrate the right way and the child will have perfect confidence that such an accident will never happen to him."

Children must be given assurance and confidence; that is real safety work, to teach children to have absolute confidence in their ability to protect themselves. When they cross a street or do one of the many familiar things they know the right way to do it, because of the confidence and assurance you have given them. I said to that principal: "Why have you not sent your audience away feeling that accidents are something that can be prevented; that an accident is wrong thinking and wrong doing? Teach them the right way to do things. If that is done, when they go to the shop or to the industry, they do so with confidence and a feeling of assurance." Safety is a positive, constructive, conservative thought; with children it is teaching light, understanding and wisdom.

I want to thank the teachers and children of Detroit for this fine tableaux and for the splendid method of presenting the safety idea. It is constructive thinking; the right way of doing things. Teaching men to do things right and to think right has been a wonderful idea in our shop, but to start with the children is far better. The more affirmatively we live the better and the more constructively, the better progress we are making. All calendars of the National Safety Council heretofore have dealt in a comic, in a joking, way with negatives, but if you look at the new ones for next year you will find they are much better as they deal

with constructive thought. I think they are a million times better because they are dealing with the positives and affirmatives.

Mr. Claude E. Connally will tell us what the National Safety Council can do to assist the States in educational work. He is from Oklahoma, and we will hear from him now.

WHAT CAN THE NATIONAL SAFETY COUNCIL DO TO ASSIST THE STATES IN SAFETY EDUCATIONAL WORK?

CLAUDE E. CONNALLY, COMMISSIONER OF LABOR OF OKLAHOMA

I think we are all agreed that in safety education lies the promise of securing the most permanent results in accident-prevention work. At the present time there is no agency in a number of the States prepared to give the safety-education program the attention it deserves and which it must have to successfully put it across. For that reason it is believed that the Education Section of the National Safety Council should adopt some plan for effectively reaching the teaching profession where they are unable at the present time to become acquainted with this work. The States, I am sure, would be glad to sponsor the safety-education program; in fact, a number of them have already done so, but the limited attention they have been able to give to this work has failed to attract and hold the interest necessary to make it successful. Safety-education work in Oklahoma is lagging for the reason that our department has not been able to properly interest school authorities in the program. Our State, and perhaps a number of others similarly situated, has made no provision for paying the expense necessary to bring the safety-education message to the teaching profession. While it is true the schools are deeply interested, the departments of labor and industrial commissions have more educational and other accident prevention work to do among employers and employees than can properly be taken care of without placing this additional responsibility on them; furthermore, they are not always successful in securing appropriations necessary to meet this expense.

What can we suggest that will assist the States in safety education?

COUNCIL LECTURE COURSE ADVOCATED

First: The Executive Committee should arrange for a corps of experienced lecturers for the Education Section of the Council; at their option the Section to send out these representatives for the purpose of selling the idea to the teaching profession. Concerted action with this program in the States is not only desirable it is imperative.

Second: "Visual education" is considered one of the effective methods of impressing the minds of children of school age and this idea is now being put forward in the schools. Safety education, it is believed, could be effectively linked with visual education in the schools; this could be brought about through the work of the Council.

Third: The Executive Committee of the Council could arrange for an attractive reduced membership fee for representatives of the educational profession, as an inducement for them to join the Education

Section and encourage them to attend the annual Safety Congresses. Membership for the education profession should be considered on a different basis than other classes of membership.

Fourth: Have the editor of *The National Safety News* set aside a liberal section of that publication, to be known as the "Safety Education Section," or, if this could not be done, begin the publication of a separate magazine devoted exclusively to safety education in accident-prevention work; in either case making the price of subscription attractive, so that schools would subscribe for the publication in quantities and thus make the circulation as widespread as possible. Teachers and students in the schools would submit competitive manuscripts on accident prevention and various topics connected with the problem would be opened up for discussion.

Fifth: It is of the highest importance that the work of safety education in accident prevention be pushed forward by the Education Section and this cannot be done successfully unless sufficient funds are provided to maintain and advance the work. The Executive Committee should, therefore, give the problem of financing this Section every possible consideration.

I was very much gratified at the statement of the Chairman to the effect that some of the insurance companies had arranged a fund for assisting the Council in this work; to my mind this is the crux of the whole problem, the financing of the Education Section.

FINANCING THE EDUCATION SECTION

CHAIRMAN MOREY: I have been President of the organization and a member of the Executive Committee for many years and I can assure you the financing problem is always with us. The last two years we changed a \$30,000 deficit to a \$12,000 surplus—a wonderful piece of work. We have long studied how best to raise funds to finance the Education Section and public safety work.

The Council started, you know, from the industrial end, and the Sections all have been developments. The Executive Committee has had the financial problem of this Section before it constantly. The officers last year raised, by contribution alone, enough to pay the stenographer. We have been working with the insurance companies and Mr. Van Schaack has announced the establishment of a fund which will be of great help to us.

If you will leave with me a copy of your excellent paper I will see that every recommendation therein will receive consideration by the officers of the Executive Committee and any further suggestions you can give us along that line surely will be appreciated.

We are very sorry, indeed, that Mr. Max S. Henig of the Essex County Vocational School for Boys of New Jersey is unable to be present. We will now have the report of the Nominating Committee.

REPORT OF NOMINATING COMMITTEE

MR. THOMY: Your Nominating Committee has chosen, they believe, very wisely and carefully: Dr. E. George Payne, Professor of Educa-

tional Sociology, New York University, New York City, has been selected as Chairman of the Educational Committee. Dr. John J. Tigett, United States Commissioner of Education, whom we had the pleasure of hearing yesterday, and whom we believe will take the Vice Chairmanship, has been selected for that office.

For Secretary, we have selected Mr. A. W. Whitney, National Bureau of Casualty and Surety Underwriters, New York City. He is thoroughly familiar with the needs of this Section and will enable us to do better work along educational lines. (The recommendations of the committee were concurred in.)

DISCUSSION AND ROUND TABLE

MR. T. H. CARROW (Pennsylvania Railroad): I was very much impressed with Dr. Payne's address. I realize, of course, that he did not have an opportunity to give a complete exposition of his theories on safety education, but I was impressed with his emphasis on the negative aspect of the case, a matter which the Chairman also touched on. That comes home directly to me because I am in the railroad business, and it there is any place in the world it is there that you cannot teach negatives. People have to get on trains, they have to run them, they have to raise cars and get under them, they have got to drive spikes almost when trains are passing, and it seems to me the great principle in the safety education of the future is not to slow down automobiles on the streets of Detroit, where it makes congestion in traffic, as I believe they are doing, but to educate the people, rather, that they can go fast and not be in danger.

One point I gathered from this meeting which, as a business man, has been a great inspiration to me—one which ought to be of some encouragement to teachers: For ages past the teacher has been the poorest paid, the least recognized and the least appreciated, while at the same time he or she was the most important citizen in the community. As Dr. Payne unravelled the theory he has worked so hard on I could not help but think of what H. G. Wells says in his recent work on evolution, that man is never qualified to meet the position in which he is placed—the position and the condition arrive long before he is ready to meet them. Automobile and steam transportation and all the multitude of industries today have brought upon us, almost in a decade, a multitude of dangerous situations. It is necessary to be placed in the midst of danger before we provide the means for safety.

SAFETY BEGINS WITH THE CHILD

If people want more safety, there is the place to get it—in those dear little children. It almost made me cry with joy and appreciation to think that in a little mind like that you could plant a realization of danger and the confidence and assurance necessary to avoid it. I thank these teachers for giving me an inspiration to go back to my job and work like Sam Hill to make this a better world to live in.

DEAN C. B. CONNOLLEY (Commissioner of Labor and Industry, Harrisburg, Pa.): I want to thank Mr. Carrow for what he has just said and

a few words about his company. The Pennsylvania railroad is doing more, perhaps, than any other institution in America for the protection of the citizens of the United States by a slogan they have sent out. They have enlisted the aid of all the people of Pennsylvania and New York to help them and they are carrying on this campaign in the way we used to send out Red Cross Stamps and literature.

In Pennsylvania, in 1919, a law was passed that made it ~~compulsory~~ to teach safety in the public schools. In those days Mr. Carrow ~~said~~ and told the truth, when he said that the teacher was the poorest paid person in the world. In Pennsylvania today the teacher ~~outranks~~ the clerks in the steel works and in the railroad companies. You ~~will be~~ gratified to know there has been an increase of 110 per cent in their salaries in Pittsburgh where I am a member of the school board—120 per cent for some of them. The increase in one year amounted to \$1,200,000. That means what?

TEACHING PRACTICAL SAFETY METHODS

It means the kind of teacher we are going to get will be very different from the kind we once had. In the Department of Labor we have what is known as a committee of safety engineers. On that committee three men have been appointed as a sub-committee to assist Superintendent Finnegan of Pennsylvania to get across the safety movement from a practical viewpoint. In Pittsburgh we have Mr. Auel as a member of that committee and the committee has done the best piece of work for safety that is being done in Pennsylvania.

For eleven or twelve years at the Carnegie Institute of Technology we have been trying to extend safety work and we have been trying to design pieces of machinery as nearly "foolproof" as possible. If the people of the United States will only get a little more of the information that is required to give children what is necessary our problem is solved. We have in Pittsburgh the largest Local Safety Council in America and that means in the world. Mr. Auel, our ex-president, started it and has worked it in such a way, with the help of others, that we now reach 1,500 members. We are going into the public schools but we are far behind the city of Detroit.

We need someone from the National Safety Council to pay us a visit and tell us what to do and what to teach. A prophet is without honor in his own country and we need a "foreigner" to come in and tell us what to do. I feel, as I have felt for years, that the success of our great movement lies with the children—"A little child shall lead them." I feel better for having come here; I always feel better when we have this kind of a meeting, especially where children are involved.

I have no patience with the teacher who says that she cannot teach safety because the curriculum is overloaded. It can be done and it must be done. It is the best thing in the world and you must do it; you must do it because God demands that you protect the people. The trouble is the material things of life have gotten into the schools and crowded out the better things. I have no patience with people who are constantly talking about the expense of education, putting the ma-

terial side above the human side. We must think more of the life of the child than we do of the expense of education and when that is done—and we are going to do it—we are going to have a better trained citizenry.

WORK OF THE VOCATIONAL SCHOOLS

LOUIS H. CARRIS (National Committee for the Prevention of Blindness, New York City): I am sorry that the gentleman from Essex County, New Jersey, will not be here this afternoon. However, I would like to place in the record something about the place of the vocational school in the safety program, because at one time I was (in New Jersey) an assistant director in charge of vocational education and afterward with the Federal Board of Vocational Education. I have seen vocational education develop from the beginning.

In the vocational education system of the country we have an organized agency or society which could co-operate with the National Safety Council in putting further emphasis upon the safety program in so far as the vocational schools of the country are concerned.

At the present time, there is a Federal Board for Vocational Education which is in charge of the national vocational education law, a measure which has been accepted in every one of the forty-eight States. There is a director of vocational education in every State and his is the responsibility to see that safety is taught in the vocational schools. Under the head of "Vocational Education" there have arisen several types of schools, sometimes we think of them as machine shop schools, but they have a much wider scope. Where we have a machine shop school, a plumbing, or a carpenter school, we have the very best of equipment; we have such places as the New York State School where the State Director of Vocational Education has gotten out a magnificent bulletin on Safety First for the schools of the country.

In addition to the all-day vocational schools we now have part-time schools in some twenty-eight States; these require the attendance of children who have gone to work at ages up to 16—these afford a splendid chance to teach safety. In Wisconsin, New York and Pennsylvania perhaps 75 per cent of the children of 14 to 16 years of age are in the part-time schools.

My recommendation is that the National Safety Council communicate with the Director of Federal Vocational Education with reference to securing additional workers in each of the States to see if something more cannot be done to teach safety to our children. We should also ask the Legislatures of all the States for additional appropriations.

INTEREST MAINTAINED FROM YEAR TO YEAR

MRS. J. E. STEVENS (Feld Worker, North Dakota Tuberculosis Association): In connection with my tuberculosis work we have taken up the question of safety and I have found there is nothing that appeals and interests the children as does accident prevention. It must be taught, under the law, in our public schools. We have taken it up at all our county and state fairs, and in that way we keep it before the people. My work among the children has convinced me that the school is the

place to teach safety. The children of today will be the citizens of tomorrow and it is so easy to get them interested.

This spring I was invited to go to several towns to give them something in regard to child welfare work and I tried to think of something new. I advertised we would have a safety meeting and I used the safety buttons gotten out by the Great Northern Railroad. To my surprise we had 1,400 people at the meeting that afternoon and it was the fourth time I have been there. I thought no one would come out because I had been in that town so often.

Let us begin with the children and organize safety clubs. Children like to do something, as we have learned this afternoon and they like to give their money also. If we could get 5 cents each from all the children of this country we would have no trouble in carrying on safety work.

CHAIRMAN MOREY: I want to thank you for helping to make this meeting a success. The national headquarters will increase its measure of co-operation and put on two field secretaries this year.

The meeting then adjourned.

Electric Railway Section

August 30, 1922

B. D. HASKINS, Chairman,
Chattanooga Street Railway Company, Chattanooga, Tenn.

H. B. POTTER, Vice-Chairman,
Assistant General Manager, Boston Elevated Railway Company,
Boston, Mass.

MELVIN W. BRIDGES, Secretary,
Safety Engineer, Metropolitan West Side Elevated Railway Company,
Chicago, Ills.

WEDNESDAY MORNING SESSION

THE meeting was called to order by Chairman Haskins.

CHAIRMAN HASKINS: The Nominating Committee, consisting of Mr. A. J. Van Brunt of the Public Service Corporation of New Jersey, Newark, N. J., Mr. W. R. Lloyd, of the Alabama Power Company, Birmingham, Ala., and Mr. S. H. Reid, of the Bureau of Safety, Chicago, submit the following report:

For the officers of this Section for the ensuing year:

Chairman, John H. Truett, United Railway and Electric Company, Baltimore, Md.

Vice Chairman, G. T. Hellmuth, Chicago, North Shore and Milwaukee Railroad, Chicago.

Secretary, M. W. Bridges, Metropolitan West Side Elevated Railroad, Chicago.

It is moved and seconded that the report of the Nominating Committee be accepted and that the names therein presented be declared elected. [The motion was put to a vote and prevailed.]

Mr. Metzger of the Toledo Edison Company has a number of copies of a course of study in safety that is now in use in the schools of Toledo. He will be glad to furnish copies to those interested.

SAFETY WORK IN THE PUBLIC SCHOOLS

MR. METZGER: We have been trying since 1914 to get the public schools in Toledo to adopt a systematic study of safety in the schools, but until last year met with little success. When the new superintendent was appointed the secretary of the Toledo Automobile Club, the claim managers of the Toledo Edison Company and the Community Traction Company called in a body on him and found him very much in accord with our ideas of preventing accidents in the city of Toledo. He turned us over to Miss Wilson, his assistant, who was also very enthusiastic, and together we prepared a course of study for the public schools. The superintendent gave one or two copies to each teacher in the city.

In addition to establishing the course we started a safety patrol, or school guard, as we call it. Each school was divided into a court and each room elected two members as a school guard. The members of the court hold regular meetings and plan the study of accident prevention in the school. Each school also elects what we call a school guard executive—one member to each school in the city. We started the work in April and our first meeting, held in the Edison Building, was attended by one representative from each school, some fifty-four members of the school guard executive council attending. The chairman of the Council is to become a member of the Public Safety Committee, when formed, and the Public Safety Committee will consist of representatives of the different organizations and industries in Toledo. The children are interested and have done a whole lot of good in the short time we have been organized.

Children are one of the biggest assets of a Safety Council or electric railway in any public safety work in a city; they are enthusiastic in the work and always looking for something to bring to your attention.

MR. VAN BRUNT: Who paid the expense of the movement; did the companies pay or did the board of education?

MR. METZGER: We paid the expense. The Community Traction Company and the Toledo Edison Company each paid a portion and the Toledo Automobile Club made a small donation.

For the study of safety work, the curriculum has been arranged by the assistant superintendent of schools; she has set aside a definite period each week for the consideration of such subjects as health, public safety, fire protection, etc.

SAFETY TEXT BOOK IN COURSE OF PREPARATION

MR. HELLMUTH: The Chicago Safety Council, through its Secretary, is preparing a text book for use in the schools. The idea is not to interfere with the regular subjects, but to make the teaching of safety a part of them. For instance, in arithmetic, you can just as well figure how many people can be saved on a certain percentage, or a certain total, by certain safety practices, as you can how many apples will be left in a bushel if there are so many to start with and you take so many away. The book is being prepared by a committee of principals and will probably be ready for use this fall. I believe it will be of great value in offering independent thought and ideas to members of this Section. At

the annual convention of the American Electric Railway Association, in October, Mr. Bell will probably be able to supply copies to those desiring them.

MR. VAN BRUNT: We found it very difficult to get the teachers interested. They recognized safety as being of paramount importance, but they were not willing to add anything to their work. We got over that by establishing safety patrols in each school in twenty-eight of our cities. Each city appoints policemen to receive reports from the safety patrols. It is preferable to teach safety through the medium of organized school classes, but where this cannot be done, try the plan of organizing safety patrols.

CHAIRMAN HASKINS: Education of the children is one of the important things we must strive for in our future work. The fact that so many people are endeavoring to produce a satisfactory text or instruction book indicates the thought given to the subject.

MR. FISHER (St. Louis): The schools of St. Louis are actively engaged in carrying on safety work. Last winter an association of boys held mass meetings once a month and 3,500 to 4,000 boys attended. As a result of those meetings an organization is being planned to work in co-operation with the St. Louis Safety Council. Such an organization will be beneficial in carrying on the work in the public schools. The material and inspiration naturally will come from the Safety Council.

MR. KEYSER (Washington, D. C.): Has the text book mentioned by Mr. Hellmuth been adopted by the board of education?

MR. HELLMUTH: It will be adopted. It is really the work of a committee of school principals. The text has been reviewed, some slight changes made, and it will soon be put into use.

EXPERIENCES OF BEAVER VALLEY COMPANY

MR. HAMILTON (Pittsburgh): School safety work appeals very greatly to me. I see in our audience one who has had a great deal of experience along that line. I would like to have Mr. H. O. Allison of the Beaver Valley Traction Company tell us of his experience.

MR. ALLISON (New Brighton, Pa.): I have my entire safety committee here from the Beaver Valley Traction Company, including Miss Hardman, our official secretary. It is not because we have made more money than the rest of you that we have this delegation here. We are just as hard up as the other companies, but we felt our safety committee should attend this Congress.

In school work we have had to adopt different methods from those so far mentioned as we had no studies we could put across in the schools. We tried a number of plans and some of them worked out very well. At Rochester, Pa., following a prearranged program, each teacher would read a story containing a safety message that we and others thought the child would carry to the home. This was followed by an assembling of the children in the auditorium, where talks were made to them. We did this for several months.

In another school we had an outline accident poster, as we called it. It was homemade and one side illustrated 100 ways in which accidents could occur on the street and in the home. Then following talks in each

room of the schools, the posters, which were blank on one side, were distributed by the teachers to the pupils, with the request that pupils make an accident poster on the blank side; they could take them home and get the help of their parents if they wished to do so.

The children could cut an illustration from a magazine or newspaper, and use that in making the poster, or they could draw one. In this particular school there was an art class and for the 2,500 posters distributed I received 1,500 in return, made by the children of that school. The posters have been on display at many public meetings in the valley and will again be on display at Chicago at the A. E. R. A. convention.

We prepared a book entitled "What Caused the Injury," containing a series of seventy-eight articles, and we arranged with the teachers in some of the schools to read one of the articles each day. In some of the lower rooms we distributed "Sure-Pop and the Safety Scouts."

We continued our work throughout the year and I found the effective way to reach the children was not to discontinue the lesson part of the work but to get it all in. Some one should go into the schoolroom and talk to the children; they will be interested if the message is properly prepared and put across in such a manner that they can grasp it. Nothing touches me more than to visit a school and have the children say: "We are doing what you told us to do." That has happened frequently—the school children know almost every member of the committee.

This work has been done by the safety committee, not by me as an individual. If it was not for them we could not do the work as we have thirteen towns and a great deal of outlying territory to cover. Any of our literature, "What Caused the Injury" with the series of stories that goes with it, samples of the accident poster (they are 12x14 inches), the four-page folders that were distributed following the meetings and contain suggestions on how to prevent accidents to the school boy or girl, the automobile driver, the pedestrian and the workman in the shop—any of these you would like to have, we will be glad to send to you. I want you to feel that we on the Beaver Valley traction, in Pittsburgh and Beaver, will be glad to do anything which you may call upon us to perform.

GIVING PRIZES FOR NO ACCIDENT RECORDS

MR. KEYSER: During the year 1921, in our company, accidents did not increase in number but they did in severity of injury, so we started a safety contest among our platform men. Every motorman and conductor who passed through a three-month period without an accident due to negligence or misconduct received a cash prize. If he went through a full year he received, in addition to the quarterly prize, a new uniform.

We have had eighteen months of safety. For those types of accidents most common in the electric railway industry our record follows: Collisions of cars, the most demoralizing accidents we can have, a decrease of 68 per cent in 18 months. "No-report" cases and blind accidents (you would naturally suppose that in a contest of this kind there would be a tendency toward an increased number), a decrease of 50 per cent. In personal injury cases (those necessitating hospital treatment), a reduction of 42 per cent. All other cases of personal injuries (a miscellaneous classification), a decrease of 28 per cent. In claims we have effected a

decrease of 31 per cent; in accidents, 28 per cent, and in deaths, 66 per cent for the eighteen-month period.

This work has been costly if you look at it from a dollars and cents standpoint. The uniform for a trainman costs \$20 to \$25 and our trainmen had won 350 by the end of the first safety year! In addition each received \$20 in cash prizes. In all, the campaign has cost us about \$20,000, but we feel that the results attained through our safety contest will be worth many times that sum.

In addition we have built up in our personnel a feeling of safety we never had before. Our transportation department is divided into six divisions, or barns, and at the end of each quarter we award an appropriate banner or pennant to the division showing the greatest percentage decrease in accidents over the same period of the previous year. Our men are anxious to secure the banner for their section, even more so than winning the individual prizes; this shows the keen rivalry between the divisions.

When we put this plan into effect I stole all the thunder I could from Mr. Haskins and the plan that he put into effect in Chattanooga, from which he obtained such wonderful results, but instead of teams we used divisions of the company.

The figures speak for themselves. I think the work shows as convincingly as can be demonstrated that safety is not a hollow sound; that if properly applied it brings results. We attempt to reach our industrial employees through a systematic educational safety campaign and believe we have succeeded, because, during this campaign, we have decreased industrial accidents to linemen, shopmen and car barn employees 52 per cent. Safety has done a great deal for our company and the proper attitude for every claim department is to make it a paramount factor.

REDUCTION IN ACCIDENTS DUE TO PRIZE SYSTEM

MR. HELLMUTH: Does the period of the last eighteen months represent the time in which you have carried on your safety work?

MR. KEYSER: The safety contest began Feb. 1, 1921; the first year ended Jan. 31, 1922. Our board of directors endorsed it for another year—it is still in force.

MR. HELLMUTH: Did you do some safety work before that?

MR. KEYSER: No, sir.

MR. HELLMUTH: In your mind, is it the offering of prizes that gets results?

MR. KEYSER: I am inclined to believe so.

MR. HELLMUTH: Do you keep your claim costs year-by-year, for, say three years, so we could get an idea of the percentage of reduction?

MR. KEYSER: When we put the plan into effect we had \$3,500,000 in litigation—280 lawsuits pending in local courts. Today we have thirty, involving \$250,000.

MR. HELLMUTH: Do you know whether you ran, say, 4 per cent of your gross in 1918?

MR. KEYSER: In 1918 and 1919 we were running 7 per cent of our gross; in 1920, 5½ per cent; in 1921, 5 per cent. That was the amount set aside for this purpose.

MR. HELLMUTH: How does your percentage run so far this year?

MR. KEYSER: Slightly over 4. Since Jan. 1, 1920, we have set aside, as surplus, over \$270,000.

MR. HELLMUTH: How many million a year does your gross run?

MR. KEYSER: About \$3,500,000.

MR. HELLMUTH: It would be safe to say you ran around 6 or 7 per cent of your gross in expenditures before you started your safety competitions; now you probably won't run more than 4.

MR. KEYSER: About 4¼.

MR. HELLMUTH: That is a very good showing, isn't it?

MR. KEYSER: Yes.

CHAIRMAN HASKINS: Are there any further questions?

MR. B. V. WHY (Beaver Valley): Where do you place the banner you referred to?

MR. KEYSER: The banner is awarded the barn making the best score and is awarded every three months at a banquet given our employees. The president of a prominent club, a member of the board of directors, or other prominent citizen is invited to address the men at the banquet. The banner gives wonderful results.

MR. CHAPMAN: How do you determine the winners of the no-accident prizes?

EVERY ACCIDENT CONSIDERED AND RATED

MR. KEYSER: We have a safety committee, of which I am chairman; the other members are the general manager and the superintendent of the division. We determine, from the accident file, whether or not the man is entitled to a prize. It is a very tedious task but we have to do it in order to give our trainmen a fair show.

MR. CHAPMAN: Do you investigate every accident?

MR. KEYSER: Not every accident. We have the crew's report and that of the division superintendent. We mail out witness blanks between the time the accident happens and the time the committee meets, about two weeks. If the witnesses exonerate the crew the accident is not held against them. Sometimes we have to decide upon the crew's report alone.

MR. CHAPMAN: How can you draw a line so as to be fair to every man? We held back because some of our men had an idea that accidents would occur where the men were not to blame, but would be charged against them because of lack of proof to the contrary.

MR. KEYSER: We may have a few such cases but they are rare. If we make a mistake and give a man a prize that he is not entitled to, we take it away from him the subsequent quarter.

MR. HELLMUTH: I would like to make a motion: That we recommend to the Program Committee that the subject, "The award system as a means of reducing accidents," be assigned for a paper at our next Congress. [The motion was seconded.]

MR. VAN BRUNT: The unreported accident, the one that is hidden or covered up, is the accident that not only costs the most money, but creates the greatest amount of tears and heartaches, and I think the paper spoken of should go into that phase very seriously. It is an important question in a large company—whether it is possible to maintain compe-

tition between the carhouses or between the lines, because of the liability of having unreported accidents. We have been discussing it for some years in our organization. I would like to have the proposed paper show the effect of the plan on unreported accidents.

CHAIRMAN HASKINS: That will depend largely upon the man preparing the paper.

MR. VAN BRUNT: Not if it was mentioned very strongly.

PRIZE SYSTEM REFERRED TO PROGRAM COMMITTEE

MR. HELLMUTH: The program committee should ask the man to whom the paper is assigned to get statistics, so far as possible, from all the companies, because the paper might be of great use in overcoming prejudice against the system.

CHAIRMAN HASKINS: We will vote on the amended motion and then continue the general discussion. [The motion was put to a vote and prevailed.]

MR. W. H. SCHUMANN: Ardently as we have discussed the bonus system, we are somewhat prejudiced against it. We have always held that motormen and conductors, properly instructed through our local meetings, should be efficient enough to operate the cars carefully without a bonus. The debate has been very interesting and I shall be pleased to hear the papers at our next meeting; we are deeply interested in the reduction of accidents. Years ago it was a common thing to see cars with the vestibules knocked off and the percentage of cost of the gross receipts was about 7 per cent. I am glad to say that in the last three years it has been cut down to about 3 per cent. This is due to monthly meetings with our men and also to the campaign we have carried on in the schools at Joliet. In our monthly meetings we are very emphatic in asking our men to make suggestions as to the best ways of avoiding accidents and we have secured their co-operation.

Yesterday I heard a discussion regarding the emphasizing of the economic side of safety to the officials of the road and the human side to the employees—I believe in talking both at each meeting. We talk to our trainmen about the economic side as well as the human side—it affects their wages and they have taken a great interest in the reduction of accidents on that account; it gets us good results. We are willing to be shown on the bonus system. I hope good will come out of the papers on the subject.

CHAIRMAN HASKINS: The bonus system in various forms has been tried out for years past and the railway and light companies are pioneers of at least one feature of the bonus plan, operated under set rules. Our success has been marked and I will ask Mr. Whiteman to describe our plan and tell you something of its workings.

MR. WHITEMAN: Our plan is based on contests between picked teams of employees for cash prizes. The contests occur twice each year for a fixed amount of money, divided between the members of the winning team. Penalties are fixed for failure to report accidents; if a man fails to report one accident, he loses one-half of his possible award and his team is penalized a point in the standing of the teams on his account. If he fails to report two accidents, he loses out altogether and his team

is also penalized; so he has not only his individual record to protect, and he is sure to do so, but he has the record of his team to care for as well. Naturally the members of the teams are very strong in their pressure upon the individual to report every accident that occurs. The plan has worked out very successfully.

Mention has been made at this Congress of street railway companies whose percentage of loss on account of accidents runs from 2 per cent at the lowest to 17 per cent at the highest. I am ashamed to say that Chattanooga was in the 17-per cent class in 1917, using about 17 per cent of our gross income for claim losses. We had to take severe measures but we have reduced it to 3½ per cent. We credit our success largely to this plan of holding contests.

FOREMEN SELECT MEMBERS OF SAFETY TEAMS

MR. CHAPMAN: How do you divide the property to get the teams?

MR. WHITEMAN: Some 300 employees of all departments are thrown together for the purpose of making up these teams. Captains are either appointed or elected; we reserve the right to appoint them or have them elected by the men. Each captain, in turn, draws his men—the captains know the men and that prevents the best men all getting on one team. The contests usually run very close; out of 16 we have three or four right up at the head of the list—often the contest is decided on the last day. The power-house men, the track men, the line men and the shop men (we don't include the foremen) are all in the contest.

CHAIRMAN HASKINS: The contest runs for four months, then two months intervene, and the teams are changed; we are on our eighth contest. At the last banquet (No. 7) Mr. Whiteman asked how many had not shared in the prize money and I believe only five or six in the whole company had not, at some time or other, been on a winning team. The contest plan in our safety work has enabled us to come nearer getting 100 per cent reports of all accidents than any company in the South.

The men are all watching the other fellows. If one has an accident and does not report it someone in the competition with him hears about it and it is reported. He has a limited time within which to make his report and if it is not made in that time he is penalized.

MR. RUD (Milwaukee): I could not help wondering, while Mr. Keyser was describing his reductions, whether or not he also carried on educational work among the trainmen—he did not simply offer prizes and uniforms, and then let them work it out themselves: I assume that he carried on the work in various ways. I would like to know more about what the work was and whether or not it was the cause for a large reduction of accidents. In any large company it seems to be increasingly difficult to judge, with equity, as to the responsibility of trainmen for accidents. Our experience is that about 90 per cent of accidents are not due to the fault of the trainmen, and that the biggest chance for improvement is through giving particular attention to the public. We feel that trainmen have been well educated and that they go more than their share of the way towards avoiding accidents, but that the public must be educated in order to make the campaign fully effective.

MR. HELLMUTH: You may have a lot of accidents for which your trainmen are not primarily responsible—where an automobile driver is responsible—but you can get the trainman to guard the driver against his own carelessness, and that is what he must do if he is out for the prize; he watches the motorists at street crossings.

“YOU JUST ABOUT GET OUT WHAT YOU PUT IN”

CHAIRMAN HASKINS: Mr. Keyser's plan, as I understand it, is this: If the man is not responsible for an accident they do not charge him for the accident. Our plan is different and I get away from acting as a judge on any question—I do that to keep from getting into the situation of having some men think that I have not been fair in my decision. If a man runs into the side of a moving car the motorman on that car is charged with an accident under our safety-contest rules. We don't undertake to pass on the question of whether it was the man's fault or not; perhaps he just played in hard luck.

You can go a long way toward protecting the public in safety work. Permit me to use a poker expression: In safety work you just about get out of it what you put in. If you make a hard fight you do a lot of good; if you make a half-hearted fight, you don't do much good. The idea of a bonus system is to get the employees interested—you have got to interest them before you can do any good. If you get them interested in accident prevention, no matter how you do it, that is the thing; but the bonus plan seems the most feasible. If your men are interested in accident prevention you have gone a long way toward preventing accidents.

MR. KEYSER: Answering the gentleman from Milwaukee: Before we launched our safety contest we went into the matter very thoroughly, and at the same time conceived the idea of a tremendous educational campaign among the trainmen, preparatory to putting the plan into execution. In every car barn and on every job we posted the bulletins offered by the National Safety Council—that was the first thing we did; we took advantage of the tremendous service they furnished. We talked at each of the carbarns; we demonstrated certain accidents by use of moving pictures; we had meetings two or three times a week until we got things started. We still have meetings, but not so frequently.

We undertake to pass on every accident, saying whether or not it is chargeable to the man; not necessarily from a legal standpoint, but from the standpoint of accident prevention; whether there was anything the conductor or the motorman could have done to prevent that accident; if so, he is eliminated from that prize. We passed on about 3,500 claims and objections to the committee's decisions have been one-half of 1 per cent. The men are entitled to come in at any time within thirty days and present any reason they desire why the committee's decision should be changed.

MR. HELLMUTH: Who composes the committee?

MR. KEYSER: The attorney of the company, the general manager and the superintendent of the division. The trainmen are not represented.

CHAIRMAN HASKINS: The discussion is very interesting but we must proceed with our program. I will ask Mr. Scott to address the Section.

THE MOST EFFICIENT MANNER OF CONDUCTING SAFETY WORK

CHARLES B. SCOTT, GENERAL MANAGER, BUREAU OF SAFETY, CHICAGO

I have a friend in Chicago who is a member of one of the largest firms of architects in that city. Recently he toured Europe for the purpose of studying the architecture of the principal buildings and among others visited those old cathedrals of which the European countries are so justly proud. While inspecting St. Marks, one of the greatest and most ancient of the cathedrals, his guide remarked: "America has nothing that can compare with this."

"That may be true," replied my friend, "and here is the reason. Europe is content to spend centuries in the building of a cathedral, such as this. We have, in America, architects competent to design such an edifice and we have engineers and builders capable of constructing it, but if plans were prepared and submitted, those in authority would no doubt write across the specifications: 'Must be completed in eighteen months.'"

This impatience for immediate results, which is characteristic of the American people, is one of the factors which sometimes interferes with the success of our accident-prevention plans and takes from the efficiency of our safety organizations. I have seen companies inaugurate, for the first time, a plan of accident prevention, and after a trial of six months, show keen disappointment that their accident record did not show a reduction of 50 per cent.

INVENTORY OF SAFETY ORGANIZATIONS

I find a certain enjoyment in analyzing safety organizations and in taking an inventory of their characteristics. In some respects they resemble each other greatly and then, again, there is in each (just as in each individual there is a personality like unto itself alone) a distinct personality on which often depends its success or failure. During my study of organizations and accident-prevention methods, I have always had one thought uppermost in my mind and I know it will amuse you when I tell you what that thought has been. It was to find "the most efficient manner of conducting safety work," the very subject upon which I am to speak this morning.

It is with a feeling of responsibility that I approach a subject of this character, for I fully realize that in reality this is the keynote of the entire Congress, and that the one main purpose of each delegate attending this convention is to learn, by exchange of ideas and experiences, the most efficient manner of conducting safety work. I am willing to admit that when this subject was first assigned to me, my impulse was to refuse, for the reason that it took in too much territory and that I would necessarily have to choose between monopolizing at least two sessions of a half-day each or else skim over the ground so lightly that my remarks would amount to nothing more than an incoherent collection of subjects, any one of which would be worthy of serving as a subject for a safety paper. Responsibility, however, is one of the most important words in the dic-

tionary of a safety engineer and the appreciation of responsibility is the primary lesson in accident prevention.

EMPHASIZING THE IMPORTANT FACTOR

One thing I have noticed as I have listened to the various talks at this convention, is that each speaker has one main point in mind which it is his purpose to put across and that 75 per cent of his talk is devoted to illustrating and proving—by examples, statistics and other means—the truth and importance of his main point. This is as it should be for one good point impressed on the minds of an audience is worth a dozen points of questionable value which are forgotten as soon as heard.

I have noticed one thing further: After each annual Congress of the National Safety Council, when the talks are combined into the complete proceedings of the convention, there stands out, over and above everything that has been said, one main and important factor in accident prevention which holds its exalted position until the next Congress, when it is replaced by another discovery, which for the next year holds the limelight of the safety world and which acts as a program for the accident-prevention activities of the individual member companies.

I remember back in the early days of the National Safety Council, the few Sections which existed at that time would devote their sessions to discussions of safeguards, illumination and sanitation. A few years later saw the pendulum swing to the other extreme and 75 to 95 per cent of all industrial accidents were charged to the indifferent, careless or thoughtless workman. Another year saw the convention lifting a part of this responsibility from the shoulders of the workmen and placing it on the foremen. The executives were next called in on the green carpet and told that safety must begin at the top and without their support all efforts were useless. Each of the convention headliners, as they may be called, had their merits at the time and were we to live over this period we would in all probability follow the same cycle. The time has come, however, when these factors can be tempered by years of experience and by mixing in proper proportions and administering in reasonable doses, the results will be of benefit to any organization in need of an operating or financial remedy.

HANDLING RAW MATERIAL—MEN

I sometimes find myself looking with something akin to envy at the man engaged in production work. He buys raw material and transports it to his factory. Within a given time he knows that, by a certain process, this raw material will be transformed into a product that can be disposed of through his sales force for a certain definite price. His costs, his materials, his time and his distribution are all concrete, tangible factors entering into his business and barring emergencies he can figure his profits and nothing is left to the imagination. There seems to be no uncertainty.

Then again, I wonder if I would be content in a position of that character. My job is also handling raw material and finished products, both of which are men. However, just as the highly finished Victrola is of the same material as the log floating down stream, so is the finished

product "man" of the same stuff as the raw material "man," although transformed and therefore more valuable. In these times we have learned to respect things according to their value and I often wonder if the raw material with which we deal (and remember I am still dealing with the subject of men) receives the respect and attention which it deserves.

What are the qualities most desired in men engaged in safety work?

If it were possible for me to drive home just one point in my remarks today, or if there could be but one big result of this Congress, I would want it to be confined to just two words, "originality" and "initiative." There is a tendency on the part of those engaged in accident prevention to accept as law the words of the leaders in the safety movement and to follow in their footsteps. Some of the best suggestions for handling safety work which I have received, have come, not from Will Cameron or Ralph Richards or Arthur Young or any of the other men whose names are known to every man attending this Congress, but have come from men interested in the safety of those employed in their own company and whose names would not be recognized by more than twenty or twenty-five members of the National Safety Council.

ORIGINALITY AND INITIATIVE

Originality is a quality which is vitally necessary in the efficient conduct of any safety plans. Without this quality the safety work of today would differ very little, if any, from that carried on fifteen years ago. Neither will the plans of fifteen years hence show any improvement over our present plans, except through the influence of practical, workable ideas which must be originated and developed by those engaged in this business.

Initiative is the quality most eagerly sought for in a man to be placed in charge of safety work. It, like originality, is vital to the success of the work. I sometimes wonder at the results of a company's safety activities when I see the timid manner in which its safety representative approaches its executives to explain a plan or change in organization or schedule or to offer a suggestion regarding improvements in construction or operation methods which should be presented with enthusiasm on account of its real value and worth, and my wonder is that the company has any success whatever for often the plan of unquestionable value is so poorly presented that an executive misses the point altogether and the result is the rejection of the recommendation to the loss of the company and the discouragement of the originator.

So far what I have said has been general in character and applies equally well to one industry as to another. This I have done intentionally for, after all, the foundation and structure of safety work is the same in all Sections of this Congress and it is only in the details that it differs. For the benefit of those who may be disappointed at not receiving two or three specific points which they may jot down and take home with them for experimental purposes or for the purpose of adopting as part of their present methods, I am going to enumerate a few ideas which I am sure will be of benefit to you as they have been to me.

EFFECTIVE PLAN FOR SMALL COMPANY

In doing this I am going to forget for a moment the large public utility and electric railway companies employing upward of a thousand men, for I take for granted that they have their safety engineers, their safety bureaus and their safety organizations and that they do not need the help or advice as much as do the smaller properties who do not enjoy such benefits and advantages. I want to say to these smaller properties that in my opinion a safety engineer, or one who devotes his entire time to accident prevention work, is not a necessity and that because a property has no such position on its payroll is no reason why it cannot make a good showing as to safe operation, provided that the executives in charge of such small properties take the proper attitude and the proper action with reference to its safety program.

On a property such as I have described there should be a committee of executives, including the general manager and the heads of departments, and it should be the duty of this committee to plan and carry out the accident-prevention work of the company. As to what these plans should be, of course, depends upon the size and geographical location of the properties, but in one respect they should all be similar, and that is they should be formed with an idea of continuous and systematic operation. I firmly believe that a company which has a systematic plan of accident prevention woven into its daily operation, and which is considered part of its operation, has far greater chances of success than a large company with half-a-dozen safety engineers who carry on a program of intensive training one month and do nothing the next. The point is to develop a continuous plan which is made part of the company's operation and to keep this plan constantly before the employees.

In a small company, whose safety work is directed by an executive committee, one person should be appointed to see that plans and recommendations are properly carried out. These duties need not require much of his time, but should be thoroughly done and reported. The experiences and results of other companies are always available and are of value to a small company in carrying on its own organizational plans.

ADOPTION OF DEFINITE PROGRAM

Now I am going to deal specifically with electric railway safety, particularly with reference to its definite problems, and to those of you who are making notes for future reference I would suggest that you jot down what I am about to say, for in brief outline I am going to cover the entire safety field of traction properties. Each item which follows is of vital importance and my reason for not emphasizing each one and enlarging on each is not because of a lack of appreciation of their importance but rather on account of lack of time.

1. To begin with there are just three main divisions of electric railway accidents:
 1. Accidents occurring to employees.
 2. Accidents occurring to passengers.
 3. Accidents occurring to pedestrians or drivers using the streets or crossing the right-of-way.

2. Just as there are three main divisions of electric railway accidents, so are there three chief causes from which result practically all accidents on electric railways:
 1. Improper operation of cars by employees.
 2. Rundown condition of equipment, track, etc.
 3. Carelessness on the part of the injured party.
3. As every cause has a remedy it naturally follows that there should be three main prevention measures designed to combat accidents occurring as a result of the three main causes:
 1. Careful selection of employees and specific instructions and rules for their guidance.
 2. Proper inspection and maintenance of property and equipment.
 3. Education and publicity regarding electric railway hazards for the benefit of the public.
4. There are three main classes or groups which must be enlisted in safety work in order to insure its success.
 1. The executives of the company.
 2. The employees including foremen and others in supervisory positions.
 3. The public including passengers.
5. The three chief reasons for failing to produce proper results in reducing accidents are equally divided between the groups just mentioned as well as between the causes of accidents. They are:
 1. Lack of support—executives.
 2. Lack of supervision—foremen, superintendents, etc.
 3. Disobedience to rules—employees.

KEY NOTE OF SAFETY PROGRAM

In presenting the outline thus far I have been purposely very brief but any one of the subjects could very advantageously be enlarged upon. For example, the subject of "Improper operation of cars by employees" was merely mentioned, but what do we find upon further study of it? Improper operation often leads to collisions, derailments and premature starting with consequent injuries to passengers in the cars or while boarding or alighting; collisions with other vehicles at street intersections; the striking of passengers who have alighted from cars going in the opposite direction, etc. The subjects in the other groups could likewise be subdivided, but time will not permit further detail.

6. We now come to the last group which, though last in the outline, is probably first in importance. It is the group which is of most interest to us this morning. The three means by which the most efficient methods of conducting safety work may be selected:
 1. By adopting those methods which have proven successful in other organizations.
 2. By originating plans to meet your particular requirements.
 3. By studying those methods which have failed, thus learning wherein they have failed.

The first of these, that is, the adopting of methods which have proven successful, is no doubt the most common means of selecting methods for conducting safety work. This convention is largely devoted to the reciting of these successful methods for the assistance and benefit of those desiring to adopt safety plans. The National Safety Council is based on this idea and the chief benefit which its members derive is through this exchange of successful ideas, plans and methods.

The second item which deals with originating plans to meet specific requirements, is one which cannot be overemphasized and it was with this

thought in mind that I spoke a moment ago of originality and initiative. Even though successful plans of others are adopted it is usually necessary to alter them to the extent of conforming with local conditions and in this process of alteration the man with originality and initiative is most valuable.

INTER-COMPANY SAFETY CONFERENCE

The third item, therefore, is the only one I need touch on and that has to do with the studying of those methods which have failed, thus learning wherein they have failed. The entire operation of an electric railway safety organization is to a certain extent dependent upon details of plans, schedules, inspections, education and literature so that to avoid going into these details is difficult. I have attempted to avoid this temptation and something equally tempting, and that was to relate my own personal experiences and practices. In closing I am going to yield to the point of describing one plan which has been carried on in my office with success and which could very well be made use of by any group of companies to their mutual advantage:

We have in Chicago an organization known as the inter-company safety conference. This conference is composed of representatives of the public utility and electric railway companies in Chicago with which the Bureau of Safety is connected and represents approximately 25,000 employees. Meetings are held every three months for the purpose of exchanging ideas and presenting problems which confront the companies in their safety work. Having in mind the studying of methods which had failed in various companies, our April inter-company safety conference was called and a discussion of this subject was conducted: "The Weakest Point in our Practiced Plans of Accident Prevention and How to Overcome It." Each member present was called upon for a frank, personal opinion regarding this subject.

ANALYSIS OF WEAK POINTS IN SAFETY ORGANIZATIONS

I wish time would permit me to call on about half a dozen at this time so that I might ask each one what his one greatest weakness is in carrying on his accident prevention work. I would be interested in comparing such answers as I might receive today with those I received in Chicago on the day of that conference last April. I am going to tell you what a few of those answers were and I want you to notice one thing about them. In no instance was there any complaint of the employees, or of another department, or of the executives, nor of any one else. Each man present appreciated his own responsibility and was man enough to acknowledge that any failures he may have experienced were due not to another person, but to his own lack of effort, lack of foresight or failure to secure departmental co-operation. Some of the answers, as I read them, may give the impression of a complaint, but this is due to the fact that I have summarized them to the limit and if I were able to review the discussion of each subject which its originator presented, it would clear up any doubt as to the nature of the answer for in each case the primary cause was traced back to the safety department. Here are a few of the answers:

1. "Laxness on the part of department heads in carrying out or complying with recommendations which have been acted upon and approved by the central safety committee." This subject emphasizes the necessity of an efficient follow-up system.
2. "The need for a closer co-operation between the safety department and the employment department." The subject I referred to a moment ago in connection with the improper operation of cars by employees.
3. "The need for a closer co-operation between the safety and engineering departments." Such co-operation minimizes construction changes often necessary to avoid hazardous conditions and further is an advantage in the reduction of insurance rates.
4. "The safety department often assumes too much responsibility for the holding of employee safety meetings." In this connection it was pointed out that by placing this responsibility on the respective employee groups they were made more independent and better results could be secured.
5. "Failure to specialize on those causes which are responsible for the most serious accidents in a department or division."
6. "A need for more thorough and specific instructions to new employees."
7. "The need for concentrating our efforts on one problem at a time."

EFFICIENT WORK WILL BEAR CRITICISM

As I stated, this meeting of which I have just been speaking was called for the purpose of finding the most efficient methods of carrying on safety work by revealing the methods which needed improvement. If there is to be a discussion of this paper I know of no portion of it which could be discussed to greater advantage than this which deals with failures as a guide to success.

Thomas Edison once said: "There is no truer test of a man's qualities for permanent success than the way he takes criticism. The little-minded can't stand it. It pricks his egotism. He 'crawfishes.' He makes excuses. Then, when he finds that excuses won't take the place of results, he sulks and pouts. It never occurs to him that he might profit from the incident."

DISCUSSION

CHAIRMAN HASKINS: I remember my first attendance at the Annual Safety Congresses and how I wished someone would make just such a talk as Mr. Scott has given us. Those are the things a new man wants to hear—the new man who is anxious to get started right.

I wish Mr. Scott had gone a little further and told us how to conduct the work after we get it started. As he did not do so I will ask you to pardon me if I dwell on how we carry on the work in my company. I will try to interest the new man.

We have what is known as a safety committee, composed of motormen, conductors, shopmen, linemen, trackmen and power sub-station men; the heads of all departments are ex-officio members of the committee. The committee also includes a member (usually a young lady) from the accounting department. Meetings are held twice a month, with a regular order of business. A stenographer keeps the record and the minutes are printed and distributed to every member of the committee. After the roll is called we take up "unfinished business"; suggestions that have been made and referred for a report. Each suggestion is numbered and

carries the name of the person making it. The suggestion is read and the party it was referred to is called upon for a report as to what has been done with the suggestion. The answer is recorded. Then we come to new suggestions. When we first started we undertook to call indiscriminately for suggestions, but we found that some who had good ideas and suggestions were backward, so we changed to the present method and got fine results.

NINETY PER CENT ATTENDANCE AT MEETINGS

Each member serves six months and one-half of them are changed every three months. In that way we rotate, and, in time, all our employees serve on the committee. In addition to our safety committee meetings we have a monthly meeting for the platform men—we have two meetings on one day and we average about 90 per cent of our platform men at one or the other. The meetings are planned to continue for one hour.

At the general meetings we discuss with the men the things that pertain to their reports and we listen to any suggestions that they have to make—really it is one big committee meeting. We have meetings of the different departments along the same line. That is the way we carry on our safety work.

MR. CHAPMAN: Have you had complaints of too much warning given by foot bells or whistles by the citizens of the communities through which you go?

A VOICE: I think all of us have had that.

MR. CHAPMAN: We started our safety work seven months ago and I think we are getting along pretty well. We had not gone more than a month before we had lawyer after lawyer, representing some of the citizens, call upon us and try to prevent the annoyance of the very thing we were trying to get them to do. You all know that when a man comes into court on a question of lack of warning, you all know what they try to do to you!

CHAIRMAN HASKINS: We have not had any trouble on that score. One of the things we preach to our platform men is to sound the bell. We are now installing, instead of the pin gong, a ratchet gong on some of our cars.

MR. CHAPMAN: We have them on nearly all our cars.

CHAIRMAN HASKINS: We have had no complaint on that score, but we have had some considerable criticism on how it makes them sit up and take notice when they are on the track ahead of you.

We will now have a paper by Mr. Coates.

SAFETY AS AN OPERATING FACTOR

F. R. COATES, PRESIDENT, COMMUNITY TRACTION COMPANY, TOLEDO, OHIO

It is recognized beyond the peradventure of a doubt that safety is an operating factor and must be so treated by every wide-awake operator and I do not need to tell you the development of accident prevention in the industrial movement. It began several years ago and the result was a marked decline in the number of industrial accidents; at the

same time, with the growing complexity of life and conditions generally, there was a marked increase in the number of public accidents. While efforts at education and the introduction of safety devices were constantly decreasing the number of accidents in industry, the number of utility accidents, due to public conditions, street and home, was increasing alarmingly. It was such a condition as may best be described by the story told by Governor Oglesby in telling of an incident which occurred when he was chief executive of Illinois:

It appears they had a strike down state and it was not certain whether he would have to send troops to quell the disturbance or not. A few days later he received a telegram from the sheriff of the county saying, "Everything is in statu quo." Not being up on Latin to a great extent he called in his secretary to explain, but it appears the secretary was somewhat short on Latin also, and as he studied the telegram he said: "Governor, I don't know exactly what those words mean but I think the sheriff is in a ——— of a fix." The condition of public accidents has gotten pretty much in "statu quo."

The reduction of accidents in any community, in my opinion, is purely a matter of education. People will cross street car tracks, women will get off cars backward, children will play in the streets and last, but not least, they still permit irresponsible persons the license to operate automobiles. Barnum was right; there is one born every minute, only he referred to suckers, while I refer to fool auto drivers, and of all the hazards public utility railway men have to contend with, this constitutes the greatest.

ADVENT OF THE FIRST AUTOMOBILE

Twenty-eight years ago Elwood Haynes took the first "horseless carriage" out upon an Indiana road, defying human skepticism, the perversity of inanimate objects and the anger of farmers, who were bound to tell him they'd "have the law" on him, and returned home triumphantly under his own power. Probably Elwood Haynes let his imagination soar very freely on the evening of that great day but he, with the widest scope given to his imagination, could never foresee the terrible toll in human life and limb exacted by the creature of his inventive brain; for instance, child victims in New York alone were 375 in 1920 and 402 in 1921. More than 500 are predicted for 1922.

The auto deaths in ten American cities, picked at random, show increases in five and decreases only in cities where safety campaigns have been in progress during the past two years:

	1920	1921		1920	1921
New York	756	865	Milwaukee	72	67
Chicago	542	668	Rochester	37	38
Philadelphia	232	191	Flint, Mich.	52	25
Detroit	240	134	Louisville	18	20
St. Louis	102	97	Grand Rapids.....	16	17

In 1896 there were only four auto obiles in the United States. In 1900 the first four-cylinder car was brought out and exhibited at the first New York auto show. Today the yearly production exceeds 2,000,000 cars. Eighty-three per cent of the 12,588,949 motor vehicles in use in the world, that is, 10,505,666, are to be found in the United States. Three

times as many persons meet death by automobile accidents as are killed in all the factories, mines, railroads and other industries—that means 500,000 automobile accidents a year. Every thirty-five minutes that your watch ticks off, records the death of another person due to an auto accident.

CAN A CURE FOR AUTOMOBILE ACCIDENTS BE FOUND

This is but one phase of the operating official's troubles as far as accidents are concerned, but it is the most important one and is bothering every such official in the country. The best of our safety engineers are at their wits' end to discover some method to get to the automotive public at large the proper message. No one can hope to measure the result of safety work accurately. It would be a stupendous job to obtain from industry all over the country, either publicly or privately, the statistics necessary to make fairly accurate computations on the saving in human life and limb, to say nothing of the saving in dollars and cents, before the advent of safety propaganda, as compared to the methods now used.

Safety as an operating factor must be reckoned with. A few short years ago operating heads gave scant heed to it, until it had been demonstrated most forcibly to them that it was the one thing most needed if accident costs were to be reduced. Results which have to do with intangibles cannot be expressed in dollars and cents. There is no way of telling how many accidents would have occurred throughout the country had certain things not been done, but we do know that where they can be applied accident-saving results point clearly to the efficiency of the company's efforts. On the railroads of the country and in a number of large industrial plants, records have been developed showing a rapid drop in the number and severity of accidents where safety efforts have been sincerely, actually and consistently carried on.

SPLENDID RECORD MADE IN TOLEDO

We find in the operation of our property in Toledo that well-organized safety work pays and, largely through this channel, we are able to make some interesting comparisons. On the basis of the last eight years we find the following: From a total of 3,908 accidents to the public for the year 1914, and ending on the last day of the year 1921, we find this class of accidents reduced to 2,296 for 1921. For the same period we reduced employee accidents from 306 in 1914 to 152 for 1921. During the same period we reduced our cost for total accidents for public and employees from a total expenditure, inclusive of office expense, etc., of \$149,225.19 spent in 1914 to \$69,729.74, and our litigated cases from 91 at the beginning of 1914 to 22 when the Community Traction Company started business in February, 1920. At the same time we reduced our per cent of gross revenue from 7.813 in 1914 to 2.35 in 1921. Of this record we are justly proud, but realize that it could not have been accomplished without our enjoying the hearty co-operation of our employees, due almost entirely to our safety talks to them, plus the work done with the public.

The attitude of employers today is greatly different from that of ten or fifteen years ago. There are many today who are willing to consider the question largely on its humanitarian standpoint alone; it is an advantage to them that there is an economic question coupled with their humanitarian outlook. The number of these men is increasing daily, but there still remains a large aggregate of employers who must be approached through their pockets rather than through their hearts.

Very recently there appeared in a safety magazine the announcement that Joseph S. Goodwin, general manager of the new municipal street railway system in the city of Detroit, at a recent meeting of the Safety First and traffic committees in that city—a representative group of men from the police department, board of education, auto club, Safety Council and manufacturing concerns—made the following interesting remarks regarding the safety features of the cars now in operation and the type on order: "It is impossible to start the cars while the doors are open as the power is shut off until they are closed. There is an automatic control that throws in the emergency brakes, sands the rails, etc., when the motorman lets go of the hand controls or foot lever. Rails are sanded by air pressure and the motorman can accomplish this by pressing downward on the airbrake lever. The Linten system of rear lights warns following traffic by indicating whether the car has full power on, part power on, or power off. Stopping at intersecting streets is done only for passengers, but the men are instructed to shut off power when approaching crossings, to have cars under control for a quick stop in case of emergency. Men in automobiles check up the car crews to see whether they are obeying instructions as to safety precautions. In addition to the saving of life and limb, the installation of safety equipment and the use of safety methods is an economic proposition."

"DON'T GET HURT"

In New York we note, as recently as the latter part of July, that the Safety Institute of America, in an auto-accident campaign underway throughout the United States, used the simple slogan: "Don't Get Hurt" and that Lawrence Vail Coleman, the director of the institute, is quoted at length on the proposition that it is through the children, by continuous educational campaigns in the schools, that we must hope to cut down the national bill paid each year for carelessness. Elbert H. Gary, chairman of the United States Steel Corporation, a vice-president of the institute and a prime mover in industrial safety, will head the committee that will put on a "No Accident Week" in New York next fall.

The above is a concrete example that we must recognize safety as an operating factor. Both capital and labor know that safety pays them well. They will never want to see it discontinued. The worker has generally learned that safety methods of production pay. Security of income, due to unimpaired earning capacity, is his financial return for the lesson learned. The operator and the manufacturer has also learned the lesson that safety methods pay: *first*, because they are the means of saving life and limb, not only to his employees but to the public as well, and *second*, because the saving of dollars and cents as a result of the efforts expended return two-fold.

DISCUSSION

CHAIRMAN HASKINS: We have come a long way and our companies have gone to quite an expense to send us here. Let us continue the discussion.

MR. C. J. CRAMPTON (Dallas, Texas): I would like to ask a question based on the description of your plan. We have carried on our safety work entirely without committees. Of course, we have meetings of the employees of our various departments, ranging from weekly to once a month for the transportation men, but we really have no personnel in our safety department other than the safety engineer and an assistant; we consider all the inspectors and supervisors and foremen and division superintendents as working under him. I would like to have your reaction on that plan of safety organization. What I am particularly interested in is the value of the committee plan of organization such as you have outlined.

MR. MACLACHLAN: In answer to the question about the value of committee meetings in carrying out accident prevention work: In two utilities that I happen to be connected with, one has carried on their work through committees, but the other had to change from the committee form to another plan of organization. The one that started with the committee form and carried it through was a utility in a city of about 600,000—it was quite feasible. You could get your men to committee meetings without undue expenditures for traveling expenses. The committees were first started with the foremen, then with the rank and file of the employees; care was taken not to mix the foremen and their subordinates on the same committee, because in other plants where I have used that form there has been the trouble that the rank-and-file men will not talk freely with the foremen present.

TAKING THE WORK TO THE MEN ON THE JOB

The other plant was a utility covering the province of Ontario. It spread over some six or seven hundred miles, at places, and the bringing of the committees to a central point caused a lot of disorganization. For that reason, accident-prevention men go to the localities, and then, practically speaking, everybody in the power house, sub-station, or what-not, is on the committee at some stage. Both plans are working very effectively. In the first instance, we cut down the lost time per hundred employees inside of two years. The general manager told me that was just chance. "All right," I said, "let us cut out the committees for a year." Up went the lost time. We started again and down went the lost time.

If you can work with committees, it is very effective—more effective than talking to large bodies of men. But if your groups are small, and your distances great, your expenses of bringing the men together and the disruption of your operating scheme is going to cause friction; the operating superintendent or operating engineer will not like it.

CHAIRMAN HASKINS: I would warn you against making the committees too heavy or too large.

MR. CRAMPTON: I am interested in the large committee, representing all types of work. The lady from the accounting department, the motorman, the conductors and the men from the sub-stations, how do they work together?

CHAIRMAN HASKINS: One of the benefits of safety committee work is friendly criticism, and it is usually the outsider that finds the criticism. I see no objection to a person in one department calling attention to some unsafe practice or some unsafe condition in another department—we frequently do that in our meetings. Sometimes we get a good suggestion from this source.

MR. CRAMPTON: That is, you get from the non-department members something like a public reaction?

CHAIRMAN HASKINS: Yes.

CHAIRMAN HASKINS: Mr. Reid, will you favor us with a few remarks?

NO HARD AND FAST RULES POSSIBLE

MR. REID: I have long been convinced that you cannot determine hard and fast method for carrying on safety work; it is like everything else, you have got to be governed largely by conditions and circumstances. I know places where the work is carried on exclusively through committees and the rank and file of the employees have little or no part in it.

With reference to the plan in effect at Dallas, Texas, of having the work carried on through safety meetings of employees, we tried that a number of years ago. We had a feeling that accidents were caused by employees not being interested, or because they were careless or indifferent, or because they had not always been instructed in the proper method of doing the work, and we felt that where the accidents were happening, that was the place to make the appeal. That seemed logical, but after a few years' experience we found we were only half doing the work; in other words, we had only gone half way. We secured some results from the average employee—the motorman or conductor or a man in some other department—but we found there was more to accident prevention work than that. So we built up an organization through the establishing of committees. That was some eight or nine years ago. We find now that probably the best method is to have well-organized small committees. In some places committees must consist exclusively of heads of departments, those in supervisory capacity; there are other places where it seems advisable to bring in men not engaged in a supervisory capacity. I know of some central safety committees on which motormen and conductors have a permanent place. Superintendents and others acting in supervisory capacities are always given permanent places, while trainmen are made members of the committee for a limited time, possibly six months or a year.

As to the question of having men from different departments on the same committee: Where we have tried that plan we have found it to be an excellent idea. We see no objection to a man from a sub-station, or from the mechanical department, or from some other department, all being on the same committee. A good point was brought out when it was said that it was well to have these different interests represented, because

of the fact that sometimes an outsider sees things that the other fellow does not.

Another value of that plan is that it makes for harmony and co-operation; that is one of the things we are working for. I know of organizations where the different departments were frequently at loggerheads, in some instances amounting almost to a feud. After these members were brought together in a committee meeting, and got their feet under the same table, they saw various problems from the viewpoint of the other fellow, and it almost entirely eliminated that source of trouble.

Pretty nearly every fellow has to work out his problems to suit himself. The first thing to get into the minds of the sub-station operator, the master mechanic, the superintendent of transportation, and the heads of the other departments, is that no traction company can make a success of its operations without the co-operation of all its departments. That is just as true in safety work. If you are to make a success of safety work, you must have the co-operation of all the departments, and the closer you get them the better they co-operate and the more success you will have.

SAFETY WORK NOT A SIDE ISSUE

One of the greatest mistakes that has been made in safety work is to regard it as a sort of side issue. The companies that have made a success of accident prevention—and this applies to traction companies as well as any other industry—the companies that have made it a part of the operation of the company, a part of the business, not simply a department trying to carry on something entirely separate and distinct from the business that the company is engaged in, but made it a part of the business just as much as the line department, the mechanical department, or any other department that is necessary to carry on the business of transporting passengers and freight, those are the companies that have succeeded in this work.

Every fellow must start out on the theory that there is a definite time, a definite place and a definite organization or piece of machinery with which to carry on safety work. Call it a central committee, executive committee, or anything you want to, the name does not matter. The important thing is to have some method and some person or persons designated to look after this work and see that it is conducted in the same businesslike fashion that everything else is. All the departments are to put together—the superintendent, the inspectors and those under him—and they consider only the best plan for carrying on the work.

The heads of departments are interested in the financial success of the property and no company would think of carrying on a business without frequent conferences and proper machinery for solving the various problems as they come up. The same thing is true of safety work. You must have some department where the work can be carried on in an efficient manner. Some company may be fortunate in having a man at the head of the safety work who knows all about it, and who is able to carry it on without the advice or assistance from any definitely organized staff of men, but most of us are not able to do it that way. We find it

necessary to have someone able to give us advice on various questions that come up in order to get the best results.

COMMITTEES WITH OVERLAPPING JURISDICTION

MR. CRAMPTON: Let me say a word on what I mean by absence of committees: Mine is an overlapping department, it goes into all others in a supervisory way. When our inspectors meet once a week, safety work is on their program. We don't stress the safety feature, but every department head has for his purpose the emphasis of safety work. In that way we make safety a part of our operations instead of carrying it on as a separate and somewhat independent type of work.

MR. PARSONS (General Manager, East St. Louis & Suburban Railway): We have carried on safety work in East St. Louis for a great many years; in fact, it was carried on before I went there with Mr. William Sawyer, our president. We have gone into the work, and we have set our house in order; in other words we have not anything on our property that is unsafe. If anyone shows that we have anything unsafe, we correct it. If anyone in the community desires to promote safety features they come to us first. We are proud to have our house in order. If you have open-platform cars, you had better get rid of them because people will hop on and off while they are in motion. If you are going into safety work with a view to doing good in the community, you must start at home.

CHAIRMAN HASKINS: If your company is not willing to spend money to correct evils and dangerous situations, there is no use trying to put safety over; you cannot do it. It may be expensive to do the things that are necessary to put your house in order, but after you have done so, you will never regret it.

EVERY SUGGESTION ACKNOWLEDGED AND CONSIDERED

SECRETARY BRIDGES: We tried the safety suggestion plan. We furnished forms in the shape of postal cards for the men to make their suggestions on and in two years we received 2,600 suggestions. Out of that number between 68 and 69 per cent were approved and the work carried out. We have three kinds of employees' committees and fourteen committees are covering 5,500 employees, 197 miles of road, and 1,700 cars.

We have four distinct car repair and machine shops; in fact, we operate four distinct systems. The suggestion cards go first to the employees' committee of the department which the recommendation will hit. If it is a suggestion regarding tracks, it goes to the road department; if it is regarding train operation, it goes to the transportation department committee. The committees meet twice a month and those suggestions are handled by the employees first; then our division committees, composed of superintendents and heads of departments on that road.

The latter committees meet the day following the employees' committee and the suggestion goes from the division committee to the safety engineer's office—he immediately sends an acknowledgment to the man who sent in the suggestion to show that the recommendation has gone through the committee and reached the safety engineer's office. The last line of the receipt, as we sometimes call it, reads: "This suggestion is

under consideration. You will be notified as to whatever action is taken." We try to give these suggestions the quickest action we possibly can.

INVITING THE REACTION OF MEN ON THE JOB

If a suggestion is disapproved we write back and tell the man exactly why and give him just as many reasons for the disapproval as we can—from his angle and the other fellow's angle. A suggestion that is good for a switchman may not be worth anything for a motorman. That is the way it works out; it may do away with a hazard for a switchman, but it may create another hazard for the motorman or trainman passing through that yard.

We invite the men to come back at us, because they may have a point of view that we have not hit upon—we find that to be true every once in a while; they may have an angle that we did not catch, even if a dozen of us went after it. I have had suggestions come back to me, which have been adopted, after having been disapproved all the way to the central committee.

If a suggestion is approved and means a large amount of work, we write to the man that his suggestion is approved, the material is on order, and it will be so long before we start work. We keep after that material until they get it on the ground; when that material arrives, we write that the material is on hand, and that we expect to start work on the 15th or the 30th and when we expect it will be completed. When the job is complete we write and tell him that it is complete. Those letters go out over my personal signature.

You will find, especially in the transportation department, the men realize that things cannot be done overnight and they use common sense. What we have to do in the matter of suggestions is to satisfy the man that made the recommendation. Just as sure as you live, if the man never hears from his suggestion after he sends it, you will never get another from him.

Some fellows have an odd idea of what safety means when they send in their suggestions, but by paying attention to all of them, we have received some excellent service as well as safety suggestions. Suggestion after suggestion on improvements to the service have come in which have been approved; they represent the ideas of the man on the job.

The whole thing in safety work is to educate the man on the job, and you have to keep after him all the time. Just as sure as you let down, he lets down; just as sure as he sees the boss is going to lay off of it, he lays off of it. The work starts with the head of the firm and goes all the way down. We like the suggestion plan; it has worked very well with us and the men take a great deal of interest in it.

CHAIRMAN HASKINS: Answering your question directly, the situation would be no different, legally, if the suggestion was made reporting a defective condition and the defective condition was there; it would make no difference, because the company is charged with the duty of knowing it.

The Section then adjourned.

Employees' Benefit Associations

WEDNESDAY AFTERNOON SESSION

August 30, 1922

F. F. CHAPMAN, Chairman,
International Harvester Company, Chicago

CHAIRMAN CHAPMAN: The National Safety Council at its last Congress decided to set aside one afternoon for a discussion of matters relating to benefit associations. I am sure our program will be very interesting. Our first paper will be given by Dr. Quinby:

REDUCTION IN CLAIM COSTS THROUGH HEALTH SUPERVISION

DR. ROBERT S. QUINBY, SERVICE MANAGER, HOOD RUBBER COMPANY,
WATERTOWN, MASS.

This paper presumes to deal with the methods of creation and maintenance of industrial medical service, the reduction of sickness and accident disability, and with the economic justification through savings in settlement of accident, sickness or death claims. The greatest single appeal for health supervision is through a demonstrable financial saving of such service in connection with various forms of personal insurance as they appear in industry. The sound logic of improving health standards and the humanitarian element both contribute, but "money talks," and if it can be demonstrated that a plan of industrial health supervision will save money you have a customer.

BENEFITS NOT MEASURABLE IN MONEY

One has little interest in or patience with many attempts to show in units of dollars and cents the accomplishments of industrial medical service. The motive is to be commended, but so many of the premises are unsound and so many variables enter in that one has little confidence in the conclusions. For instance, when it is said that so many man-hours at a given rate are lost on account of sickness or accident, it may, even under certain conditions, be an asset to be rid of the given individual, or in the case of another may mean an expense of one hundred times the man-hour-dollars involved. It is not to be inferred that I do not believe in the savings to be accomplished through the reducing of disabilities on account of accident or sickness by medical supervision, or that I do

not think it desirable to study in every possible way to measure and justify these savings, but I do plead for greater accuracy in conclusions, so that the sound foundations of industrial medicine may not be shaken by the discrediting of erroneous assumptions.

I will outline the methods and machinery by which a system of health supervision may be built up and conducted so that the greatest influence may be exercised in the reduction of costs in benefits, insurance or compensation, as applied to disabled workers in industry. The main activities of such a program may be enumerated as follows: 1. Physical examinations of applicants and re-examination of those already employed. 2. Dispensary treatment of sicknesses, accidents, and in many cases care of dental, ocular, and other conditions. 3. Supervision of factory sanitation and the elimination of accident and disease hazards. 4. Absentee investigation, home nursing and medical supervision in such cases as it may seem advisable. 5. Education in health, personal hygiene and safety. 6. Facilities for the settlement of all claims involved in any compensation or benefits for sickness, accident or death:

BENEFITS BASED ON PHYSICAL EXAMINATION

Physical examination forms the foundation of any well-developed program of health supervision; it is the inventory of health conditions and is the basis of a preventive and constructive industrial health program. The great majority of subnormal workers may be satisfactorily employed because of the diversity of operations in the ordinary plant, but it is of vital importance, both for the protection of the individual and his employer, that such physical defects be discovered and that such defectives be placed in occupations for which they are best qualified and can contribute most to production. Physical examination should, and if properly done will, bring about a more intelligent placement of applicants for work; the discovery and subsequent correction of many physical conditions which would be prone to become more serious and effect the productivity of the individual, the elimination of persons who, because of serious physical defects, are unfit for any available employment; the transferring of certain persons already engaged to operations for which they are better physically adapted; the protection, through knowledge of physical conditions, in the case of future unjustified claims and, lastly, the closer acquaintance between worker and physician, and therefore opportunity for advice and instruction in matters of health, safety and hygiene.

The second function of industrial health service has to do with the treatment of different abnormal conditions. The factory dispensary should provide, insofar as possible, for the remedying of defects found as a result of physical examination, and provide for the early treatment and the giving of necessary advice to such workers as are taken sick during employment, and should provide for the earliest possible treatment of accidental injuries. If facilities do not allow the treatment of certain conditions, the clinic should serve at least as a clearing-house and advise such individuals as to where and how they may receive the best treatment. In other words, it should be the function of the medical department to supervise and follow up all cases showing physical de-

fects, illness or accident, and see that the most effective results are secured.

SATISFACTORY HEALTH PROGRAM INAUGURATED

The third function of the medical department has to do with the supervision of factory sanitation and the elimination of disease and accident hazards. Much of this work comes within the jurisdiction of the safety director, but the direct effect of working conditions on the health of employees, and the possible future complications in connection with claims, demands that much consideration be given to this question by the industrial physician.

Even when we have created a satisfactory health program for the workers within the plant we must still realize that these people spend hardly more than a quarter of their time in the factory, and if we are to create the greatest possible constructive influence on health we must seek to improve home and community conditions, in some cases co-operating with other agencies and in others working directly. Probably the most direct method of improving health standards in the home and of minimizing lost time on account of sickness and injury is obtained through visiting all cases of absence by means of nurses and, when necessary, supplementing their services by those of a physician. Ordinarily from 30 to 40 per cent of the total lost working time is due to sickness or accident disability, the rest through more or less uncontrollable personal reasons. If cases of sickness or accident have not for some reason been seen in the dispensary before leaving work, the home visiting and follow-up by nurses is a constant and complete check on development; it gives opportunity for rendering the best possible medical advice and service and insures against malingering. Then, too, a competent nurse, acquainted with factory conditions and the workers, discovers many conditions, important both from an employment and a health standpoint, and forms a relationship between home and factory which is of inestimable value. She is frequently in a position to give valuable service in improving the home conditions and through many channels may contribute much to reduction of lost time and the adjustment of various claims resulting from disabilities.

PROMPT PAYMENT OF EQUITABLE CLAIMS

Closely co-ordinated with all the foregoing activities must be machinery for the prompt and equitable payment of all claims arising out of any form of compensation or benefits paid on account of either accident, sickness or death. Conditions discovered by physical examination, the records of dispensary treatments, the records of past illnesses or absences, as shown by nurses' home visits, accident reports and records of service, combine to give to whoever is in charge of the financial control of payments a comprehensive picture of conditions and should enable him to be prompt and accurate in the settlement of claims. No single element in connection with any sort of insurance benefit or compensation so antagonizes the worker as the failure to promptly liquidate just claims. Neither does any system create more malingering than a thorough knowledge of conditions, past and present, and a con-

~~timorous and~~ careful follow-up of the case. Just dealing, with the "benefit of the doubt" given to the worker in case of legitimate question, and stern reprisal in the case of attempted fraud pretty much completes the elimination of malingering.

In order to apply the foregoing generalities in a more specific way, and to cite some definite conclusions, I will now outline parts of the work as it has been carried out in the Hood Rubber Company for the past eleven years. The first development in this connection was the establishment of a dispensary in 1911 for the treatment of accidental injuries and minor illnesses and shortly thereafter much of the investigation and adjustment of accident claims was attended to through this channel. Responsibility in this connection increased yearly to a point about five years ago when, in spite of the fact that the policy was carried by a commercial company, the administration was almost completely in the hands of a department allied with the medical department and in charge also of safety and sanitation work. This came about through the increasing appreciation of the fact that claims could be more easily, accurately, equitably, promptly and economically settled directly with our workers than through a third party—in this case the insurance carrier. I do not mean this as a reflection on insurance companies, but it came about through the natural development of circumstances. We know the man, his record, his physical condition, the circumstances of his injury and his progress toward health; we are in close proximity to him; we have an interest in his early recovery and a desire for just and prompt settlement; therefore we are in a more favorable position to deal with him directly than is a third party.

CREATION OF MUTUAL LIABILITY COMPANY

All this led up to our last step, two years ago, when we created a mutual liability insurance company for the purpose of carrying our own liability in industrial accidents. We have, since the creation of this company, entirely controlled and administered all matters pertaining to industrial accident claims, of course in compliance with state insurance regulations and compensation laws.

At the time our dispensary was established we employed approximately 3,000 workers, and this number gradually increased to an average of about 7,500 during the last three years. Throughout this period about one-third of those employed have been females and two-thirds males. There has been a representative age, nationality, occupational and residential distribution, so that it need not be inferred that anything mentioned in this paper applies to any selected or unusual group of industrial workers.

From year to year additions were made to the health supervision program. In 1914 a dental dispensary was established as an adjunct to the medical service, probably the first in a factory in this country; later X-ray equipment was added and in 1919 an ocular clinic was established. In 1917 physical examinations of applicants for work and of those already employed was instituted, and in 1918 home visits of absentees by nurses, later supplemented by the services of a physician when desirable in sickness or accident, was inaugurated. These various activities are men-

tioned in order to bring out the gradual development, over a long period of time, of different co-operating branches of the medical-supervision and claim-settlement work, all directed toward the early detection, prevention and reduction of disability due to disease and accident, and to show the background of the development of machinery for the settlement of all claims arising out of such disabilities.

BENEFIT PLAN INSTALLED

On Jan. 1, 1919, our benefit plan became effective. This provides for the payment of benefits in cases of sickness, non-industrial accident and death, varying with length of employment from three months to five years and over, ranging from \$8.00 to \$12.00 weekly, and covering a period of from seven to fifty-two weeks. Death benefits, again depending on length of employment, range from \$200 to \$1,000 at the end of five years of employment. The company bears all expenses of this plan and entirely controls and administers it. Here, again, is an example of our policy of dealing directly with our own employees in matters of personal industrial insurance. Department heads are given a considerable responsibility in connection with the investigation and approval of sickness and non-industrial accident claims. Their investigations, of course, are supplemented and in most cases initiated by visiting nurses and the medical department, but we wish to link up the department heads and foremen in the general administration of all such claim settlements.

Having now outlined, in general, methods in procedure and having given the background of our general plans, I will narrow consideration down to the actual administration of our compensation and benefit plan claims and to a few conclusions based on our experience with these two systems.

EMPLOYEES HAVE CONFIDENCE IN SYSTEM

Cases of sickness and accident, if not seen in one of the dispensaries before leaving work—and this is rare—are at the very latest discovered on the second day of absence by the nurse's home visit. The condition is determined as well as the probable disability and the case is revisited as frequently as may be indicated by given conditions. If an industrial accident, proper information of a medical nature is furnished to the foreman so as to enable him to make out the necessary accident reports. If from non-industrial accident or sickness, information is likewise forwarded to the department head in order to enable him to investigate and approve payments, so that claim settlements may be made promptly. Any new development in these cases is brought to the attention of the department head by the benefit or insurance office or, if discovered by the department head, to the attention of those in charge of claim settlements. We are always mindful of the confidences which should exist between physician and patient and do not betray these to department heads without good reason, so our workers are generally frank and free in their statements, feeling from experience that their rights and confidences will be regarded and that they will be accorded equitable treatment.

Payments both under compensation and benefit plan are made promptly and with the knowledge of department heads. In cases of question,

such as will sometimes arise, we always suggest a consultant or offer to refer the case to the decision of the accident board or to an impartial examiner. In the long run it is good policy to be as liberal as possible in such matters, for eventually you are able to build up a credit for fair dealing which will do much to help the general industrial relationship and to discourage malingering. If you are able to create such a reputation it is rare for workers to try to impose to any great extent, and in such cases as they do there is always possible speedy and effective redress.

ONLY GENERALITIES SHOWN IN FIGURES GIVEN

For reasons quite apparent, I do not wish to go into detailed figures as to results, more particularly as referring to finances. In the first place, it is nearly impossible to compare such figures accurately with other experiences; conditions in two factories are rarely comparable—it is even more true in companies under different state laws as regards compensation or insurance. Then, too, it would not be feasible in many companies to attempt to carry out such work as we have found to be to our advantage. Detailed comparisons of our experience with other insurance costs are hardly fair to insurance companies, because they have many overheads that we are able to eliminate and thereby make a saving and also bad risks which must be offset by good risks at the expense of the latter, so I am simply going to give a few figures showing our disability experience and some general statements as to the economies resulting in our case, and if anyone wishes detail it will be furnished, but privately.

Because of the lack of dependable statistics it is impossible to compare our experience of recent years with that of over five years ago. This is unfortunate, but it is found to be the situation in most plants, so the best we can do is to give our experience during such time as we have actually recorded. From all available evidence, experience would be much more favorable if we were able to go back of this period; then, too, the influenza epidemic had a very serious effect on disability records, both during its active stage and also as a result of the disabling complications which followed.

Considering first our industrial-accident disability reduction, records show that the average disability per employee per year was as follows: In 1917, 0.85 days; 1918, 0.61; 1919, 0.42; 1920, 0.39; 1921, 0.32.

Similarly, the percentage of employees disabled by industrial accidents yearly is as follows: In 1917, 0.24 per cent; 1918, 0.20; 1919, 0.14; 1920, 0.11; 1921, 0.10.

In other words, we have reduced by over one-half the number of disabling industrial accidents and the disability time resulting therefrom during the last five years. Our experience indicates that our workers last year averaged to lose only about 5 per cent as much time on account of industrial accidents as industrial employees in the state at large. This very low rate is accounted for by our freedom from death cases plus lessened number of accidents and shortened disability per accident.

REMARKABLE SUCCESS OF COMPANY'S ACTIVITIES

Our sickness and non-industrial accident records cover a period of three and one-half years and indicate that during that period our workers

have averaged to lose 5.2 days on account of sickness and non-industrial accident. Our average total lost time from all reasons, including personal, has averaged during this time to be 5.3 per cent, while last year we were able to reduce this to 4.3 per cent, the lowest in our experience. Considering that about one-third of our workers are women and that except for accidents their rate of lost time is double that of men, we believe that these figures represent very nearly a minimum.

Finally, as to financial savings: All absence investigations, in spite of the fact that about two-thirds of the calls are on account of absences due to other than sickness or accident, are charged to the benefit plan. Including all these overheads, plus actual benefits, we were able to conduct this work for approximately one-half the cost of re-insuring this plan in a commercial company.

FIGURES SPEAK FOR THEMSELVES

Our accident liability insurance company writes its compensation business at the same rates charged by other insurance companies. After having paid losses, overhead expenses, taxes, etc., and placing in reserve sufficient funds to liquidate all outstanding liabilities, we have, at the end of two years' experience, 78 per cent of earned income unexpended. In other words, this is the net percentage of profit on our total business. Without further detail, I believe these figures speak for themselves.

Our experience satisfies us that properly conducted health supervision, co-operating with adequate machinery for reduction of lost time and for the elimination of accident and health hazards and with those in charge of the settlement of claims, economically justifies itself. Beyond this it gives us the advantage of relationships with our workers which are not measurable in dollars but which perhaps contribute more than we realize to the prosperity of the enterprise.

DISCUSSION

MR. E. R. LAWLER (United States Rubber Company): In case of an accident does a man draw, in addition to his compensation, any benefits from the association?

DR. QUINBY: He does not. All industrial accidents are handled under the compensation law of the state; the benefit plan takes care of all other types of accidents or sickness.

DR. FISK (International Harvester Company): There is one point which Dr. Quinby did not touch upon and which, to me, means quite a bit in the way of a physician helping the cause along, and that is physical examination. A great deal of benefit is derived from physical examinations, through the placing of class B or defective men in proper employment. They must be put at work, otherwise the social problem will be something terrific in the course of a few years.

Another point the doctor could elaborate on at some length is the fact that the average factory man is ignorant, illiterate—I mean that respectfully, of course—he is superstitious. When he is sick he is usually very sure that he is sick; he thinks he is going to be sick a very long time. The doctor can help a great deal by teaching that man—not how to be sick but how to be well. Seeing the man every second or

third day, if the trouble is mental rather than physical, the doctor can work upon the man's feelings and in that way educate him to the fact that he is not really sick.

The average factory man thinks he must be off a couple of years with a broken leg, when, as a matter of fact, a man with better education—one you can reason with—will be back in from three to five months. The doctor has a golden opportunity to work among these men and to educate them, teaching them that they have erroneous ideas about the length of time it takes to recuperate from an illness. Both the company and employee save money when an injured or sick workman recovers and returns to work as early as the disability will safely permit.

DOCTOR VISITS PATIENTS WEEKLY

DR. BARR (National Cash Register Company, Dayton, Ohio): To what extent do your plant physicians call upon employees in their homes?

DR. QUINBY: If the illness or accident is not serious the doctor sees the employee in the beginning and the nurse takes up the home work. The more serious cases the doctor sees as it is necessary to follow them up, depending upon reports from the nurse. In cases of sickness and non-industrial accidents I see them at least once a week. Seventy per cent of such cases are ambulatory ones, where the patients come to the hospital; there are relatively few home visits by the doctor in the course of a month. In emergency or unusual cases the doctor does go to the homes, of course, but it depends on the needs of the individual case. This is determined by the nurse or the doctor; sometimes the patient requests a visit. We are very careful not to step on the toes of the local physicians any further than is absolutely necessary and follow to the fullest degree the medical ethics code. We have become known, the doctors have received some remuneration as a result of our plan, and they are somewhat more communicative than formerly.

MR. H. W. FORSTER (Brown, Crosby & Co., Philadelphia): Did I understand Dr. Quinby to say that his company paid the entire expense of the benefit association? Really it is not an employees' benefit association, but one paid for by the Hood Rubber Company.

DR. QUINBY: The name of it is the Hood Rubber Benefit Plan. It is paid for and administered by us.

MR. FORSTER: Why are the employees not asked to contribute?

DR. QUINBY: There are several reasons. We had had an employees' mutual benefit association but it became dormant. It was our experience that those covered by the plan were the thrifty ones, who laid away something for a rainy day and did not need the protection. We considered several plans and finally adopted the good features from several of them. If the employees were joint contributors with the management it would mean joint administration—altogether, we felt it would be better handled if we administered it alone. The working out of the plan finally adopted involved the expenditure of a considerable sum and we thought it worth while to go the whole distance. It is a very important part of the entire fabric we have been building up in connec

tion, with our safety work, home investigation and medical work. We felt that the other work justified our paying the entire cost.

DOCTORS AND NURSES DO NOT DO DETECTIVE WORK

MR. LEONARD (Public Service Corporation, Chicago): Are the activities of home calls resented by the worker?

DR. QUINBY: On the whole it has been negative. We have tried to avoid any shadowing or police work by selecting the proper type of nurses—those who could render service to the sick or injured in a pleasant, social and friendly rather than in an inquisitive fashion. They might catch a man in the back yard digging worms to go fishing, but they wouldn't report that to the department head—not the first time, probably. We try to use diplomacy. One thing might surprise you: Where a worker has moved we often receive letters or calls asking why the nurse hasn't been out to see them. Our employees look for the friendly visits and appreciate rather than resent them. If the department head wants to make a police service out of your nursing don't go into it, it will ruin your work.

THE MUTUAL BENEFIT ASSOCIATION

E. E. RICE, E. E. RICE & Co., Boston, Mass.

I shall endeavor to give a brief survey of the development of the mutual benefit association, including an outline of the various types of mutual benefit associations in existence and the methods of providing funds and the general practice in payment of benefits to employees.

There is little doubt that the mutual benefit association sprang from the needs of employees in individual industries, without any initiative or prompting on the part of the employer. The old craft guilds and trade societies developed mutual help features which, however, cannot be considered prototypes of the mutual benefit association. The fundamental basis of the mutual benefit association is a limitation of membership to employees of a common employer, regardless of the affiliation of these employees with outside labor organizations. It is a natural outgrowth of a system of voluntary relief which in many cases sprang up in single departments of an establishment. It is natural that the occupations where the greatest hazards existed should be the first organizations to develop such associations. Railroad employees, as far back as the middle of the nineteenth century, had developed a method of voluntary relief which may be described as the "pass-the-hat" method. Employees in various departments of railroad employment collected voluntary contributions from fellow employees and paid over to the dependents of the deceased employee, and to employees themselves who were disabled, the actual sums raised for the emergency. This method may be described as the genesis of the mutual benefit association and in many industries, as well as many labor organizations, this system of collection is still followed. It is, of course, subject to the following defects:

First: That it is really nothing more or less than charity in time of need.

Second: That it does not place the financial burden evenly on all who expect to benefit.

Third: That it usually leaves undetermined the amount of relief which individuals may expect.

ASSOCIATIONS HAVE RELIEVED MUCH DISTRESS

It is important because it marks the beginning of mutual help and organization within a specific employment. It is a refutation of the argument, sometimes advanced, that the worker does not want protection; that his only interest is in his pay envelope, that all effort in the line of a betterment of financial conditions within an industry should be discarded as ulterior to the real purpose of the employer-employee relationship.

The origin of the mutual benefit association in industries indicates the only true method under which protective features should be developed—they should be created within the organization. Protective features in the form of group life insurance, group accident and sickness insurance and pensions, which are super-imposed on employees as gratuities offered by the employer, have failed in most cases to develop the degree of appreciation by the employees which was anticipated. Undoubtedly these gratuitous plans have accomplished great good in relieving distress of employees in cases of sickness and in providing for the families of those deceased a substitute for loss of income when most needed. The service as well as the social value of these gratuitous plans may have fully justified the expense involved. The fact that employees have not seemed to appreciate these gratuitous plans is because, first, the average American does not expect to receive something for nothing and, second, because of a distrust of the employer's motive. The new attitude of employers recognizes the necessity of consulting with employees in all matters affecting their personal interests. Employers in large industries today realize the need of a medium or point of contact for the development of real co-operation.

The form of organization may be purely economic, as under the shop-committee plan, or may be purely beneficial as under the organization of the mutual benefit association. In many large street railway organizations the mutual benefit association has served also the economic purpose of adjustment of grievances, rules, etc.. In other organizations, where shop-committee plans are in existence, the mutual benefit association has been co-extensive with the representative system and has with other co-operative features, assisted in creating a personal interest of employees in the organization as a whole. I mention this development of consideration of the various types of mutual benefit associations with a view to emphasizing the possibility of development of this medium from its regular function as a purely relief feature.

LIMITATIONS OF EMPLOYEE-MANAGED ASSOCIATIONS

A development from the method of voluntary relief through collections marked the first step by substitution of a businesslike plan, where each person received benefits in proportion to his own contribution. The

important point to observe is that the plan originated with the employees themselves, without initiative on the part of the employer. The earliest relief associations made their appearance in the more hazardous lines of employment, such as the railroads. These associations, in many cases, started in single departments and spread from one to another, finally assuming the function of an association open to all employees in railroad employment. In the same way, in large industries other than railroads, relief societies started in small groups and in many large industries may be found several relief societies, each one confined to a special department. This brings up one of the limitations of a purely employee-managed association. The economic success of these associations has been found, from experience, to depend upon the interest of members in the conduct of its financial activities. This interest is usually in inverse ratio to the size of the association. These associations, therefore, are more of a factor either where they are limited to single departments, or to small industrial plants where the members are in close contact with the finances. It has been found, as a general rule, that purely employee-managed associations degenerate into small groups representing one-fifth to one-half of the total number of employees.

In speaking of the purely employee-managed association I do not refer to large mutual benefit associations which exist in large industries, where the management of the association is recognized as partly an employer function. This form of association marks a further step in the development of the mutual benefit association. The point I wish to emphasize is that the employee-managed association may be successful when confined to relatively small groups, where employees can be made to take a real interest in the conduct of the association and where close supervision of claim payments is possible on account of the knowledge which employees in these groups have of each other. On the other hand, there is a real danger in the financial conduct of small groups, due to the fact that the losses are bound to fluctuate to a greater degree the smaller the group. Therefore, there is all the more necessity for the exercise of care in the building up of a proper reserve to take care of unusual losses due to epidemics or unusual hazards. Probably as high as 90 per cent of the so-called mutual benefit associations consist of the old type of employee-managed association. This is due principally to the fact that employers have not as yet recognized the need of the development of these agencies to fulfill their real place in industries, both as a protective and economic medium.

COMPENSATION AND MUTUAL BENEFIT ASSOCIATIONS

The workmen's compensation acts adopted by practically all states today have pointed the way to a necessity of providing adequate relief to employees for lost time due to disabilities. These acts provide for definite payments equal to one-half or two-thirds wages, up to a certain limit, in case of loss of time due to accidents incurred as a result of employment. The lost time of employees through industrial accidents probably represents from one-fifth to one-half of the amount of lost time resulting from non-industrial accidents and sickness, depending upon the

nature of the employment. Recognition of the employer's liability to protect the time of employees in the case of occupational accidents has emphasized also the need of some form of adequate protection for employees' time lost through disabilities not covered under compensation acts.

The employer, of course, is not legally liable for non-occupational accidents or sickness. He is, however, vitally interested in the continuity of employment of his force, and he is or should be vitally interested in the character of service which employees can render. The character of this service depends, to a great extent, on the financial security of the worker and his family. The worker who is in debt as a result of a period of sickness, or who returns to work before he is sufficiently recovered, is not in a good position to give the employer full return for his compensation. The mental attitude of the employee toward his job is dependent, to a great extent, on his sense of security in that job, and this sense of security is enhanced by the knowledge that in case of sickness, death, or old age retirement his interests are provided for. This does not mean that the employer should assume the responsibility of guaranteeing the financial independence of the employee, but does mean that the employer should place within reach of the employee the proper agencies for the development of protective features.

As a result of recognition on the part of employers of their interest in the protection of the employee and his home, we find the mutual benefit association, which was run exclusively by employees developed in large industries as a plant function. The progress in this direction started many years ago on the railroads, in the assumption by the corporation of the expense of management of the relief association. This development went still further when the large railroads established relief departments which became practically a condition of employment. The expense involved in the administration of these relief departments has become a large factor, representing as high as \$1,000,000 on certain large systems. These relief departments, while not in the same category as an employees' association, must be regarded as a development of these associations through their contributory features.

BENEFITS TOO SMALL TO AFFORD ADEQUATE RELIEF

One vital defect of these relief departments at the present time, as well as a defect which exists in the case of all employee-managed mutual benefit associations, is the fact that wage scales have risen during the past ten years to such an extent as to render the amount of relief obtainable by employees too small in proportion to actual present-day wages. The workmen's compensation acts provide a fixed percentage, varying from one-half to two-thirds of average pay received. The average benefit paid by mutual benefit associations and relief departments represents today not more than one-fourth of the average wages received. The usual benefit is in the neighborhood of \$5.00, \$6.00 or \$7.00 per week. Furthermore, the benefits paid by mutual benefit associations are paid irrespective of whether the injury resulted from the employment. Payment of one-half or two-thirds wages for injuries received in the course

of employment should make unnecessary any additional payment on the part of the mutual benefit associations and the payment of any such additional amount will invariably result in increasing the element of time lost, as an average proposition. Therefore, the proper development of the mutual benefit association should be in line with supplementing workmen's compensation acts, by providing the largest amount of indemnity for non-occupational accidents and sickness at the lowest cost to employees.

There are various formulas or methods of payment of indemnities which may be provided. The mutual benefit associations may provide an exact percentage equal to one-half or two-thirds per cent of wages, thereby harmonizing with the compensation act provisions of the state, or the amount may be established in accordance with a wage classification, as follows:

Class A. Employees earning under \$22.00 per week, benefit \$10.00 per week.

Class B. Employees earning from \$22.00 to \$35.00 per week, benefit \$15.00 per week.

Class C. Employees earning over \$35.00 per week, benefit \$20.00 per week. Or in place of the above classification a uniform payment may be arranged, approximately equal to one-half average wages, for illustration, \$15.00 per week. The amount of dues paid by employees will, of course, be proportionate to the amount of indemnity.

EMPLOYERS' CONTRIBUTIONS TO COVER DEFICITS

There should be a waiting period of one week, during which no benefits are payable. The proper limit of time during which benefits are payable is open to discussion, but should be not less than thirteen weeks nor more than fifty-two weeks. The mutual benefit associations should not attempt to cover permanent total disability cases. This field should be covered under a pension provision which provides for retirement of employees during old age or incapacity. The saddling of permanent disability cases on the mutual benefit association will naturally result in raising the cost of insurance for the great majority. If the permanent disability feature is desired as a function of the association it should be provided for under a contribution on the part of the employer.

This brings us to what I would call the third development of the mutual benefit association. We have considered, first, the purely employee-managed association and, second, the association managed by employees and by management jointly, with a contribution by the employer to management expenses. The third step indicates a still further development in the employer's interest, which is represented by a flat contribution to the cost of actual benefits paid. As a matter of experience the employer in many cases has been forced to make a contribution to the mutual benefit association in the form of making up a deficit. The amounts actually paid out by employers in the form of deficits will probably never be known, but they represent a very considerable sum of money. It is our observation that employers are expected to stand in the breach when things go wrong with the mutual benefit association, but

seldom receive due credit for their generosity in this direction. It is our further observation that the employer, in many cases, would receive far more credit were he to make a definite contribution in advance to the dues paid by each member and this contribution might be actually less in total than would be represented by a contribution to general funds. Furthermore, such a contribution appeals to the individual employee, because he feels that he is purchasing insurance at a figure below cost. Cost, in the case of the self-financed mutual benefit association, is very difficult to arrive at. The health curve is similar in some respects, to the stock market curve. Within every five-year period, approximately, there has been a high point and a low point. The peak at times reaches an alarming height, as in the year 1918, when the reserves of many benefit associations were entirely depleted. The problem of costs, therefore, can only be regulated by actual experience. The increase of amounts of indemnity by mutual benefit associations to harmonize with payments made under the compensation acts, requires still closer attention to the problem, not only of costs, but also administration. The payment of \$5.00 or \$6.00 per week, representing perhaps one-fourth of average wages, will show an entirely different experience than the payment of a larger amount, equal to one-half or two-thirds of wages, due to the natural increase in malingering hazards as the indemnity more nearly approaches the wages. This increase in indemnity also calls for closer attention in checking absences due to disabilities and the handling of specific cases. This points the way to what I would consider as a fourth step in the development of the mutual benefit associations, namely, the problem of guaranteeing the financial solvency of the association through reinsurance of the indemnities provided or through the application of group insurance.

GROUP INSURANCE POPULAR

Group insurance has been a development of the past ten years and, as stated earlier in this article, has been used by employers as a means of retaining the loyalty of employees and creating greater continuity of service. This, however, I would not regard as its main purpose. I believe its greatest future lies in the provision of adequate insurance for employees—life, accident and health—at a very considerable saving in cost over the usual basis of rates. The great increase in the popularity of life insurance, due to government insurance during the war period, has created the possibility of the wholesale introduction of insurance on a purchase basis by employees. The mutual benefit association offers attractive medium for the introduction of this insurance in large establishments. Arrangements may be made for the sale of group accident and health insurance, either on a percentage of wages, or on a classified wage formula, with the provision of handling all details through the secretary of the mutual benefit association, thereby insuring not only a fixed rate of cost, but also providing an experienced and economic administration of benefit features. The actual cost of group insurance may be established on an experience basis from year to year; a low loss ratio resulting in a lower rate for the plant. The great advantage of the group insurance plan lies

in offering to employees the right of continuance of insurance after leaving service.

Arrangements may be made so that group life insurance may be offered in amounts from \$500 up to \$3,000, either on a classified formula, on a wage or salary formula, or, in cases where employers pay the cost, on a service formula. It has been found that employees quickly respond to the opportunity to secure group insurance and wherever the employer has paid 40 per cent or more of the premium an enrollment exceeding 75 per cent of the total force has been secured.

We mention this plan as a method whereby mutual benefit associations may safeguard themselves without requiring any appropriation on the part of the employer to make up a deficit and without requiring the accumulation of adequate reserve to meet varying contingencies.

ADVANTAGES OF INDUSTRIAL RELIEF AND BENEFIT ASSOCIATIONS FROM THE EMPLOYERS' STANDPOINT

LEO D. WOEDTKE, FRED T. LEY & CO., INC., SPRINGFIELD, MASS.

The days of overdrawn welfare work brought on by the war and the bidding among employers for labor have passed, and happily so. The tide of investments in time and money in competing with your neighbor in the extremes of entertainment, etc., for the employee has receded, leaving us now down to bedrock and common sense, at least, with a result that the mutual benefit association remains as the one outstanding and substantial feature of so-called welfare work.

As to its advantages from the employer's standpoint, compare the firm who has no mutual benefit association—which is often obliged through sheer charity or moral obligation to spend a considerable amount of money upon the death of an old-time employee—as against the modern method of group-insurance features of mutual benefit associations, which not only relieves the firm of this unpleasant obligation, involving uncertain expenditures, but gives the employee's family that independence and freedom from charity which is properly theirs. There is no question as to the value to the employer of the far-reaching influence on the attitude of his workers and the good-will of their families in the results obtained by the rank and file of all the employees.

REDUCING COST OF ASSOCIATIONS TO FIXED CHARGES

Again, there is the advantage to the employer through knowing, as a fixed charge in his production cost or business management, what this obligation will mean in dollars and cents per year, instead of the possibility of its running to sizable figures in the case of an epidemic, such as influenza. In my own company, wherein we have fostered a mutual benefit association for many years, more of our people died and drew a total of more group life insurance benefits in that period of less than a year than we have had in over five years at any other time, and this, of course, is equally true as regards sick benefit disability. I can quote from the experience of my own firm during last

year (1921), wherein we had thirty-five cases of sickness, to whom were paid out in benefits approximately \$7,000. It is a significant fact that at least 75 per cent of these sick employees would have probably drawn at least a major part, if not all, of their wages from the company had we no mutual benefit association, because of the type and nature of their position and occupation. You will note that from a purely economic standpoint the employer gets back a substantial portion of his contribution toward the expense of maintaining the mutual benefit association.

In this same year three deaths occurred, on which were paid a total of \$9,000 life insurance through the mutual benefit association; one was a vice-president of the company. This will show the far-reaching effect of a mutual benefit association.

We have found that the labor turnover, let alone the morale of our employees, has materially improved through the association, as our records indicate a decided falling off of lost time through sickness and disability, which we know from investigation is the result of eliminating fake sicknesses and cutting down malingering through the check-up and management of the club by the employees themselves. This is something that we never could accomplish as a firm without the medium of the employees'-managed mutual benefit association.

It cannot be said that all of this is accidental or a condition which might have resulted anyway, as we have behind us nearly ten years' experience with a mutual association as a basis for comparison and twenty years back of that without one.

We find a further decided satisfaction, as an employer is able to provide life insurance for many of his employees, particularly those of middle-age or later life, through the group life insurance feature of the club, whereas such faithful employees could not, under any conditions, buy life insurance themselves at any price, and the casting of this bread on the waters returns to us a more loyal and secure employee.

TWO-THIRDS OF WAGES PROPER AMOUNT FOR BENEFIT

We have experimented with several kinds of mutual benefit associations, running all the way from the purely social club to the wholly contributory plan for benefits by the employee, and the other extreme of the bearing of the whole contribution by the employer. We have found, to our complete satisfaction as well as that of the employee, that the ideal and correct plan, and one which we have followed out for several years, is that in which is included a disability insurance feature not to exceed two-thirds of the wage, a life insurance feature running from \$1,000 to \$5,000 according to length of service, and health service, including a thorough and strictly confidential annual examination, together with recommendations and advice on health, hygiene, etc., throughout the year—the latter developed within the past three years by the employees themselves, through their management of the club. They follow up, confidentially, the individual who has been advised to adhere to given recommendations by the medical examiner, with a result that quite a number of serious conditions, which would otherwise eventually

take from us valuable employees in responsible positions, have been entirely overcome; giving us, of course, a sound and healthy worker who is naturally more efficient and more likely to remain with us for years to come.

I recommend, in the strongest possible terms, three particular factors in the mutual benefit association program: (1) That the contribution of expense be borne fifty-fifty by employer and employee, giving as it does the purchasing power of larger benefits and values and eliminated the objectionable paternal feeling from the employee's mind. (2) The absolute management of the club's affairs from beginning to end by officers and committees elected on secret ballot by the employees themselves. (3) The combination of group disability insurance, group life insurance, and health service, which are without doubt the bedrock and foundation of any real mutual benefit association. If this is done, the matter of socials, athletics and various other features, peculiar to various firms and localities, will take care of itself. (A copy of the by-laws and constitution of the employees' benefit association of my firm can be secured by dropping me a line at Springfield, Mass.)

AN EMPLOYER GIVES DEFINITE VIEWS ON SUBJECT

As nearly all of you present are, like myself, employed by some firm, and are not chief executives, you may be interested in learning what I secured from the president of my firm by writing him a note and asking him to dictate to his stenographer, coldly and impartially, from his own experiences what he, as an employer, considered the advantages of our mutual benefit association, as well as the general subject between all employers and their associations. His reply was as follows:

"Every employer wants to have around him a group of satisfied employees, who feel that they are getting not only a wage that is equal to the prevailing wage for similar work, but also that they have an employer who is interested in seeing them better themselves. We all know that a satisfied employee will make more money for his employer than a dissatisfied one. The satisfied man is doing the thousand-and-one things during the year that makes the concern a success, whereas the dissatisfied employee does only what he is obliged to do and sometimes will even go out of the way to hinder production and make trouble to satisfy a real or imaginary grouch.

"I feel that every employer is justified in spending some money in the operation of his business in addition to wages, if it is going to result in his employees being better satisfied and more content. This is again justified by the well-known fact that a healthy employee is more efficient and can and will do more and better work than an unhealthy one. For this reason, also, an employer is justified in spending money to improve the physical condition of his people. I know the wonderful advantages of the sick and death benefit insurance features of the Employees' Club, as this has been brought home to me on several occasions involving a number of our important and old-time employees in responsible positions.

"Knowing, as I do, that these two stock features are easily maintained, I am more particularly interested in the health question which to my mind, is one of the most valuable features of the mutual benefit association. In our firm we have passed through the trying early states of inducing employees to take the annual physical examination; happily this has progressed to a point where complaints have been made to me by some of our men and women because they did not get their examination, due to their having been away or some other condition. However, simply making a physical examination does not improve the employee's health, as what really counts is the attention and follow-up of the recommendations made to the employee by the examiner.

AN EMPLOYEE IS INTERESTED WHEN HE PAYS IN HIS MONEY

"I have found from experience that where a person pays for something out of his own pocket, he is more likely to follow suggestions for his own betterment, physically or otherwise, and that is one of the main reasons I advocate employees paying part of the expense of maintaining the Association.

"Over an experience of many years I have found that employees, as a rule, are interested in what may happen to them if they are taken sick, or what may happen to their family in case of death, and as an employer I know, beyond any question, that the mutual benefit association run on a fifty-fifty basis will solve all of these problems in a way that is satisfactory to both the employee and employer.

"If the employee cannot be sold on a plan calling for his contributing a part of the expenses for such benefits, he does not warrant the consideration given the other employees who are willing to club in on the total expense in mutually protecting one another. The employee who is sold on the contributory basis, and pays some of his own money, is certainly going to take an interest in seeing that he will get as much as possible for his money, as well as seeing that no other employee member puts anything over on his Club; all of which is a whole lot more than the employers themselves can accomplish.

"I am well satisfied that a mutual benefit association run along lines where the employees get all the benefits that result from improved health, will at once interest the entire group in the health of each member of the association. In this way the association accomplishes a lot of good through group work, which would be impossible for the employer to accomplish for the individual, and the result, of course, is a gradual improvement in the health of the entire group. All of this cannot help but mean greater efficiency in the work they have to do and, while I know of no existing statistics whereby the net results of this group work on the health feature can prove the statement, I do know of any number of instances where the men and women in my employ have been improved through this service.

SATISFACTION COMES WITH KNOWLEDGE OF WORTH-WHILE WORK

"I have only touched on the commercial side of the problem, but if I knew that the company had not benefited one cent the satisfaction

that comes from the knowledge that we have helped so many of our employees would more than justify the expenditure.

"It is very difficult, in a great many cases, for an employer to know just what he ought to do when an employee has been taken sick and is laid up for a long period, or when an old employee has died and left his family in straitened circumstances. We all sympathize with these cases, but when we know that the person, when he was in good health, made no provision for the sickness and death which is bound to come to all of us, then the employer does not feel that it is up to him to rush into the breach and do the things that the individual should have done for himself when he was in a position to do so.

"When we offer to pay one-half of the expense of the mutual benefit association, regardless of what figure it may run to, we offer to help those who show a disposition to help themselves, and such an offer is a real pleasure for an employer to make. To me this is the only work worth while in the so-called welfare game. Taking the other fellow's burdens off his shoulders builds up the man who has been relieved, it helps him to carry his share of the load and to make the sacrifices that are necessary in doing his share to build up character; this will eventually mean a better and stronger individual. If any employer can impress upon the young employee that the time to plan for what happens at the age of 65 or 70 is when the employee is 20 to 30, then the employer has done one of the most important pieces of work that is needed in industry in this country today."

It is singular that the mind of an employer, as indicated from what has just been said, should run so closely to the ideals held by so many of us who are steering employees' benefit associations, and to my mind the coincidence is encouraging. I know, from talking with many of the best and leading employers, that most of them think along the same lines.

CHAIRMAN CHAPMAN: A paper by Dr. Rector will come next.

COMPARISON OF DISABILITIES FROM SICKNESS AND ACCIDENT

FRANK L. RECTOR, M.D., NATIONAL INDUSTRIAL CONFERENCE BOARD,
NEW YORK CITY

We know that accidents occur among industrial workers and that they are subject to sickness. We know they lose time from productive employment and that a considerable amount of this time lost can be charged to accidents and illness. We do not know the facts about this problem because there are available no authentic sources of information to which we can turn for enlightenment. We have only a few, a very few, instances where industrial records have been kept in such a way as to give information of value in arriving at a determination of the relation between the incidence and duration of industrial accidents and illness.

It was hoped and believed that with the administration of workmen's compensation law a fund of information on these questions would become available. But after ten years of operation of these laws we have made little progress in the accumulation of desirable evidence. With the con-

stantly changing political conditions under which these laws are administered it has been impossible to adhere to any scientific method of approach to this problem, even though a standard method of statistical analysis and report has been adopted by an organization representing the best collective thought of the various compensation commissions of the country.

SICKNESS AND ACCIDENT DISABILITIES BASED ON STATISTICS

To be of the most value a study of sickness and accident disabilities should be based upon statistical evidence, as it is only by such evidence that actual conditions can be measured and the proper remedies instituted. Progress based upon estimates only is likely to be sporadic and oftentimes misdirected. The question of relation between accident and illness statistics for various industries and for industry as a whole is one which has not as yet been solved in a satisfactory manner. There are a number of industrial organizations that have compiled useful records of accidents, due largely to the compulsion of workmen's compensation laws; fewer have attempted to keep accurate statistics of illness. From such fragmentary statistics as are available attempts have been made to generalize for industry as a whole, but all accident and illness statistics are estimates only, no two estimates being based upon the same conditions.

There is much confusion in the minds of students of this problem regarding the definition of industrial workers. Frequently all gainfully employed persons are considered, and again the more restricted groups of industrial workers as classified by the Bureau of the Census are meant. In the former classifications are comprised approximately forty million workers, while the latter has about one-third as many. So it is seen that there is fundamentally a wide discrepancy between the figures that have been used in discussing this question.

Industry cannot obtain an answer to its accident and sickness problem until it is willing that adequate records be kept of the incidence and extent of these conditions. Guessing is a poor way to arrive at accurate conclusions and is followed in no other department of a successful organization. In order to have adequate and useful records a medical department worthy of the name must function, and this is possible only with a personnel trained in this work. Little can be expected and less obtained from a so-called medical department presided over by the office boy, a first-aid assistant, a stock clerk or even a nurse, whose principal duties are to pick slivers and bandage fingers. Until the time comes when industry is willing to give adequate recognition to the work of the medical department, progress in solving this most vexed and costly question will be impossible.

NO RELIABLE AND COMPREHENSIVE FIGURES AVAILABLE

There is no need to recite detailed figures of accident frequency or severity, nor of the number of days lost from sickness. Such figures as I might give you are estimates only, as are all other statements that have appeared so far. Diligent and extended research has failed to produce reliable and comprehensive figures dealing with such cases. Probably the

most authentic record of large numbers of employees is that contained in a report issued by the National Industrial Conference Board*, in which 207 plants employing over 764,000 workers furnished records of the activities of their medical departments covering a period of one year. Analysis of this material showed an average of 1.35 new injuries per worker per year, each new injury requiring an average of two redressings. This would indicate that the vast majority of accidents encountered in industry are comparatively slight, a fact further borne out by the findings that of the total number of new injuries received only 2.86 per cent were of such severity as to require payment of compensation. The average number of medical cases was 1.4 per worker per year.

From a study of the operation of mutual benefit associations in industrial organizations, results of which have not yet been published, it has been found that in twenty-six industries of a varied nature during the years 1918 to 1921, inclusive, the amount of money distributed for sickness totaled about 73 per cent of that for sickness and accidents combined. These figures are not conclusive as to the ratio of sickness and accident occurrence and duration, but are indicative of what is taking place in certain industries. To draw the true picture many other questions would demand consideration in addition to the amount of money paid in benefits.

IMPORTANCE OF RECORD KEEPING NOT YET RECOGNIZED

The value of safety work in industry has not been stressed in this discussion for two reasons: (1) The Safety First movement has attained large proportions and judging from its wide dissemination is familiar to all, and accepted, in principle at least, by all classes and groups. This fact, combined with the economic saving on insurance premiums and compensation payments, has served to bring about a marked reduction in the amount of time lost from accidents and their cost. (2) Where accurate records have been kept in individual plants the amount of time lost from accidents is much less than that from sickness and "personal reasons." In many cases absence from "personal reasons" has illness as an underlying cause.

Industry as a whole has yet failed to grasp the significance and importance of adequate record keeping of accident and illness data. If a fraction of the energy, time and expense involved in keeping cost and production records were expended on medical records, I venture the suggestion that a much greater proportionate saving would be accomplished. Weak spots in the organization, either of physical surroundings or working conditions, are reflected in the medical records more accurately than in any other type of plant statistics.

In order to establish some uniform basis upon which to build a system of record keeping, a committee of the American Association of Industrial Physicians and Surgeons, of which the writer was chairman, submitted a report to the annual meeting of that body, held in St. Louis last May, in which was outlined the minimum data needed to establish comparative records in different plants. This outline is as follows:

*"Cost of Health Service in Industry." Research Report No. 37. National Industrial Conference Board, May, 1921.

ACCIDENT RECORDS

1. Personal Items (employment data): Name and address, shop number, age, sex, race, marital condition.
2. Plant Items (occupational data): Department, foreman's name, occupation, how long in employ, physical examination classification, were guards provided and in place, could they be used, cause, mechanical or non-mechanical.
3. Scientific Items: Part of body injured, nature and extent of injury, treatment.
4. Economic Items: Amount of time lost, amount of equivalent wages lost, cost of physician, drug and hospital expense, amount of compensation paid, end result.

MEDICAL RECORD

1. Personal Items (employment data): Name and address, shop number, age, sex, race, marital condition.
2. Plant Items (occupational data): Department, occupation, previous occupation.
3. Scientific Items: Physical examination classification, diagnosis.
4. Economic Items: Amount of production time lost, amount of wages lost, cost of physician, drug and hospital expense, end result.

It will be possible to enlist the co-operation of management only if record keeping is put on an economic basis; that is, if economic items are stressed and purely scientific items kept in the background. By means of the outline given above it is possible to show the amount of production time lost, amount of compensation paid, and the cost of medical, surgical and hospital attention furnished for each case. With this information the management can see in what departments and occupations their greatest absence from accidents and sickness lies and can introduce the proper corrective measures. After such records have been kept for a sufficient length of time, and by a sufficient number of organizations in varied industries, it should be possible to establish a daily cost basis upon which to figure the expenses of medical supervision. When this is done, the work of the medical department can be placed on a par with that of any other department in the organization.

UNEMPLOYMENT AND ITS RELATION TO PREVENTIVE WORK

Records of mutual-benefit associations can be utilized to interpret industrial conditions only to a small extent. They cover disability due to non-industrial as well as industrial causes, and in certain instances are applicable to disabilities among dependents of members. Again, there are certain types of benefit associations that make no distinction between compensation and non-compensation cases. So that in some associations of this kind an injured worker may be receiving both compensation and mutual benefit payments concurrently.

If, as Whiting Williams says, even in spite of present indications, the greatest worry to an industrial worker is that of unemployment, it may be of interest to determine the causes of unemployment insofar as they affect and are affected by the worker's physical condition. These causes are: (a) Illness of worker. (b) Illness in worker's family.

Illness of the worker can be controlled in large measure if there is a medical department properly functioning within the industry where he is employed and enjoying co-operative relations with other departments of the organization. Under such conditions a sick or injured worker is

given prompt and adequate attention, with the result that his disability is lessened, or he is placed in capable hands if in need of prolonged attention.

Illness in the worker's family may be treated by the plant physician, if he is the only medical aid available, or a nurse may be sent by the employer to look the situation over and render the needed aid which will release the worker for his regular employment, or help in procuring necessary assistance to care for the sick ones. In either case the worker's mind is relieved from home worries and he is able to carry on his usual occupation. Thus we see that causes of unemployment, primarily dependent upon the physical condition of the worker or his dependents, can be removed by helpful co-operation by the management and proper functioning by the plant medical department.

AN INDUSTRIAL PHYSICIAN MUST UNDERSTAND PLANT CONDITIONS

This relation of unemployment to disabilities is summarized as follows in Research Report No. 43 of the National Industrial Conference Board, page 1.* "A man may be out of work because, though willing to work, he suffers from such physical or mental disablement as to throw him either temporarily or permanently into idleness. Such disablement may be due to personal factors or social negligence quite apart from industrial conditions, or may be due to causes arising out of his industrial environment. If such an idle worker be incapacitated for work because of his physical or mental condition, permanent or temporary in character, he must become an object of private or public attention and care as a social obligation, except that; if his disablement be caused by and in consequence of his employment, the employer must be made to contribute to his care as now provided for under workmen's compensation laws and similar enactments. If the disablement be of very short duration, the worker may only temporarily be subjected to a loss of wages, and usually has his old job waiting for him or has at least a good prospect of returning upon recovery to the previous or similar job and wage-earning capacity."

Given a broad-minded and sympathetic management and a properly functioning medical department, how may sickness incidence be lessened? Three main factors must be considered in answering this question. (1) Physical examinations before employment and periodically after employment. (2) The competent and prompt treatment of all injury and sickness cases occurring within the plant. (3) A thorough knowledge on the part of the medical department of plant processes and hazards and a voice in the placement of workers on occupations that will not be harmful to their health. Let us consider these more in detail.

RESULTS ACCOMPLISHED BY EXAMINING PHYSICIANS

(1) *Physical Examinations:* Where physical examinations have been introduced into industrial organizations for the purpose of so placing applicants for employment and workers that they are not a menace to themselves, to others or to property, the following results are reported by

*The Unemployment Problem." Research Report No. 43, November, 1922.

examining physicians: "Increased efficiency, fewer accidents, lessened absence and labor turnover, elimination of tuberculosis, reduction in venereal disease, elimination of other infectious and contagious diseases, better adaptation of workers to jobs, reduction of compensation claims and useless litigation, a clear record of impaired joint function, satisfaction to employees that their interests are being safeguarded."*

Physical examination is still the exception among industrial workers, but with the results accomplished so far it carries great hope for future permanent good and argues well for the value of this phase of medical work in industry.

(2) *Prompt Treatment of Sickness and Accident Cases:* Physicians in industry will tell you that successful treatment of industrial accidents is inversely proportional to the length of time elapsing between the occurrence and treatment of the accident. Untreated trivial injuries furnish the greatest number of infection cases. Cases with delayed treatment are the next most prolific source of infection. A considerable proportion of time lost from accidents and amount paid for compensation is also directly or indirectly due to infection. Experience has shown that infections can be reduced to a minimum and in many cases eliminated from the factory by prompt and adequate treatment of all injuries, no matter how trivial they may seem at the time of occurrence.

Many illnesses can be checked in their incipency by prompt medical attention and many hours of production time saved to the firm and wages to the workers. Headaches, indigestion, beginning of respiratory diseases and dysmenorrhea among female workers can be relieved and frequently cured by early attention to them.

REDUCTION OF NEW INJURIES SECURED BY INTENSIVE WORK

The value of full-time medical work in industry is further attested by an analysis of data supplied for but not included in Research Report No. 37, mentioned above. This study showed that as the physician devoted an increasing amount of time to industrial work, the number of new injuries per worker decreased and the number of redressings per new injured increased. This reduction in new injuries is brought about by better placement of workers and the increasing number of redressings indicates better attention to such injuries as do occur. The figures on which these statements are based are as follows:

Type of Service—	New Injuries per Worker	Redressings per New Injury
No physician	2.40	0.77
Physician on call	1.64	1.68
Physician on part time	1.37	2.11
Physician on full time	1.29	2.67
Average	1.35	2.01

The educational possibilities which come to the physician treating these cases is of no small value. With the disability before him and the mind of the injured worker willing to listen to suggestions for the prevention of similar conditions in the future, he can drive home lessons

*Rector, F. L.: "Physical Examination of Industrial Workers." *Jrn. Am. Med. Association*, V. 75, Dec. 18, 1920, p. 1739.

in health and safety that are sure to be remembered by those receiving them.

(3) *Knowledge of Plant Processes and Part in Placing Workers:* This is a necessary part and the logical sequence of the physical examination of applicants. Workers should be placed in jobs for which they are physically and mentally fitted and such placement cannot be had unless the physician is familiar with the work being done and the requirements of each job. Given this information, he can match the physical capacity of the workers with the mechanical requirements of the work, thus forming a productive unit with the least possible friction and lost motion.

PHYSICIANS SHOULD HAVE VOICE IN PLACEMENT OF CONVALESCENTS

If the physician who examines the applicant for work is unable through lack of organization to have a voice in his placement, his opportunity to do good will be greatly lessened, and if he confines himself to treating accidents and cases of illness as they arise, without knowing something of the plant processes and their possible connection with such disabilities, his value to the organization is greatly lessened. In fact, he is missing the opportunity for greatest service to industry.

Medical work in industry, the same as public health work in communities, must place first emphasis on prevention. The public health officer who remains inactive until epidemics of disease force him to act to prevent dire results to his community will accomplish little in the way of permanently improving living conditions, and the plant physician who can or does do nothing but care for such accidents and cases of illness as find their way to his dispensary will contribute nothing to the improvement of working conditions or the advancement of industrial betterment. "Prevention is better than cure" and in no activity of life does this hold good more than in industrial medical work.

In conclusion, may I repeat that we have insufficient reliable evidence upon which to determine the true relation of industrial accidents and illness. We do know, however, that such evidence can be obtained, but only by the co-operation of many industrial organizations in the keeping of adequate and comparative statistics and the subsequent analysis of this material to show the cause of disability and the economic cost and result. To accomplish this end will require time and patience, but surely the benefits to be obtained are worth the effort.

The Section then adjourned.

Engineering Section

August 31, 1922

H. W. FORSTER, Chairman,
Vice-President, Independence Bureau, Philadelphia, Pa.

GEORGE T. FONDA, Vice-Chairman,
Fonda-Tolsted, Inc., Chicago

S. J. WILLIAMS, Secretary,
National Safety Council, Chicago, Ill.

CHAIRMAN FORSTER: The program calls for a report by the Chairman of the Section. There is little for me to say. You all know why the Engineering Section was created, to consolidate the engineering spirit and provide a medium through which we could have sessions of general engineering interest. The Engineering Section, during the past year, has not held any meetings, owing to the hard times that have been upon us. Perhaps, during the coming year, we shall be able to have one or more gatherings of an engineering character in the larger cities.

The Chair reported at the meeting on Tuesday afternoon that he had appointed a Nominating Committee consisting of Fred Davidson as Chairman and Walter Paine and Stanley Kershaw. That committee will report later in the day.

The next item on the program is a report by the Secretary, our Chief Engineer.

SECRETARY'S REPORT

MR. SIDNEY J. WILLIAMS (National Safety Council, Chicago): The principal thing this Section has done during the past year has been the work on safety codes. Various States are paying a good deal of attention to the National codes being developed by different committees. The State of New Jersey adopted a code on mechanical transmission of power even before the committee itself had finally adopted it, and the same State is waiting to adopt the code on punch presses as soon as it is finally passed. People all over the country are taking notice of these national safety codes, which bid fair to have a very large influence.

We have, at present, representatives on no less than twenty committees, each one working on some specific safety code; some of them are under our own particular sponsorship and some under the sponsorship of other organizations.

Another interesting thing that this Section has started during the past year has been (where we have found some particular subject on the engineering side of safety that needed study and investigation) to set up a standing committee to study safety. For example, in the field of electrical switches, a lot of organizations are interested and are working in one way or another on the subject of enclosed switches, yet only a very small amount of definite information is available as to the number and severity of accidents occurring on open or enclosed switches. We set up an electrical committee, not to do the work that the Bureau of Standards or the Electrical Safety Conference or anyone else is doing, but to work with those bodies and make use of the wide circle of contacts the National Safety Council has, to collect information as to the actual occurrence of electrical switch accidents, which information would be at the disposal of all bodies that are working in the field. One of the possibilities that lie ahead of this Section is to do the same thing in other fields.

We had several meetings in Chicago on the subject of static electricity, which brought out much information, and we may issue a pamphlet later on this subject.

The Chairman then called for brief reports on the present status of the safety codes already mentioned.

REPORT OF NOMINATING COMMITTEE

The Nominating Committee then submitted the following report: For officers of the Engineering Section for the year 1922-1923: Chairman, George T. Fonda, Fonda-Tolsted, Inc., Columbia Salvage Corporation, Washington, D. C.; Vice-Chairman, W. S. Paine, Aetna Life Insurance Company, Hartford, Conn.; Secretary, Sidney J. Williams, National Safety Council, Chicago. Members of the Executive Committee (for three years): S. E. Whiting, Liberty Mutual Insurance Company, Boston; M. F. Crass, Graselli Chemical Company, Cleveland; E. B. Tolsted, Fonda-Tolsted Company, Inc., Chicago.

The nominees were unanimously elected.

REPORT OF ELECTRICAL COMMITTEE

MR. J. I. BANASH (Consulting Engineer, Chicago): Your Electrical Committee submits this brief report:

This committee has been organized since July 1, 1922, and sent out a questionnaire as per copy in the August (1922) edition of *The National Safety News*. Some time before publication the questionnaire was sent to all members of the Engineering Section and to seven State industrial commissions, sixty-five insurance companies who are members of the Council, thirty large industrial concerns and about twenty-five switch manufacturers.

Many of the replies have been quite interesting and some have contained requests for larger supplies of the questionnaire, which promises that during the coming year very good results will be obtained.

Rumors have reached the committee of accidents with the enclosed switch of the so-called "safety type." especially in maintenance when

tightening screws and nuts or refuseing. No definite information relative to any such accident has yet reached the committee and it would be interesting to have such data, if such rumors are correct.

The work of the committee thus far indicates that the hazards in industrial work from switches will probably have to be differentiated from the general hazard when household use of appliances is considered.

It is interesting to note that a number of replies have been received from people who have not kept their records in such shape that the data required is available, but who offer to do so during the coming year. In this report the committee recommends that all those interested keep specific records of accidents with switches during the ensuing year on a simple form along lines to be published shortly, so that we can start from a common basis in studying accidents; with this in view the committee hopes to have the data in much better shape for the next annual meeting.

It is believed that a very considerable interest has been awakened in this subject and results of material value may be forthcoming. The committee has no specific position in the matter and does not at this time propose to make standards, but simply desires to receive and correlate information for the benefit of those who can use it.

The committee also feels that its work would be furthered and greater facilities for a wide application of its findings obtained by a slight expansion of the committee itself, and suggests that two or three more members be added; representing, perhaps, a manufacturer of switches, a large user of switches and a public service corporation or similar large installer of switches, particularly, if they can be found, persons who have kept or will keep definite accident record.

J. I. BANASH, *Chairman*,
S. V. JAMES,
M. G. LLOYD,
W. S. PAINE,
S. E. WHITING.

CHAIRMAN FORSTER: You have heard the report of the committee, which will be received and printed. I am sure the incoming Chairman will make the appointments Mr. Banash has suggested.

DISCUSSION

MR. DAN L. ROYER (Ocean Accident and Guarantee Corporation): Since I received the committee's letter we had an accident where a fan operator directed a stream of water into a fire in the roof of a fan-house; the stream came in contact with an open switch which was isolated, up in the roof, but the accident was fatal. The voltage was 2,200 D. C.

MR. E. B. TOLSTED: Do you know whether mine water or surface water was used?

MR. ROYER: No investigation into that phase was made.

CHAIRMAN FORSTER: It is well understood that ordinary fresh water is not likely to carry electricity from any moderate voltage for even short distances. There are, of course, exceptions.

MR. WILLIAMS: Could it have been possible that he inhaled carbon monoxide?

MR. ROYER: I would consider that possibility more or less remote. The house was right at the shaft of the mine.

MR. WILLIAMS: It might be interesting if you could get more detailed information and let our Electrical Committee have it.

MR. H. J. BURTON (Consumers Power Co., Jackson, Mich.): I happen to know of a similar experience. A man put some water on an open switch, probably ten or twelve feet up. He did not receive any shock. The voltage was 2,200. He was holding a brass nozzle and standing on a damp floor in the basement. He did not receive a shock, but the chief engineer came along soon afterwards and, owing to the fact that the insulation had been put in more or less of a bad condition, the chief engineer, in getting close to this switch, received a fatal shock. He did not come in contact with the switch.

SHOCKS RECEIVED THROUGH STREAMS OF WATER

DR. M. G. LLOYD (Bureau of Standards, Washington): There are a number of elements involved in determining whether you can get a shock through such a stream of water. It depends somewhat upon the purity of the water, of course, but perhaps most of all upon the distance away of the party, because beyond a certain distance from the hose the water is broken up into a succession of separate particles which do not carry a current. The distance in which the stream breaks will depend on a number of things, such as pressure, size of the stream and smoothness of the nozzle. You can hardly set a specified distance over which you get conduction. Under ordinary conditions, almost any over-head line is perfectly safe as far as firemen are concerned.

MR. BURTON: I know of another case of turning a hose on conductors which were close enough together so that contact was established; it started a slight fire.

CHAIRMAN FORSTER: Mr. Tolsted will now deliver the first of our set addresses. His papers are always full of meat, and he will talk, as he always does, straight from the shoulder. He also has a number of slides.

FLY WHEEL EXPLOSIONS AND THEIR PREVENTION

ELMER B. TOLSTED, FONDA-TOLSTED, INC., CONSULTING ENGINEER,
INDEPENDENCE BUREAU

In this discussion of flywheels an account of three accidents, which occurred within nine months' time in different mills of the same company, will illustrate the technical principles involved in preventing fly-wheel explosions.

In mill 1 on account of maintenance difficulty the engine stop was not in use. The engine flywheel and all the pulleys on the line shaft were of the flange-jointed type and all the pulleys on the line were of larger diameter than the driven pulley, and, consequently, had a greater rim speed than either the driven pulley or the flywheel.

The governor belt broke, the engine speeded up and all the larger pulleys on the line shaft broke. The governor belt being broken, the governor gradually decreased speed and finally cut off the steam. It was found that the engine flywheel had opened up because the elastic limit of the bolts had been exceeded; the flywheel was almost on the point of exploding when the engine stopped. It should be noted that the action of the governor was entirely satisfactory and all that could be expected of the governor.

The engine at mill 2 was of about the same horsepower but, having four cylinders, required only a five-foot flywheel and the small diameter made it possible to use a solid wheel. On one side of the engine five sheave wheels were driven by rope from the flywheel—what might be termed a "tandem" drive. On the opposite side of the engine were two sheave wheels. The engine was provided with a tachometer, with a belt-driven engine stop, and with an ordinary throttling ball governor. Pulleys were located beside each of the driven sheave wheels and inclined belts ran from these to the floor above.

One of the inclined belts tore, picked up a piece of pipe railing, and threw it at the engine governor, putting it out of commission. The engine speeded up at least 50 per cent but the engine stop did not work. All five pulleys on one side of the engine were broken, probably due to one pulley breaking and throwing parts at the others. The flying pieces did much damage about the engine-room. Finally a piece hit the steam pipe and broke it off; at the same time the engine stop was tripped by the jar and stopped the engine. It was found that a ring of oil had gummed around the engine-stop spindle just above a bearing, preventing the spindle from moving and thus preventing the stop from working. The stop had not been operated for five weeks, thus giving time for the oil to gum and cause this trouble.

The first accident showed the need of an engine stop to shut down the engine in case the governing equipment should fail and the second showed the need of maintaining the stop in working order.

THREE-ROPE DRIVE SAFEST

At mill 3 there was no overspeeding prior to the accident. On a previous visit to the plant attention had been called to the high speed of the line shaft and the possibility of a pulley exploding. One of the pulleys (of cast iron, with flange joints) did explode, the line shaft became unbalanced, and possibly bent, and the trouble traveled along the shaft to the other pulleys. It seems probable that after the first pulley broke, partly unloading the engine, the governor belt slipped and the engine was allowed to speed. This indicates that a three-rope drive, which is much less likely to permit slipping than the single belt drive, should be used. It also bears out the contention that pulleys are often run at dangerously high speeds and may explode even without overspeeding of the engine. The damage involved was in the neighborhood of ten to fifteen thousand dollars.

With these three accidents in mind let us analyze the subject further.

Statements have been made frequently that exploding flywheels cause more damage than exploding boilers; whether or not this statement is true, it is true that State and city regulations practically disregard flywheels, while we have boiler regulations wherever we turn. It must be only a question of time when regulations and laws will protect lives and property against flywheel accidents, as they now protect them against other hazards.

The limiting speeds for flywheels and pulleys of the best design have been determined theoretically and by tests, and the figures agree very well. We know that a given wheel cannot speed beyond a certain point without giving way, and the speed depends among other things upon the type of wheel.

Users of flywheels have bought their engines and other machinery equipped with flywheels, and they have assumed that the flywheels were safe for the speeds specified. Some purchasers have gone further than this. They have treated their flywheels and pulleys as they would their automobiles and they have run them at as high speed as conditions outside of safety would permit. They have learned that faster working machines, in many cases, increase output and they have speeded up without giving the flywheels or pulleys a thought.

Nearly all factory men have heard that the belt has a limit of speed beyond which there is disadvantage in going. This has been the salvation of the pulley for it has held down the rim speeds of pulleys. It should be remembered, however, that a split cast iron pulley, or a flywheel with a flanged joint, carrying a belt which runs at 5,000 feet per minute is going altogether too fast. A solid cast iron pulley can run at about 6,100 feet per minute and still have a factor of safety of 10, which is the figure that should be used in pulley and flywheel work.

Unfortunately, the correct speed for the belt does not always hold down flywheel speeds. For example, one might have an engine direct connected to a line shaft having pulleys, let us say four feet in diameter. This engine might have a flywheel ten feet in diameter. The flywheel speed could then be in the neighborhood of 12,000 feet per minute without overspeeding the belts.

COMPUTATION OF STRESSES

There are three types of wheels in common use: The flywheel with a single piece rim, the flywheel with a split rim and a link joint and the flywheel with a split rim and a flange joint. The solid wheel can be used only if the diameter is less than ten feet, on account of the difficulties in construction and shipment. The link-jointed wheel can be conveniently adopted only where the rim is thick and, since such a rim is not frequently used for belt or rope driving, where such a drive is necessary a solid wheel or a flange-jointed wheel is used.

One can usually get an idea of the safety of his flywheel equipment from the rim speeds, but since the computation of the rim speed requires the multiplication of three figures, namely, the revolutions per minute, the diameter of the wheel and the constant π , it has been found

more convenient to omit the constant π and to think of flywheels in terms of the revolutions per minute and the diameter.

The following tabulation shows the product of the revolutions per minute and the diameter, which should not be exceeded, if it is desired, to keep the factors of safety at 10, or above:

- (a) For solid cast-iron flywheels the product of the revolutions per minute and the diameter (in feet) should not exceed 1,937.
- (b) For link-jointed cast-iron flywheels the product of the revolutions per minute and the diameter (in feet) should not exceed 1,500.
- (c) For flange-jointed cast-iron flywheels the product of the revolutions per minute and the diameter (in feet) should not exceed 968.

If, in any case, it is found that the product referred to above exceeds the figures suggested for the type of wheel which is operating, a further investigation of the conditions should be made.

The diameter referred to above is not to be taken as the outside diameter of the wheel but as the mean diameter of the rim.

From Marks, Kent and similar handbooks, we may obtain formulae for centrifugal force which can be finally worked into the following:

Stress in a cast-iron rim, due to centrifugal force, equals $.0002664 (RD)^2$.

If we take the accepted figures of 10,000 pounds per square inch as the maximum tensile stress which a cast-iron rim is capable of withstanding, and use a factor of safety of 10, which means an allowable stress of 1,000 pounds per square inch, we have:

1,000 equals $.0002664 (RD)^2$ or RD equals 1,937.

A joint in a flywheel is like a riveted joint in a boiler, in that one cannot exceed a certain efficiency. For a flange-jointed wheel this maximum efficiency is 25 per cent. Therefore, while we can allow a stress of 1,000 pounds per square inch in a rim of the solid wheel, we should limit ourselves to 250 pounds per square inch in the rim of the flange-jointed wheel. Then, in this case:

250 equals $.0002664 (RD)^2$ or RD equals 968.

Because the efficiency of a link-joint does not exceed 60 per cent—600 equals $.0002664 (RD)^2$ or RD equals 1,500.

STRESS INCREASES WITH THE SQUARE OF THE SPEED

Now, having the speeds of several wheels at which we will have factors of safety of 10, the next question to be determined is the probable bursting speed. Since the stress increases with the square of the speed, it follows that the wheels can operate not ten times as fast but $\sqrt{10}$ times as fast as is indicated by the figures above, before they will actually burst. The $\sqrt{10}$ is approximately 3.16, therefore, the highest speeds which wheels are likely to be able to attain are:

- (a) Solid wheels 6,120
- (b) Link-jointed wheels 4,740
- (c) Flange-jointed wheels 3,059

In order that the approximate factors of safety of wheels may be known, the following formulae may be applied:

For a solid wheel the factor of safety equals $\frac{(1937)^2 \times 10}{(RD)^2}$

For a link-jointed wheel the factor of safety equals $\frac{(1500)^2 \times 10}{(RD)^2}$

For a flanged-jointed wheel the factor of safety equals $\frac{(968)^2 \times 10}{(RD)^2}$

As explained above, the figures given are those for wheels with the best possible design of joint.

Therefore, if you make a computation from any of the formulae used above you may be sure that your wheel is not better than the result obtained from an application of the formulae but that it is less good if the design is not of the best.

The engineer who is called upon to investigate a flywheel finds it necessary to measure that wheel very carefully and to make practically a duplicate of the original flywheel drawing. From this he determines the stresses in the various parts of the wheel. Link-jointed wheels and flange-jointed wheels furnish complicated mathematical problems for him. A few assumptions are necessary. Most of these happen to fall on the side which would indicate the flywheel to be safer than it is, so that, when the engineer has made his computation, he can only say to you: "I know that the stresses are this high and I do not know how much higher they may be. Similarly, I know that the factor of safety is not above this figure."

One assumption which is frequently taken exception to but which, nevertheless, is justified, seems to fall on the side of indicating the wheel less safe than it actually is. This assumption is to the effect that the flywheel is a ring revolving in space. In other words, it assumes that the spokes do not tend to hold the wheel together. While there are undoubtedly wheels which are partially held in place by the spokes there have been enough cases proven of actual compression against the spokes to justify those who calculate wheels in considering that the spokes at least do not help to hold the rim together.

LINK-JOINTED FLYWHEELS REQUIRE INSPECTION

If the engineer could watch the erection of the flywheel and could make a record of the conditions existing as the flywheel goes into place much that is later questioned could be answered. I have in mind a corporation in Chicago which erected a power-house and put in a number of reciprocating engines. Link-jointed flywheels were used, since the engines were direct connected to generators and since belts and ropes were unnecessary. When the last link was cooling down, after it had been shrunk in place, it broke. This made the company which had bought the wheels suspicious and they drilled a small hole in each of the other links. Although the link was several inches wide and the hole was probably only one-fourth inch in diameter the removal of this small amount of material was of sufficient importance so that several

other of the links broke. The reason for the breakage was that the links had been made too short in the first place; consequently, it had been necessary to heat them very hot and as they cooled to the room temperature the stress put in them was too great. It exceeded the strength of the link in only one case, but had the other wheels been run up to speed it is quite possible that all of them would have broken. Had the erecting engineer carefully measured the link itself and the place where it was to be fitted he would have been able to have determined the stress that would have been put in the link after it had cooled, or had the company's engineer noted the high temperature to which the links had been heated he would have known that there was something wrong in the design.

Any company which has important wheels to set up should assure itself that matters of this kind are not overlooked, since it is practically impossible to determine conditions after erection without tearing the wheel down.

CAUSES OF FLYWHEEL ACCIDENTS

While the principal cause of flywheel accidents comes from overspeeding, which may be normal or momentary, there are many contributing causes and several independent ones. The principal divisions are overspeeding, overloading, and failures due mainly to defects, flaws and improper handling. The causes of overspeeding may be divided and subdivided as follows:

- (a) Normally high speed not necessarily exceeded when wheel breaks. (Failure due to this cause is frequently in combination with "a," "b" or "c" under the next heading.)
- (b) Breaking of engine parts.
- (c) Breaking of engine belt.
- (d) Engine belt running off flywheel.
- (e) Breaking of governor belt.
- (f) Slipping of governor belt.
- (g) Governor belt running off pulley.
- (h) Derangement of governor, which may be subdivided as follows:
 - 1. Struck by flying parts.
 - 2. Failure of governor pulley.
 - 3. Loose or lost set screw.
 - 4. Loose or lost key.
 - 5. Gear or gears broken.
 - 6. Fly ball off.
 - 7. Parts broken or sheared off.
 - 8. Insufficient lubrication.
- (i) Derangement of governor valve gear.
- (j) Loss of load (frequently when an engine speeds slightly, the first act on the part of men operating machines is to throw off these machines. This increases the likelihood of the engine speeding.)
- (k) Circuit breaker blown out, burning out of armature, or electrical load otherwise dropped.
- (l) Improper adjustment of engine stop, governor, or valve gear, or governor or valve gear parts blocked or otherwise made inoperative, or engine stop out of commission.

Overloading may be divided as follows:

- (a) Clogging of machinery in mill.
- (b) Unusual number of machines forced at same time.

- (c) Careless or ignorant handling of friction clutches.
- (d) Short circuit of driven electrical machinery.
- (e) Sudden stoppage of engine.

Some of the miscellaneous causes of flywheel accidents may be divided as follows:

- (a) Failure of wheel due to flaw.
- (b) Failure of wheel due to improper material. (For instance, too high a percentage of phosphorus in a wheel is likely to make it brittle. Jobbing foundries frequently use phosphorus for small moulds, which must flow readily. The effect of phosphorus in iron is to make it flow at a lower temperature than if the phosphorus were not present.)
- (c) Failure of wheel due to crystallization.
- (d) Failure of wheel due to internal stresses.
- (e) Failure due to accidents to engine.
- (f) Failure of wheel due to improper design.
- (g) Failure due to dirt or foreign materials carried in rim.
- (h) Failure due to holes drilled in rim.
- (i) Failure due to increasing diameter by adding on to rim.
- (j) Tight keys.
- (k) Wheel struck by flying objects.
- (l) Belt pull.
- (m) Loose bearings.

Of the above causes derangement of the governor is probably the principal one, and broken belts the next most important one.

REMEDIES FOR DANGEROUS CONDITIONS

Generally speaking, remedies which can be applied for the prevention of flywheel accidents may be found among the following:

- (a) Better governors.
 1. Triple rope drive instead of single belt drive for governor.
 2. Governor sheaves to be keyed and the unused portions of keyways to be filled in.
 3. Governor sheaves to have suitable guards of substantial construction.
 4. Safety cams on all Corliss valve gears.
 5. Guards around governors.
 6. Governor gearing enclosed in oil-tight covers, readily detachable for inspection.
 7. Couplings, set screws, keys, bolts, etc., in moving parts countersunk.
 8. Better care of governors.
- (b) Better care of engine parts, belts, etc.
- (c) Lower flywheel speed.
 1. Two small wheels instead of one large one.
- (d) Solid wheels instead of jointed wheels, or link jointed wheels instead of flange jointed ones.
- (e) Steel, wood or other wheels adapted to high speeds instead of cast iron wheels.
- (f) Better design of equipment.
 1. Avoidance of overload.
 2. Arrangement of steam piping to avoid breakage.
 3. Avoidance of materials fastened on outside of pulleys or flywheels, and avoid holes drilled in such pulleys or flywheels.
 4. Locate engines and equipment so that the least possible damage will be done in case of breakage.
 5. Space in flywheel pits for broken belts.
 6. Signals from engine room to machine room, and vice versa.
 7. Engine stops.

8. Automatic valves on boilers.
9. Bracing of dangerous wheels with tie rods.
10. Frequent operation and testing.

THE BETTER TYPES OF WHEELS

The table below, which is made up for 10-foot cast iron wheels, shows the *relative* balancing effect of wheels at various speeds, the factors of safety of two types of wheels, the increase of speed necessary to break the wheels, and relative elapsed time necessary to reach breaking speed. It should be understood that the balancing effect and the time necessary to reach breaking speed are relative figures only.

TEN-FOOT DIAMETER CAST IRON WHEELS

Revolutions per minute	Balance effect	Flange Jointed Wheel			Solid Wheel		
		Factor of safety	Increase of speed necessary to break	Time to reach breaking speed	Factor of safety	Increase of speed necessary to break	Time to reach breaking speed
96.87	1.	10.00	2.16	1.	40.00	5.32	4.33
150.00	2.41	4.16	1.04	0.84	16.62	3.08	4.18
193.74	4.00	2.50	0.58	0.67	10.00	2.16	4.00
306.00	10.01	1.00	0.00	0.00	4.00	1.00	3.33
612.00	40.00	.....	.....	.....	1.00	0.00	0.00

Referring to the table above, the advantage of the solid wheel over the flange-jointed wheel is readily understood. Take, for instance, the third line of the table. This assumes a 10 foot wheel to be operated at approximately 194 revolutions per minute. The balancing effect of two wheels is naturally the same. The factor of safety of the solid wheel is four times as great as that of the flange-jointed wheel. It must be increased in speed another 216 per cent before it breaks, whereas the flange-jointed wheel need be increased only 58 per cent. While this increase is going on the engineer has six times the time to get the engine stopped that he would have with the flange-jointed wheel. If, for instance, the time with the flange-jointed wheel should be ten seconds he would have a full minute to stop an engine carrying a solid wheel. Few engineers could be expected to get the steam shut off of their engines in ten seconds; most of them could do it in a minute if they had the nerve to make the attempt.

Solid cast-steel wheels or built-up steel wheels are capable of running at higher speeds than cast-iron wheels. Wooden wheels also may run faster than cast-iron wheels, providing they are properly made. A well-made wooden wheel may be run about 54 per cent faster than the best cast-iron solid wheel, and a well made built-up steel wheel may be run about 88 per cent faster than a solid cast-iron wheel. Usually, however, cast-iron wheels are adopted because of their lower cost.

It is unfortunate that the subject of the hazards of flywheels cannot be completely covered in a paper of this length. For instance, it is regrettable that there has not been space to discuss the requirements which an engine stop should meet. The engine stop should be considered to be one of the best protections against the flywheel hazard, but every care should be taken in choosing the engine stop. If, for instance, an engineer is slowing down his engine with a fair chance of getting the steam shut off before the flywheel bursts and the engine stop takes hold of the throttle, winds his arm into it and becomes blocked with the throttle half open, then neither the stop nor the engineer can avoid a flywheel explosion. This has actually occurred.

DISCUSSION

A MEMBER: What means have you of determining whether the wheel is solid or whether there is a hidden flaw?

MR. TOLSTED: Go over the wheel carefully with a hammer and listen to the ring; this will determine whether the wheel has or has not flaws.

MR. ROYER: At one time we had big, slow-moving wheels. At present, to compete with steam turbines, we must have smaller wheels; as a result there have been valuable changes in wheel design. John Fritz, the well-known rolling mill man, developed a link-joint wheel; you will find this type in the rolling mills in the Pittsburgh region; it was generally adopted on ammonia compressors and equipment of like nature. Later on, however, Mr. Fritz recognized the point brought out here and attempted to pour a large solid wheel, but the wheel, when uncovered, was too hot and it cracked. He had the same trouble with a second wheel and gave it up. You cannot get a solid wheel because it is an impossibility from an engineering standpoint, but there is a wheel on the market with a special design (indicating on blackboard) and it will run, according to design, up to 6,000 feet a minute—the so-called pad-jointed wheel.

CHAIRMAN FORSTER: I will ask Mr. B. K. Spencer to deliver his address.

THE BREAKDOWN OF ELECTRICAL MACHINERY

B. K. SPENCER, ELECTRICAL ENGINEER, THE TRAVELERS, HARTFORD, CONN.

Breakdown insurance on electrical equipment is something very new to the general public, but it is a subject which has been given a great deal of thought by all insurance companies for several years. The rapid strides in the advancement of the electrical industry has created a demand for a great many new devices in the industry and has also created a demand for this type of insurance. At the present time the industry is rather quiet, from a construction point of view, but this merely gives the operating and construction engineers a greater opportunity to think about the problems connected with it and to prepare for the rapid strides which will be made in the near future. We have already noticed that the upward trend of the curve has started and that all indications are for a remarkable advancement in the next year.

PROCESS OF ELECTRICAL INDUSTRY

According to recent records covering central stations, in this country, the increase in electrical generators in that class of plant has been 109 per cent in nineteen years, or an average of 57 per cent of the original amount per year. Prime movers have increased at the rate of 47 per cent per year. Just think of an industry which doubles every two years. The total capacity of generators in the central stations in the country on Oct. 1, 1921, was 14,466,915 kilowatts. The increase per year, for the previous nineteen years, has been approximately 700,000 K. W. a year and we have no reason to expect less in the future.

I might go on to give examples of the extent of the use of electricity in industrial work and the extent to which power is generated and transmitted, but this would avail nothing in this discussion, inasmuch as the future development which we can see in our mind's eye is so much greater than the present status of the industry. Engineers can easily see in the territories, in which they are familiar, innumerable places where more electric energy can be utilized, and to greater advantage. When all these are developed, immense amounts of power will be necessary to take care of this demand. Engineers have already planned for the generation of power on a large scale and for interconnection between superpower plants to accomplish the generation and distribution of power more efficiently, and we can certainly expect to see the completion of a great many of these projects within a few years.

INSURANCE COVERAGE

Let us see now what this new insurance is and what has been done toward the development of the line. At the outset it was decided that the coverage on the policy must be of the very broadest possible sort, in order to give the assured no opportunity for dissatisfaction in connection with it. We have found in the past that the greatest dissatisfaction on the part of the assured has been because of incomplete coverage. Every effort was accordingly made to afford a policy void of "jokers," so-called, and the result is a policy which is probably the broadest of any policy form written at the present time.

In order to approach the ideal condition of complete coverage, which has long been considered so desirable by insurance companies, the Travelers decided upon a combination policy form known as the "machinery policy." In this policy any electrical machines may be insured in the same contract with steam engines, steam turbines, water turbines, flywheels, etc. Under "electrical machines" any type of electrical apparatus, with the exception of lightning arresters, lifting magnets, heating elements, electric lamps, magnetic chucks, batteries and vacuum tubes may be insured. The assured wants absolutely complete coverage and with this policy we are affording him as nearly as possible what he is after.

Under our contract we agree to indemnify the assured by payment to him, or in his behalf, in the event of an "accident" to any machine insured, for loss or damage to the machine or other property of the assured for which is legally liable. Liability for injury to public or employees may also be covered, if so desired. Any "sudden, substantial

and accidental breaking, burning out or disrupting" of the machine or any part of it, which immediately necessitates shutdown of the machine, is termed an "accident."

Just see how broad this is. The more you think about it the broader it gets because there is no mention of *cause* and the coverage is not, therefore, limited by cause. Of course this policy does not contemplate payment of losses while machines are being operated in an extraordinary manner, such as on test; nor does it pay for losses which are specifically covered by other recognized forms of policy, such as fire, inundation, strike, riot or civil commotion. There would be no advantage making a policy as broad as that. As it is, the policy covers not only complete loss of the machine or a catastrophe, but also all burn-outs, whether complete or partial, and innumerable small breaks which are usually repaired by the assured's own men, and which, therefore, constitute no extra expense, but nevertheless must increase the maintenance account. These accidents are considered as maintenance by the assured and in most cases constitute a large part of the total maintenance expense.

In addition to the above we furnish special coverage known as "use and occupancy," "consequential loss," and "deductible liability." Use and occupancy is provided at an extra premium to indemnify the assured for complete or partial loss of production resulting from an accident to any of the machines listed in the policy and operated by the assured. It also covers the suspension of operation in his plant resulting from the kind of accident contemplated, to any or all electrical machinery supplying such power. Indemnity is furnished up to a certain limit for each day of suspension of operation. And this indemnity may run for 100, 200, 400 or more days' duration, depending upon the amount of insurance purchased. It may also commence on the eighth midnight after the accident or at a previous date, depending on the amount of premium paid. Consequential loss provides indemnity at an additional premium against indirect loss resulting from an accident to the electrical machinery insured. The direct-damage policy furnishes protection against all damage resulting directly from an accident or in a continuous sequence of physical events, but when an accident sets up a new condition of affairs and as a result of this condition further damage eventually results, such as the freezing of flowers in a greenhouse due to a boiler explosion, this is called indirect damage or consequential loss. Deductible liability allows a considerable reduction in premium, providing the assured agrees to pay the first \$50.00, \$100.00 etc., of any loss to his machines. Any loss which exceeds the amount of the deductible liability is paid for by the insurance company.

TYPES OF ACCIDENTS

To illustrate the ease with which accidents may occur and the breadth of coverage under our policy, I would like to cite one or two incidents of damage brought about by various insignificant causes and by conditions which are found very commonly in a great many plants today.

A large-size modern generator of low speed was being installed and had recently been tested out and placed on the line with a fairly large load. One of the small pieces of iron used for ventilating fans and attached to the spider of the machine became loose, probably due to vibration during shipment, and broke off and became wedged in the air gap. Before the machine could be taken off the line and stopped the piece of iron had torn the insulation off from a dozen or more of the coils and the result was damage to the extent of several thousand dollars. This is only one of thousands of small things that may come to light in the installation and operation of new machinery.

In a certain power system having several plants, one of the stations had been receiving regular systematic inspections by the employees for several years, but at one of these inspections a certain man failed to look at the contact bolts on a set of disconnecting switches and a few days later this switch was subjected to quite a heavy load and the contacts become very hot. After this heating commenced the increase in heat came so rapid that the damage was all done before any of the operators noticed the trouble. The switch began to arc and the arcing became so severe that high-frequency surges were set up, not only in the station but in all the outside feeder circuits, and the result was the burn-out of three motors, one generator and a transformer, to say nothing of the disconnecting switch which started all the trouble. This is an example of the care which is necessary in inspecting even the small items and the frequency of inspection necessary to protect the equipment.

A few months ago there occurred a very serious explosion in the Niagara Falls plant of the Ontario Power Company. The trouble started from an ordinary short circuit on one of the lines. This might have been due to any small disturbance on the line, nobody knows just what, but at any rate a short circuit occurred and the trouble began. Two large generators were carrying the load at the time of the trouble and were also connected to other generators in another plant, but the overload immediately caused the outgoing feeders and the second generator to be disconnected automatically. For some reason, probably the slight sticking of the governor valves, this generator ran at a very high speed when the load was disconnected and the generators in the other power plant ran with it as motors at the same speed. This increased the voltage on the other generators to such an extent that the operator was obliged to disconnect them, and the minute he did this the first generator ran at a greatly increased speed and burst. Pieces of the motor went in all directions, tore out the steel roof supports and allowed the steel and concrete to fall on another generator and a water turbine, breaking a hole in the water turbine and allowing the water to come in and flood four other generators. This is all direct damage, under our policy, and had we been covering this equipment at the time of the accident we would have been obliged to pay for a complete replacement of the two large generators, repairs to two water turbines, and probably complete rewiring of four generators, to say nothing of the extensive damage to the building and other appurtenances.

NO TWO ACCIDENTS SAME WITH ELECTRICAL EQUIPMENT

The cases mentioned do not begin to touch on the various causes of accidents. Every operating engineer will tell you that almost no two accidents are the same in dealing with electrical equipment. Each accident is a separate and distinct problem in itself to try and determine the specific cause of the trouble. In the majority of cases the cause remains more or less of a mystery and the best it is possible to do is to get an idea as to the general nature of the trouble. Surges on the line, lightning, breakdown of insulation, overloads, high and low voltage, starting strains and synchronizing, loosening of the coils and parts of the machine, and the mechanical failure of the motor are a few of the things which may result sooner or later in breakdowns, burn-outs or complete disruption of the unit.

In order to insure all cases of electrical equipment and to determine the correct rates for each, it was necessary for our engineers to make a detailed study in co-operation with other engineers, for the purpose of arriving at a rate which was adequate and yet not excessive. Insurance rates should be based on insurance experience, but the next best thing was to take actual operating experience, over as broad a spread as we could possibly obtain it, and use it for a basis. About a year was spent on this work and a very large volume of experience was recorded. We made up a questionnaire form, sent it out to all classes of operating companies, and they gave us a record of the different machines in operation, length of time operated, number of accidents, extent of loss, etc. By collecting this data, analyzing it, and drawing up curves, we were able to determine a loss frequency and extent of loss for all different classes of equipment. It is not sufficient to merely reflect the probable extent of loss for one accident, but necessary also to reflect the probable loss frequency. Some machines break down frequently, but all losses are small; others run along for years, but when they do go the result is disastrous. It was necessary that our rates reflect all conditions and this we believe was accomplished. It is not necessary at this time to go into all the details of arranging the losses or the method of calculating the rates. It is sufficient to say that a great deal of time was spent in trying to simplify the method of rating without sacrificing its flexibility and accuracy.

USE OF PERCENTAGES AND CLASSIFICATION TABLES

Everything about the rating system was arranged and laid out just as you would lay out a power plant, with the idea of allowing for future expansion. The more common types of machines were arranged in a classification schedule—generators, motors, transformers, etc., of different kinds of currents and different voltages being given certain classification numbers. These numbers refer to different classification tables in which the insurance rate varies about 10 per cent per table. In other words, starting with table No. 10 as a basis table No. 11 was made by increasing the rates about 10 per cent.

In the classification tables above referred to are given insurance rates for machines of different capacities and different speeds. There are

two steps to be taken in obtaining these rates: First we take the object rate as given in the table and to that add an insurance rate which is 1 per cent for each \$1,000 of insurance applying to the machine in question. The object rate reflects the hazard of different types and capacities of machines on account of their varying costs of replacement, and the insurance charge reflects the additional hazard on account of excessive limits of insurance, which, of course, increases the company's liability for possible damage to surrounding property. If public or employees are covered there is another charge which must be added and for each risk, regardless of the number of machines operated, we have a location charge of a few dollars.

At the present time miscellaneous equipment, such as switchboards, feeder regulators, oil switches, reactor coils, etc., are placed in a group called miscellaneous non-rotating equipment, but just as fast as it is possible to obtain the necessary insurance experience on this equipment such machines will be specifically rated and placed in the classification schedule and given a classification table number. In this way the rate may be adjusted for different classes of machinery and for different conditions of operation, so that one class of equipment will not suffer from higher rates on account of poor experience on another class. For instance, it may be necessary to increase our rates for oil switches, but that will not necessarily increase rates for motors or generators, but will allow us to decrease these rates if we find it is possible to do so.

A statistical system has been worked out and is being followed very closely on all risks so that after two or three years' experience we will be able to tell exactly what the rate should be for all classes of apparatus, all conditions of operation, all types of plants, all geographical locations, etc. In the future, as our volume of business increases and our losses accumulate, we will be able to draw from our records an insurance experience and revise our rates as needed. However, from the indications of the last six months, I think we can safely say that very little revision will be needed in the rates of most types of apparatus. The rates seem a little high to some, but this is usually because they do not appreciate thoroughly the breadth of coverage.

ENGINEERING AND INSPECTION SERVICE

With the advancement of the electrical industry comes a condition similar to that which we have experienced in connection with the automobile industry. The larger the number of users the greater the number of inexperienced operators and the greater the number of accidents from causes we are able to control by instructive literature and recommendations resulting from inspections. Already we see evidence of the small and medium size users of electricity buying equipment from the manufacturers and taking it for granted that this equipment is made "fool-proof" and that all they have to do is to connect it up with a few wires and throw in a switch and forever after obtain power in unlimited quantities without any trouble whatsoever. Sometimes they are fortunate and have very little, if any, trouble, but usually they have a great number of accidents and they immediately try to place the blame on the manu-

facturer. Right here I wish to emphasize the need of co-operation on the part of the manufacturer in this new line of insurance. Our policy covers all accidents, whether caused by faulty construction and materials or not, and for this reason it protects the manufacturer against unreasonable demands from a customer, for payment of losses which are due entirely to poor operating conditions. We have every reason to hope for this co-operation and are already receiving it to some extent.

One class of accidents is referred to above and consists of that due to neglect or ignorance on the part of the operator. There are other classes of accidents, however, which are almost, if not quite, uncontrollable. In this class come burn-outs and breakdowns caused from lightning, surges on the line, operators' mistakes during periods of extreme stress, etc. Such accidents require an entirely different scheme of treatment, but still we feel that we will be able to reduce their frequency.

Most people are more or less familiar with the service which is granted under our boiler policy and it is generally agreed that this service is of inestimable value to the assured and in some cases of even more value than the protection afforded by the policy. In a great many cases boilers are insured for the inspection service alone. There is quite a difference of opinion amongst various insurance companies as to what form the engineering and inspection service should take, in the electrical machinery line, but of course I can only cite what the Travelers' plan is in this respect.

Boiler, engineering and inspection service is a mechanical proposition and our problem is really to satisfy our engineering requirements, either by specification, supervision of manufacture and finally test in the shop, or by a rigid inspection by trained men, under actual operating conditions and recommendations which will bring the boiler up to our engineering standard from a mechanical viewpoint. Care and management have a great bearing, of course, but are not given as great weight as in electrical machinery insurance.

ENGINEERING PROBLEM RATHER THAN ONE OF INSPECTION

In electrical machinery we have an entirely different proposition. A motor or a generator is a mechanical as well as an electrical machine, to be sure, but the best make of motor or generator, if put into operation and subjected to poor operating conditions, dust, gas, heavy starting duties, overloads, etc., is no more immune to trouble than a poor grade of machine. There are innumerable things to be considered, not only as regards the manufacturer of the equipment, but also the operating conditions, care and management, etc. In other words, our service on this line is mainly an engineering problem and not to such a degree a question of inspection of the mechanical condition of individual machines.

By this I do not mean to imply that we do not give inspection service. Inspections several times a year are valuable, not because they keep the machines from breaking down, but because they set a good example to the operators and operating engineers and create an incentive to better operating conditions. We call this the improvement of the moral hazard. Tests of machines and detailed inspections from a mechanical standpoint

are valuable only in so far as they teach the operators themselves to do the same sort of inspecting at much more frequent intervals. Most plants require some sort of inspections of some of the equipment at least every day, other inspections must be made weekly, monthly, etc. It is our problem to give the assured an engineering service, but not to the extent of performing the actual installation and test of his equipment. In this respect we are like the consulting engineer who is called in by a client, makes a thorough investigation of his equipment, operating conditions, etc., but does no more than report on conditions, write specifications and supervise the changes. The client must arrange for the rest. Similarly, our engineering service takes the forms of a survey and analysis, with recommendations, after writing the business, which will tend to improve the general conditions surrounding the risk and to reduce the number and extent of the losses.

In the first place, we make an engineering survey of every risk. We have special forms made up for this purpose which bring out in detail questions as to individual machines we are interested in. Our inspectors bring out all these details very carefully and also all conditions of operations or any which may affect the good operation of the machines. After this original survey we are in a position to decide whether or not the risk is one we can afford to accept and at frequent intervals later we make further surveys as often as we find it necessary to keep the risk in good condition. Wherever it seems necessary, or where we are so requested by the assured, we are in a position to make tests of the equipment. However, such tests are usually of very little value and we do not often recommend them. Of course, in plants using high voltages it is often necessary to make tests of insulation resistance and the dielectrical strength of the oil at frequent intervals, but we do not expect our inspectors to go into this matter in detail unless it is so desired and requested by the assured. We teach the assured how he can do it himself or recommend to him a desirable means of having it done.

SAFETY TO LIFE AND TO MACHINE

Our great problem in this line seems to be to keep the good will of the assured and all employees of the assured to the extent that they will be anxious to co-operate with our inspectors and carry out the suggestions sent them by correspondence, and in this way real results can be obtained. No matter how good our inspection service may it is hopeless for us to try to accomplish anything in the way of reduction of accidents unless we obtain this close co-operation with the assured and his employees. Our policy coverage is so extremely broad that any deliberate or misguided act on the part of the man in the plant might easily do a great amount of damage to the equipment we are insuring. The moral hazard of the risk, as explained above, is the really important thing and is given by far the greatest place in our underwriting consideration of the risk. Other points brought out by our inspector's survey are also given due consideration, but only such as they deserve.

One feature of our engineering service which is being given a great deal of thought and consideration is the relation between safety measures

for the protection of life and limb and safety measures for the protection of the machines. We are convinced that these go hand in hand and anything which we can do in any industrial plant, power plant, etc., to improve the conditions under which the machines are operated and to make conditions safer for the operators will be a great step toward cutting down the number of losses to the machines. When we put guards around motors and generators this not only prevents employees from getting their hands on live wires or getting caught in the machinery, but at the same time prevents any such action on their part from short-circuiting the winding or breaking the machine. Signs are placed around the plant to warn the operators and public of live wires, but also to prevent a serious accident due to someone touching the wires and causing a short-circuit which would set up a surge on the line and possibly burn out two or three pieces of apparatus.

PROGRESS BEING MADE

All things considered, the new line has made very remarkable progress. The business we have written has been of the best, as we have succeeded in detecting those risks which were in bad condition, and yet our volume is much larger than we have ever experienced on other new lines and represents a much broader spread. The business is well distributed over the country and we have a number of large risks as well as medium size and small ones. We have also taken on a great variety of apparatus and our experience in the next two or three years should prove of great value in the way of formulating more accurate and representative rates for the unusual types of apparatus. The large operating companies have shown a great deal of interest and some have already taken out the insurance. Others are thoroughly sold to the necessity of the coverage and the advisability of taking it, but are waiting to gather their records together and to allow themselves sufficient time to thoroughly analyze the coverage and rates before taking a step which transfers such a large amount of responsibility and capital from their company to ours. Without a doubt electrical machinery insurance will fill a long felt need and will prove to be a great service to all classes of the industry.

DISCUSSION

CHAIRMAN FORSTER: Does the electrical machinery break-down insurance cover loss from fire, for example, in the alternator?

MR. SPENCER: The policy covers any loss to the machine from fire starting in the machine, but not damage from fire which starts outside of the machine. If the machine is burned out that is considered a burn-out and not a fire.

CHAIRMAN FORSTER: Do you consider that in power stations, where there are good-sized alternators, or, perhaps, large motors, an ample supply of water would minimize fire loss?

MR. SPENCER: Water is used, and it lessens the risk a great deal, but other things are used first. Fire extinguishers are not always the best things to use, especially where there is apt to be gas. In an oil-switch fire, the ordinary fire extinguisher is worse than nothing—it

merely creates a blanket which the gas forces out and shoots the flame into the room, causing more of a conflagration than you had previously. For that reason, I think water or sand or something of that sort is much better. Steam is used wherever available.

A MEMBER: Dealing with oil-switch fires, you say that carbon tetrachloride and soda-acids are not effective. Dealing with generator fires on a closed generator system, would it not be possible to use carbon tetrachloride?

MR. SPENCER: I think carbon tetrachloride is very good, indeed, where you can get it in a closed space, or where there is not apt to be gas. There is danger of the blanket causing expansion of gas, increasing its pressure, and, in that way, throwing the flame out into the room and causing more damage. As to CO_2 and carbon tetrachloride in a closed space I think it is very satisfactory. As far as "firefoam" is concerned, I haven't had much experience with it, but I am inclined to believe that it would be no more satisfactory than carbon tetrachloride.

CHAIRMAN FORSTER: The pump extinguisher is water plus CO_2 gas to make the foam, and you have water with its conductivity, but the impression I have gathered, after ten years in the field, has been that while smaller stuff may do in incipient fires, it is not enough in a big fire. If the trouble grows you want water, in large quantities, and nothing else. I think the tendency today is to provide water.

STEAM JETS INSIDE TURBO-GENERATORS

MR. ROYER: In Colfax they have an automatic sprinkler control, haven't they, Mr. Spencer?

MR. SPENCER: Yes. I do not know the details, but they have steam jets inside the turbo-generators which are automatically controlled by the temperature. In case the temperature exceeds a certain point they open up and extinguish the fire.

CHAIRMAN FORSTER: What damage would occur if they opened up accidentally?

MR. SPENCER: A great deal, probably. That was brought out very forcibly in the accident I spoke of on the large generator, which blew up, brought the roof down and let water in. Here we had a case of flooding three generators and so much water got into the winding that it was necessary to rewind the machines.

MR. BURTON: It has been the practice of our company to install steam-jet extinguishers on all our generators. They are not automatically controlled. The steam valve is operated manually from the generator-room floor and detailed instructions for use of the steam-jet extinguisher are posted in front of the valve. We have found the use of steam jets in this work to be very satisfactory, more satisfactory than the use of water. After use the equipment can be dried out more quickly and more satisfactorily than if water were used.

MR. ROYER: At Colfax, don't you have a thermometer on the main operating board for each unit?

MR. BURTON: Yes; we have a thermometer the readings of which are taken periodically and put on the switchboard by the switchboard operators.

MR. SPENCER: Was not the thermostat arrangement originally installed there?

MR. ROYER: It might have been. They tried it, but took it out.

MR. SPENCER: What sort of steam do you use—super-heated?

MR. BURTON: It is a super-heated steam.

MR. SPENCER: That is probably why you do not have much soaking in the windings.

MR. BURTON: Unless it is used for a very long period there is practically no difficulty in drying out the windings.

Mr. Spencer, to what extent does your work cover ordinary maintenance—where a routine system is followed? If a test is made on windings, it is frequently found necessary to replace certain parts. It may be necessary to replace connections on the generator, to replace coils; to rewind the armature. Do you intend insurance to cover charges which might be considered negligence?

PROVISIONS OF INSURANCE POLICY

MR. SPENCER: We agree to cover breaking or burning out of any part of the machine, whether it is in operation or standing idle, which requires immediate shutdown for repairs. If standing idle, it requires repairs before starting up. It does not cover, however, rewinding or replacement where this is done merely because you believe that part has served its usefulness. In other words, we are not covering you against accidents which you can prevent with ordinary supervision.

CHAIRMAN FORSTER: Here is about as good a scheme as I know of for introducing water—here is the rotary element (indicating) and here is the stationary part. There is a ring of brass or copper, with perforations, that will throw water horizontally into these small spaces; of course, it also goes into the surrounding space. The water or steam feed is through a pipe which has only two valves, and between the two valves, normally open, is a bleeder, so that if the valve should leak the water would run out. I would not advise anyone to put in an automatic temperature control—it might flood your equipment with steam or water.

MR. SPENCER: You do not consider it advisable to put in an automatic scheme, but a great many generating rooms have automatic sprinklers, on account of the reduction in fire rates. I think we have the same proposition as the automatic sprinkler.

CHAIRMAN FORSTER: It is not quite the same, because you have a device where your trouble would be on the inside, where the electrical insulation or wiring is, and where temperature rises are likely to occur higher than the operating temperature you anticipated, perhaps, but still possibly not high enough to cause a fire. The automatic sprinkler is unlikely to go off except in time of fire, and if it did go off it would not cause any damage on the inside.

MR. MACLACHLAN: Would not one of the difficulties be that you have to get the extinguisher in there in so many cycles, that is, fractions of

seconds? That is one of the reasons they are practically forced to use automatics—the almost inconceivable speed with which the extinguisher has to be put in.

CHAIRMAN FORSTER: Does anyone know of a case where an automatic sprinkler device has been called upon and where it worked successfully and virtually eliminated loss?

MR. SPENCER: I cannot conceive of the necessity for such extremely high-speed action. I know of one case where an operator ran half the length of the entire plant and still only burned a few out of 200 coils.

MR. BURTON: I know of a case where the operator ran and opened the main switch; then back and opened another switch—that has happened frequently. The only damage was the burning out of two coils.

CHAIRMAN FORSTER: You lost something, but not the best part.

USE OF CARBON TETRACHLORIDE IN PLANT

MR. BURTON: In the last two years we put in a large tank of carbon tetrachloride. It is under pressure and can be hauled around; it has been used to put out fires inside the generator and worked effectively.

CHAIRMAN FORSTER: I have been trying, through reliable channels, to find why there is not on the market at the present time a carbon tetrachloride fire extinguisher of larger capacity. We have recommended that companies use a small carrying basket, of four or six, so they could be taken any place and be quickly at hand. The reason that laboratories have not reported favorably on any kind of machine is that they are afraid of the toxic factor in the gas—it will produce death in a few minutes. I am not frightened by that, because we would rather take a chance of gassing someone once in a while than of letting a fire get under way. The laboratories are not yet convinced that it is wise to use carbon tetrachloride in large quantities. I want to bring the thought before you men that if water, which does not carry that hazard, is the thing which can be successfully used after the incipient stage is passed, you may want to go easy on the improper use of CCl_4 and stronger on the use of water. That is my professional conclusion.

CAUSE OF BREAKDOWN OF ELECTRICAL APPARATUS

MR. R. D. SHELLEY (Employers Liability Assurance Corporation): I would like to ask Mr. Spencer if he is of the opinion that the breakdown of electrical machinery is caused in most instances by incompetent men handling it, by not being properly maintained and inspected, or from foreign causes which are unavoidable?

MR. SPENCER: The primary cause is improper care, if you consider that in a broad enough way. By improper care I do not mean, necessarily, the man who starts the machine or the man who stops it or the man who puts the extra load on the generator; I mean the men around the plant on the maintenance gang, who look it over, clean it and put new oil in the bearings. In other words, it is a maintenance proposition as to the care which the machinery receives.

I have not touched upon all the problems of operation. Overspeed is a thing we do not give much attention to, because speed is determined

by the operating system. Most generators are designed to run at a greater speed than the prime mover can possibly operate, except in case of steam turbines. There are a great many details which inspectors look for around machines; by observation and diplomatic questions they bring out points of improper care. In other words, these are the facts we go by, in our preliminary engineering survey and on which we pass on the risk.

A MEMBER: Is it possible to rebuild or replace oil switches in the same sized compartments or must they be scrapped and larger types put in?

MR. SPENCER: Ordinarily it is possible, providing the compartments were made large enough in the first place, but there are a great many plants where they would have to be larger. In the last four or five years engineers have begun to realize that the great expansion of the industry in the future is going to mean more and more high-capacity oil switches. For that reason, the oil switches that are put in at the present time are placed in cells that are large enough to take care of one or two size larger switches.

As far as danger from the outside is concerned, I would say that that is the greatest danger we have to contend with. It is like a man driving an automobile: He is not so much afraid of his own driving as he is of the other fellow's. The outside hazard is really more serious than that caused from the inside. The only way to protect that is by a lightning arrester or some sort of arrester of that nature, or possibly by a transformer.

R. A. BLOOMSBURG (Utilities Mutual Insurance Company, New York): During the coal shortage there is a possibility that a great many small plants may tend to tie to the larger cities, and you will have the danger of ignorant men around the plant and the fire hazard. Has any attention been given to the use of reactors to keep short-circuit currents down?

CHAIRMAN FORSTER: The principle is a well recognized one in the electrical field.

A MEMBER: We use no reactors in defending sub-stations. We have had to put in oil switch stations large enough to handle the situation, but a great many do not put in oil switches.

MR. SPENCER: Reactors are used quite a bit in small sub-stations, but mostly on outgoing feeders; they are almost never used on supply circuits from outside lines.

The Section then adjourned.

Health Service Section

August 29, 1922

DR. R. S. QUINBY, Chairman,
Manager, Service Department, Hood Rubber Company, Watertown, Mass.

DR. R. B. CRAIN, Vice-Chairman,
Eastman Kodak Company, Rochester, New York

DR. R. P. ALBAUGH, Secretary,
Bourne-Fuller Company, Cleveland, Ohio

CHAIRMAN QUINBY: I will give a very brief outline of the history of the development of this Section and also of the development of industrial work for the benefit of those who were not present last year. The National Safety Council developed a concrete organization more rapidly than the industrial physicians; therefore it was the logical body to use for the advancement of the activities of industrial surgeons in the early days—hence the creation of the Health Service Section. As time went on industrial physicians grew in number and formed an organization of their own, in fact, several, the outstanding one being the American Association of Industrial Physicians and Surgeons, which now has a membership of 600 and conducts annual meetings in connection with the American Medical Association.

With the growth of definite medical organizations a change came about in the Health Service Section of the National Safety Council; last year, at the Boston meeting, it was felt that it was somewhat of a duplication to have, during the same season, two meetings of industrial doctors; also that the medical phase of industry could be carried to a larger audience in the National Safety Council Annual Congress by placing medical subjects on the programs of the different Sections and general meetings. I will read a resolution accepted last year in that connection:

"For the sake of brevity, omission has been made in these proceedings of the discussion which took place in regard to the manner in which the Section should conduct its programs to best advantage in reaching the industrial executives, superintendents, safety engineers and others interested in health and sanitation in industrial plants. It was the consensus of opinion among the physicians and surgeons present that by conducting segregated medical sessions they would not succeed in securing a satisfactory attendance of laymen representing influential companies which are members of the Council. A committee, consisting of Drs. Ford,

McKinstry and Elliott, was appointed by the Chairman to draft a resolution containing the recommendations of the Section, to be presented to the Executive Committee of the National Safety Council. The committee prepared the following resolution, which was unanimously adopted:

"Whereas, It is evident that the public health and medical programs presented by the Health Service Section of the National Safety Council are not serving the fullest measure of their purpose in reaching those members most influential in the dissemination of public health and medical information to industry; and

"Whereas, It is the feeling of the members of the Section that more effective results will be obtained if the public health and medical programs are presented to the general and special sections of the Council; therefore, be it

"Resolved, That this Section authorize its officers to present to the Executive Committee of the National Safety Council this communication as the recommendation of the Section for the Board's immediate action."

In so far as possible this idea has been carried out in the creation of this year's program, having only one strictly medical session for the purpose of receiving reports, carrying on other business of the Section and having a program to attract industrial medical men interested in technical subjects. We have succeeded in placing fifteen medical addresses in different Sections; in fact, most of the Sections have a paper on the subject. We believe this to be a desirable arrangement, and unless next year's officers find a more practical solution we would suggest that the same procedure be carried out next year.

Unfortunately, we have been somewhat disappointed in our speakers for today's program. Dr. Harris hoped to be here, but met with an automobile accident yesterday. Dr. Harry Mock is mourning the loss of his mother and will not be with us. Dr. Crile is unable to be present and Dr. Lockwood has kindly taken his place.

APPOINTMENT OF NOMINATING COMMITTEE

According to custom, the Chair will name the Nominating Committee. Their report will be given at the end of this meeting. I will appoint Dr. Shoudy (chairman), Dr. Fisk and Dr. Lloyd. They will nominate a Chairman, Vice-Chairman and Secretary for the ensuing year.

Dr. Shoudy has a report to make at this time on "Minimum Standards of First Aid."

MINIMUM STANDARDS OF FIRST AID

REPORT SUBMITTED BY DR. L. A. SHOUDY, BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

I. ADEQUATE FIRST AID

There should be provided for all industrial employees adequate first aid in case of injury. Such first aid should be as skillful, prompt, efficient and up-to-date as the locality and surroundings will permit.

II. THE EMPLOYER

It should be the duty of the employer to provide:

All materials used in first aid in the plants.

The services of such nurses and surgeons as the character of the plant warrants.

A suitable place, properly equipped, for the care of those injured or taken sick on the plant; the making and storing of dressings and the keeping of records.

Proper means for the training and organizing of first-aid and stretcher crews.

Proper means for transporting the injured.

The service of the nearest and best general hospital for appropriate cases.

III. THE PLANT PHYSICIAN

In every plant, regardless of size, there should be a competent physician appointed to render first aid to those sick or injured in the plant. He should have full charge of arrangement of rooms, equipment, hours for dressings, first-aid material, transportation of injured, placing and contents of first-aid boxes, stretchers, helmets and other apparatus; the training of first-aid and stretcher crews and the making of reports and keeping of records. Having full charge and control, he should be held responsible for results. Whether he works full time, part time, or only on call will depend on size of plant, locality or other conditions.

IV. THE EMERGENCY HOSPITAL

In plants of over 1,000 men it is recommended that a separate building be erected and used as an emergency hospital. In case this is not feasible a suitable part of other building may be used. In either case this should be well ventilated and have modern plumbing, bath and toilet, with all the equipment needed to do up-to-date, clean minor surgery, and such other equipment as the surgeon in charge may deem necessary. There should be one or more beds, where severe cases may be made comfortable during observation, or while waiting transportation to a general hospital. It should have an X-ray (room) if such is not available in the local hospital. You will find a small X-ray, of the office type, valuable because it is always handy and the results may be had at once, and such other instruments of precision as will lead to an accurate diagnosis of those injured or taken sick on the plant.

The equipment should include sterilizers, dressing materials, drugs usually used for emergency sickness, crutches, splints, surgical instruments, filing cases and desk for records, and hospital linen.

It is suggested that a plant of 50 to 500 men may use one room for a dressing-room; 500 to 1,000 men, two rooms; 1,000 to 5,000 men, three rooms, and 5,000 to 10,000 men, five rooms. Where females are employed a separate room should be provided, with female attendants. Its location should be at a point most easy of access from all parts of the plant, affording best sunlight, fresh air and freedom from noise, dust, smoke, noxious gases, or publicity. The hospital, with its whole equipment and personnel, should be under the full charge of the company surgeon.

Where the size and number of employees warrant, there should be a full-time lay assistant. In smaller plants, the duties of this assistant may be combined with those of clerk. The janitor service should be of the best, with absolute cleanliness and good order.

In plants of 500 men or more, a full time nurse should be in attendance, but a physician should be present at the daily dressing hour.

V. TRANSPORTATION OF THE INJURED

1. Stretchers of the types used in the United States Army and Navy should be provided and kept in each part of the plant, at points easy of access, night or day. They are best kept in boxes, free from dust, and should have attached a clean blanket and a first-aid box, one Thomas leg splint and one Thomas arm splint.

2. In plants having mills one mile or more distant from the emergency hospital it is recommended that there be added an ambulance service, with good roads maintained and kept open to each part of the plant. Where this is not available, service with autos, motor truck or wheel chair may be substituted.

3. Adequate means should be provided for transporting the seriously injured to a general hospital, either by train, ambulance, auto or truck, according to locality, facilities and needs.

VI. TRAINING LAYMEN FOR FIRST AID

1. All training, arrangement of crews and amount of work to be done by the same should be under the full charge of the company surgeon.

2. Lectures, demonstrations and drills may be by doctor, nurse, welfare worker or trained assistant.

3. The committee recommends a stretcher crew of five or six men for each stretcher placed about the plant. Where mills run night and day there should be one crew for day and another for night. This crew is not only the unit for work, but the unit for training or competition. In starting the training of stretcher or first-aid crews in a plant the first selection should be the best men in the mill, for their example and leadership. Each year these may rotate, gradually giving first-aid training to all in the plant.

4. The committee believe that it is a mistake to teach much anatomy or physiology to laymen, or to teach them to do too many things. We believe it best to confine the teaching to a few essentials, doing this thoroughly—carefully drawing the line between what they ought to do and what they should not attempt.

The main points in training should be:

(a) Shock—its symptoms and treatment.

(b) Hemorrhage—The tourniquet seldom; direct pressure almost always.

(c) Asphyxia—its causes, symptoms and treatment; artificial respiration by Shaeffer (prone pressure).

(d) Transportation of injured by stretcher, ambulance, auto truck, train, firemen's lift, or the two, three, or four-handed seat and the application of Thomas splint. This committee regards the careful handling of the injured so as not to cause pain or further trauma, in a minimum of time, to be one of the most important things taught first-aid classes.

(e) The treatment of such emergencies as burns, wounds, fractures, dislocations, sprains and foreign bodies in the eye.

(f) First aid to those getting sick in the plant. These are as much in need of intelligent first aid as the injured and should receive as care-

ful consideration. This applies to equipment and arrangement of emergency hospital and the training of first-aid laymen. This training should include not only care of those taken sick on the plant, but sickness prevention, including plant and home sanitation and personal hygiene.

(g) In all compact plants, where injured can be transported quickly to a well-equipped first-aid room or hospital, trained or untrained laymen should not be permitted to attend any of the emergencies named in "e." The dressing of wounds, boring of finger nails, picking foreign bodies from eyes with hard objects, or the daubing of iodine on minor injuries in a plant by fellow-workmen should be absolutely forbidden.

In scattered plants, on railroads, in coal mines, or on freight boats, first-aid laymen should be thoroughly trained to give first aid in the emergencies named under "e", but in both slight and severe injuries the patient should report at the earliest possible moment to the surgeon or trained nurse.

VII. FIRST AID BOXES AND CABINETS

1. First-Aid Box No. 1.—This to be a small, sealed box or glass jar containing: One inelastic tourniquet, three one-inch roller bandages, three two-inch roller bandages, three triangular bandages, one package "handy fold" sterile gauze, one one-yard package sterile gauze, six safety pins, three ammonia ampules, and six "pliable board splints."

In the place of the roller bandages, small finger compresses may be used. These are made by sewing small compresses of gauze to the mid-point of a strip of one-inch bandage about eight inches long.

This kit is for use in the compact plant having a well-equipped emergency hospital, with nurse or doctor always on duty. It is best kept, one in each stretcher box and one in each mill office.

For line men and other crews working at a distance from a dressing station this box may be used with the addition of the iodine ampule. In some cases the small tin box of the United States Army (individual packet) may be best suited. These are small tin boxes and suitable for the one use.

2. First-Aid Box No. 2.—This is a larger box or cabinet, containing a larger supply of articles kept in box No. 1. In addition it should contain: One can or box of burn ointment or remedy as selected by the surgeon in charge, one dozen tongue depressors (use as spatula when needed), one dozen ampules of 3 per cent iodine ampules, three ounces castor oil, three ounces aromatic syrup rhubarb, one bottle (wash) boric solution (for eyes only), one set thin board splints, one set emergency splints (including one Thomas leg splint), and one Thomas arm splint, one ice bag and one hot water bag. Increase the quantity of gauze and bandage from box No. 1 as deemed necessary. Cotton as needed.

This box or cabinet may be placed in the stretcher box, in a remote dressing station of a scattered plant, or may be used in railroad, coal mine, freight boat, or other plant or part of plant, necessarily remote from a well equipped emergency hospital. These boxes should frequently be inspected and replenished. Be careful that iodine is not allowed to evaporate, partially, and then be used.

3. In plants with special hazards there should be such special appliances for prevention and treatment of accidents as modern science has found of use. This includes helmets, masks, resuscitating apparatus, oxygen, etc.

4. The Reeves type of stretcher, with halter and rope attachment, is recommended where the injured must be lowered from a height, raised from a depth, taken up narrow stairs, through narrow doorways, or into or out of the hold of a vessel.

VIII. SUMMARY OF REQUIREMENTS BY SIZE OF PLANT

1. Small, isolated coal mine, or plant of 50 men:
 - (a) Doctor on call; welfare nurse if possible.
 - (b) Clean office room for first aid, containing first aid cabinet No. 2 and a cot.
 - (c) One or more trained stretcher crews—each stretcher with blanket and first-aid packet No. 1.
2. Isolated, compact plant or mine of 500 to 1,000 men:
 - (a) Two or three-room emergency hospital with equipment.
 - (b) Full-time nurse and part-time doctor always on call, but spending one or two hours at hospital for daily dressings.
 - (c) First-aid crews, each with stretcher and first-aid box No. 1.
3. Scattered plant, mill or mine, with 500 to 1,000 employees:
 - (a) Same as No. 2, but emergency box No. 2 with each stretcher.
 - (b) Ambulance, auto or truck for transporting injured from distant parts of plant.
4. Plant of 1,000 to 5,000 men:
 - (a) Three to five room emergency hospital, equipped according to needs.
 - (b) Nurses, janitor, orderly and surgeon, with one or more assistants as required.
 - (c) Trained first-aid stretcher crews, with stretcher and first-aid box No. 1 or No. 2, according to nearness of emergency hospital.
5. Plants of over 5,000 men:
 - (a) Central emergency hospital.
 - (b) Service of nearby general hospital, or building and equipping of general hospital by management.
 - (c) Auxiliary emergency hospitals in remote parts of plant, with trained nurse.
 - (d) Full-time surgeon with full-time or part-time assistants.
 - (e) Trained crews, stretchers, and first aid boxes as in No. 4.

The kind of service required in any plant will depend not only on the number of men, but on the nature of the work, the hazard and the nearness of a well-equipped general hospital. In some instances the medically trained, rather than the surgically trained, physician may be best suited to the work. In either case the first-aid needs are the same.

IX. CONCLUSION

The committee earnestly urges upon all plants, large or small:

1. The holding of competitive first-aid meets and awarding of prizes to successful crews to stimulate interest in the work.

2. The complete organization of a welfare and employment bureau with its accident, health, examination and safety departments correlated.
3. The health and accident departments completely under control of the surgeon.
4. The making of the first aid and health organization an important factor in bringing about loyalty and co-operation on the part of the men. The company who does only as much first-aid work as the law compels will have neither.

DISCUSSION

CHAIRMAN QUINBY: We have carefully worked out a program on standardization of first-aid and a great deal of good work has been done. It has been adopted by the National Industrial Conference Board and by the Association of Industrial Physicians and Surgeons. In order to give it a wider audience and greater backing it is the desire of the committee that the report be accepted officially by this group. (Upon motion, duly made and seconded, the report was unanimously adopted.)

The first address is to be given by Dr. Bruce C. Lockwood of Detroit, who very kindly came forward to substitute for Dr. Crile. Dr. Lockwood has had a wide war experience in connection with the subject that he is going to discuss.

DR. LOCKWOOD: I am rather reluctant to speak this afternoon because my training on the subject has been of a different nature and varies somewhat from Dr. Crile's teachings. Practically all of my experience with shock was in France at Base Hospital 17, Evacuation Hospital No. 3, of the First Army.

[Dr. Lockwood's address followed the same line as his earlier paper printed in the *Journal of the Michigan State Medical Society*, April, 1920, copies of which are obtainable from the National Safety Council Library.]

CHAIRMAN QUINBY: Dr. Lockwood has given us a very scholarly and comprehensive exposition on this subject. Does anyone wish to ask questions?

DR. DUFFEE (Hamlin & Co., New York City): Does the effect of an electric shock upon the human body cause the same congestion in the capillaries of the body?

DR. LOCKWOOD: I do not know.

CHAIRMAN QUINBY: I think the question of electric shock has been gone into, as far as treatment is concerned, very carefully by the Council and a standard practice of treatment has been worked out. So that, if you have the physiological, the pathological and the other "ogical" phases worked out, the safety man's end of it is very well taken care of.

We will pass on to the second subject of industrial dentistry. Dr. Otto U. King will read a paper which, I am sure, will be of great interest.

INDUSTRIAL DENTISTRY AS AN ECONOMICAL MEASURE

OTTO U. KING, D.D.S., F.A.C.D., EDITOR, JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

Dentistry can add ten years to life, increase man's efficiency 18 per cent and save a billion dollars a year to industry. Eight hundred million

working days each year are lost to industry through ill health. This represents a money loss of \$3,000,000,000, the equal of one Liberty loan. Industry must include preventive dentistry in its program for the perfecting of the human machine.

Statisticians reckon the average man's value at \$600 per year. Each worker in wood, iron or brass stands for an engine or an industrial plant worth \$10,000, producing at 6 per cent an income of \$600. The death of the average workman, therefore, is equivalent to the destruction of a \$10,000 mill or engine. In fact, anything that interferes with his mental or physical efficiency presents an economical problem to industry. The industrial dental clinic has had its effect on reduction of turnover of labor and decrease of hours lost from production; in other words, production was increased.

The very foundation of life depends on two important factors: *First*, food-energy and manpower; *second*, the conversion of food-energy into manpower, which depends very largely on the teeth. If, therefore, food-energy is to be successfully converted into efficient manpower, the machinery necessary to this conversion must be kept in a state of good preservation so that its function may not in any way be impaired.

The medical profession has demonstrated that malnutrition is one of the greatest factors in all diseases and upon this basis, I believe, the earning capacity of a man is in relation to the condition of his mouth. Every day adds to the mass of testimony proving the manifold and widespread destructive influence of decayed teeth and diseased gums. It is, of course, an obvious fact that insufficient teeth so interfere with the proper chewing of food as to induce indigestion and faulty assimilation of the nutritive intake. And while interference with the stomach and intestinal processes is the underlying cause of many nervous and functional disorders, the evil results of bad teeth and septic mouth conditions do not end here.

SOME RESULTS FROM DEFECTIVE TEETH

So impressive is the list of the many diseases that are attributed or actually traced to the menace of mouth infection that I feel constrained to present the following summary:

Chronic invalidism may be caused by mouth infections.

The blood pressure may be raised or lowered by mouth infections.

The thyroid gland is frequently enlarged and may hypersecrete or hyposecrete in these infections.

Serious disturbances of the blood, heart, kidneys, stomach, intestines and joints are frequently from mouth infections.

True diabetes mellitus may be caused by mouth infections.

Serious distant focal infection may occur from mouth infection.

Serious brain and nerve disturbances, as well as neuritis, may occur from mouth infection.

Ulcer of the stomach, pyelitis, appendicitis and chronic colitis may be caused by pyorrhea alveolaris and mouth infection.

Pneumonia, especially that which follows influenza, may frequently be caused by pneumococci long carried in the patient's mouth.—(From

report of Dr. Oliver T. Osborne, professor of therapeutics, Yale University.)

In New York City, last year, 67,000 children failed to be promoted to higher grades because of absence, 80 per cent of which can be laid to defective teeth, and it costs New York \$1,037,696 to duplicate a year's schooling to these absentees. Just think of 777 children committing suicide in the United States because of failure to pass examinations, fear of punishment, and unhappy homes!

Scientific researchers in the field of cancer report that cancer of the skin and mucous membrane of the oral cavity will practically disappear if the public is given this information in such a way that it will be understood and acted upon.

A superintendent of a state hospital for the insane is discharging 75 per cent of those admitted to his institution by removing foci of infection.

HIGH DEATH RATE DUE TO TOOTH DECAY

Crime is a mental disease due to some physical defect. Many crimes would never have been committed and a large number of criminals could probably be released today if mouth hygiene could be thoroughly practiced in a practical way.

Dr. Ernest E. Irons says: "The intimate relation, sometimes causal and sometimes resultant, between diseases of the mouth and general disease depends for its cause in part on chronic infections derived from the mouth.

The heart disease of the Nation is largely traceable to mouth infection. During the past fifteen years the death rate from Bright's disease has increased 15 per cent; deaths from heart disease have increased 27 per cent. The number of cases of starvation among the school children of New York has been more than trebled in the last decade. With the exception of defective teeth, disease has declined. There has been a tremendous increase in malnutrition and the basic cause of malnutrition is bad teeth. Malnutrition is one of the greatest factors in all diseases. Epilepsy, ear troubles and nervous disorders may be caused by tooth decay.

About 2,500,000 babies are born each year in the United States. One-half million die each year, and one-half of the remaining number die before they are 23 years of age. Proper nutrition and mouth hygiene can prevent, to a great extent, this mortality.

Seventy-eight per cent of all persons over 20 years of age have suppurative destruction of portions of the maxillary bones, either along the sides of the roots of the teeth or above their apices. These lesions present a definite menace to health and a serious problem relative to means of eradication and methods of prevention.

Tuberculosis is recognized as the greatest industrial disease. It is reported that many more men die of industrial tuberculosis than are killed in mine fires, boiler explosions or railroad collisions. Tuberculosis is a communicable disease wherein the condition of the oral cavity plays an important part.

The resistance to bacteria invasion will be determined not only by the contents of the blood, but by the tone and resistance of the cells

of the individual tissue on which the bacteria may find lodgment. Hence the importance of keeping up the tone of the mucous membrane which will act as a powerful preventive by helping the tonsils, soft palate and pharynx to maintain a normal healthy condition.

INDUSTRIAL DENTAL CLINICS AND DISPENSARIES

A careful analysis of the dental work being done in the industrial field might be summarized under the headings of five varieties of industrial dental clinics or dispensaries: *First.* Those furnishing treatment for their employees' children only. *Second.* Those furnishing free service to their employees. *Third.* Those maintained in conjunction with a mutual aid association. *Fourth.* Those in which the employees pay a small amount. *Fifth.* The establishment of a co-operative dental clinic, to give high-grade service to the workman and his family, at the same time giving to the dentists who are associated in this group clinic a return for their services equal to the profit made in ordinary practice.

In both Virginia and West Virginia are dispensaries maintained by the Pocahontas Fuel Company for the benefit of their employees' children. Maybeury, W. Va., a typical mining town, is the center of their work, and here the Jenkinjones Dental Dispensary was opened. Now there are six dispensaries, three for white and three for colored children. Their corps of workers consist of seven licensed dentists and five dental nurses, who make home visits and instruct the mothers how to care for their children's teeth. All the children up to 14 years of age receive treatment and individual instruction from the nurses in mouth hygiene and the use of the tooth brush, the first brush and box of powder being supplied when necessary.

The General Electric Company maintains a dispensary of the second type, furnishing free service to its employees. Of first thought here is the relief of pain, which prevents many a worker from losing a whole day's work at the factory. Next comes prophylaxis, which is an extremely thorough operation. At the same time the operator strives to show, on a model, the proper way to care for the teeth, the best kind of a brush to use and the first indications of trouble. By the use of mirrors the patient is often shown the exact condition of the mouth before and after treatment. Some of the patients offer to pay for the treatment, but the company believes the work should be done free or not at all.

Of those companies furnishing treatment in conjunction with mutual aid or welfare associations we have three examples: The Kimberly Clark Company of Wisconsin, the Cincinnati Milling Machine Company of Ohio and the Bailey Company of Ohio. In each of these dispensaries the company pays part of the expenses and the mutual aid association the rest.

For dispensaries of the fourth type we find many examples, two of which are the Berkshire Knitting Mills of Pennsylvania and Armour & Company of Chicago. In the Berkshire Knitting Mills, where there are 2,700 employees, the services are rendered on the company's time and charged for at actual cost. Although no lectures on oral hygiene are given a novel use is made of the pay envelope to illustrate the health

activities of the firm. In this way the employees receive a health lesson every time they receive their pay.

CO-OPERATIVE DENTAL CLINIC DOING GOOD WORK

Dr. Henry L. Banzhaf of Milwaukee has organized a co-operative dental clinic known as the Milwaukee Industrial Dental Clinic, which is an example of the fifth type. This is a clinic which was organized in order to give the best possible dental service at the least possible cost to the employees of some of the industrial concerns at Milwaukee. The clinic was organized in the spring of 1920. Previous to its organization a number of the largest concerns of the city had equipped their plants with dental chairs and had employed young dentists to take care of the dental work of the employees at the plants. Only a few, if any, of these attempts were successful. Dr. Banzhaf says there are several reasons why this system of giving the employees dental service by means of the ordinary industrial dental office proved to be a failure:

1. The company felt that it could not afford to pay the salary required by an experienced dentist. The dentist employed was generally just out of college and considered that his position was only of a temporary nature.

2. If the company gave this service without charge, or made but a nominal charge, the young dentist was soon overwhelmed with work and found that he could not cope with the situation. Careless work or a resignation was the inevitable result. The officers of the company invariably balked at employing the necessary four or five dentists.

3. If the company made a reasonable charge for this work the employees looked upon the whole proceeding with suspicion and only a few patronized the clinic.

Because the dental clinic in the factory building seemed to be a failure, at least in Milwaukee, the few employers who gave the matter any thought at all looked to the new Milwaukee Industrial Dental Clinic to fill the want. The activities of the clinic were planned to be four in number:

1. Education by talks on the necessity of clean mouths.

2. Education by means of anonymous printed pamphlets written in popular style.

3. Education of the children of workers by means of entertainments on Saturday mornings.

4. The maintenance of a large dental office centrally located where good, honest dentistry would be done for the lowest possible fees.

Four large industrial concerns gave their consent to allow the clinic to work among their employees. The system adopted is as follows: The clinic establishes a dental chair and other necessary equipment at the factory. Notices are posted in the factory to the effect that the dentist from the clinic will be at the factory during certain hours each day. The concern allows an employee to leave his work for a short time without deduction of pay for the purpose of visiting the dentist. The clinic dentist limits his work in the factory building to two lines of activity: (1) The alleviation of pain. (2) The examination of mouths

and drawing of mouth charts. The examination service is paid for by the industries. In the instance of small plants the examinations are made without charge.

Every patient upon leaving the dentist's factory office is given a chart showing the condition of his teeth and his needs for dental attention. He can take this to the dentist in his neighborhood or he can take it to the offices of the clinic.

DENTIST EXPERT IN PARTICULAR BRANCHES OF WORK

The clinic is gradually working toward success in its most important object, namely, to care for the needs of the employees for as small a fee as possible and at the same time to do nothing but good dentistry. There are several reasons why the fees in the clinic may be smaller than in other offices. In the first place, overhead expenses, office rent, office maintenance, etc., are comparatively small. A competent woman has charge of the business details, a dental hygienist performs prophylaxis, a nurse looks after the sterilization and assists with the administration of anesthetics, two young girls serve as dental assistants, dividing their time between the various operators, a maid keeps all the rooms clean and bright. Besides the saving of expenses afforded by this organization there is still a greater saving from the fact that in the clinic the men do their own laboratory work, X-ray work, exodontia, and each one of them devotes himself to some particular branch of dentistry. The efficiency of each dentist, when he applies himself to his own specialty, is increased over 40 per cent. The operator labors more efficiently because he is engaged only on work in which he takes particular pleasure and wastes no time on tasks which he dislikes or for which he is not specially fitted. Here is where the greatest increase of earning power occurs. The benefit of this increase in earning power the operator can afford to share with the patient. He loses nothing of what would be his ordinary earnings, rather increases them, while the patient gets his services at a lower fee.

The difficulties that the organizers of the clinic met with were not small. The first difficulty was to get the right kind of men—men who were proficient along some particular line or who could be trained—men who had the teaching instinct and were interested in the educational side of their profession.

A second difficulty was the fact that a few members of the profession, who did not understand the project, without taking the trouble or showing the fairness to investigate it, condemned it immediately as an advertising scheme.

The third difficulty encountered by the clinic is the fact the executives of the industries have not been at all responsive to the idea. The list of firms that co-operate with the clinic has grown only at the expense of tremendous effort. This was doubly true when war orders began to grow less and less and when men were being laid off in considerable numbers. The working capacity of the clinic is gradually being reached. The Milwaukee Industrial Dental Clinic will not, once the

people come to it who should, be able to serve more than half a dozen firms. Two or three similar clinics will be in demand.

The fourth difficulty has been the general suspicion among many of the workers that there must be a nigger in the woodpile somewhere. Only after some of the patients had received treatment at the clinic has this suspicion begun to be allayed.

Despite these difficulties the clinic is doing its part in fulfilling its mission, namely, to reduce the price of good, honest dentistry to the working masses.

TESTIMONY OFFERED BY INDUSTRIAL MANAGERS

In order that we may definitely establish the fact that the industrial dental clinic will prevent disease and save lives, thereby adding to the efficiency of the human machine, we are presenting the testimony of industrial managers and others qualified to speak: The Dayton Metal Products Company of Dayton say: It encourages us to know that many other large industries have awakened to the fact that there is a very close connection between mouth infection and systemic diseases, that good teeth mean good health and good health means efficiency. This work has saved us 21,031 hours so far this year.—Dr. H. B. Millhoff, Clinician.

The Emporium, San Francisco, says: Dentistry certainly ranks with medicine and surgery as a welfare feature and we find that the two branches work splendidly together. We find that our employees are very eager to take advantage of the opportunity of having good dental work done with the least expenditure of time and effort.

Kabo Corset Company of Chicago says: Dentistry in our factory has saved our employees, as well as ourselves, over 2,000 hours in the past six months, time which would have been counted as lost working time, as well as protecting said employees from the clutches of unscrupulous advertisers and incompetent practitioners. It has increased production in proportion to working hours saved.—Fred'k. H. Mill, Manager, Industrial Service Department.

Ford Motor Company of Detroit says: It is impossible to definitely estimate the good done by this department, but to date we have no cause to regret the installation of the dental department and contemplate increasing its scope in the future.—J. E. Mead, Chief Surgeon.

H. J. Heinz Company of Pittsburgh says: We feel that more important than dental surgery is instruction in oral hygiene and so our man always teaches his patients the use of the toothbrush and of dentifrices. This element of the work extends beyond the factory, for the employees carry into their homes and to the neighborhood the gospel of the toothbrush.

The Narrow Fabric Company of Reading says: We know that we are experiencing a gradual and consistent increase in the personal efficiency of our employees, in the decrease in illness, absenteeism and other evils which decrease production. We can say without reservation that the results fully equal our expectations; that it has reduced the number of hours lost through illness and has, consequently, increased to that extent the output of the mill. We believe that, in the long run,

preventive dentistry is as important as medicine and that it frequently prevents the necessity of resorting to the latter.—J. E. Kissinger.

D. H. Holmes Company, Ltd., of New Orleans, says: We pay for all materials used and we find that we are more than repaid. We consider that most diseases are enhanced, if not produced, by bad teeth. Our general health has improved and we lay a great part of this improvement at the door of the dentist's office.—Lois Janvier, Welfare Department.

PREVENTIVE DENTISTRY AIDS PRODUCTION

Dental troubles fall into a class that can be readily prevented if caught in time, but are sure to accrue if not detected. Dental prevention consists of having the dentist examine each patient periodically, about twice a year, and note on a chart the condition of each tooth, directing the patients to their family dentist for necessary work, if any, and checking the work when it is done—that is, seeing that the work is done. The dentist does first-aid work, relieves toothache, performs treatment that would require numerous trips to the family dentist and consequent loss of operative time, and prevents excuses for toothache. There are many systemic conditions in the duration of which operatives lack pep, which are due to conditions of the teeth. Most companies class the results as intangible because what preventive dentistry prevents, never happens. It is like the fire that is prevented by certain recommendations and precautions, the prevented loss of which is impossible to estimate.

Dr. L. P. Cardwell, dental director of Armour & Company, reports that they have been successful in demonstrating the fact that in dollars and cents the value of the new department to the general organization, as well as the benefit in value to the employee, has been attained. This department is steadily progressing in favor of all concerned during the two years of its existence.

The dental department in Armour's has become one of a trinity located in the same general quarters with the medical and welfare organizations. These three departments, each working independently along its own particular line under one chief surgeon and director, harmoniously co-operate. When the dental department finds that a patient requires a certain kind of dental work and he is unable to meet the fee of the outside dentist the welfare department is called in and the matter is arranged by the nurses without any publicity and satisfactory work is accomplished. This system interferes very little with the time of the employees.

CLINIC MUST HAVE CONFIDENCE OF WORKMEN

In caring for patients the very first effort made is to win their confidence. Once we accomplish this we encounter little difficulty. The teeth and gums are cleaned, the necessary extractions made and when the mouth is in a clean, healthy condition, we chart a card showing the work needed and refer the patient to his own dentist.

We keep preaching prophylaxis all the time and explain to the patient everything he desires to learn about. These little lectures are in all cases delivered in words thoroughly understood by the patient and it is

surprising to note the number of cases in which our instructions regarding the use of the tooth brush and care of the mouth are followed.

Completing the prophylactic work and advising the patient does not mean that we are through. Every case is instructed to return at stated intervals for examination and advice; as a result, we have a constantly growing practice with few, if any, dissatisfied patients. We do not compete with the outside dentist by doing dental work for our employees at cost.

From "Clean Teeth in the Factory," by H. M. Brewer, D.D.S., Dental Director, National Cash Register Company, Dayton, Ohio:

"The estimated value of the dental service to the employees for the year 1921 was \$22,576.25. This estimate is based on an average fee which would have been charged by a dentist rendering similar services. By working with the close co-operation of the medical department we have been able to keep a close check upon the work accomplished and the unusual number of productive hours saved. This is really a selfish way of reading the figures and leaves totally out of consideration the human element of body ease and self-respect engendered. The money value of medical and dental services to a factory can best be determined by an analysis of our report of sickness for 1921. The average number of employees for the year was 5,330. Statistics so far available show that the time lost per year in industry on account of sickness will average forty-eight hours per employee. During the year 1921 we lost 59,854½ hours on account of sickness. This is an average of only eleven and one-half hours per employee. Taking the above as a basis for our figures we saved 195,986 hours during the year. At 50 cents per hour this would amount to \$97,993.00 saved during the year.

ALL WORK DONE ON COMPANY'S TIME

"You will observe from our report that we do very little permanent work, and only then for some busy executive whose time is more valuable at the factory than in the chair of a downtown dentist. All visits, with the exception of the examination of applicants, are voluntary on the part of the employee. All work is done on the time of the company and the service is entirely free to the employee. We make an examination of every new applicant, show him what he needs in the way of dental services and invite him to return in the immediate future for prophylaxis, extraction or any other temporary treatment that he might need. The very fact that he undergoes examination at our hand produces a remarkable mental effect. We find many things wrong of which he is not aware and which he is glad to know. It awakens in him the feeling that we are taking an interest in his welfare and gives him the idea that he can always come to the dental dispensary for attention. Likewise it instills in his mind the thought that the company demands one hundred percent in appearance and good health.

"We make full use of the X-ray to locate covered roots and obscure infection that we all know cannot be seen in the mouth with the naked eye and we are very insistent that these be cleared up either by us or the employee's own dentist.

"We lay especial stress upon prophylaxis. We scale the teeth and roots thoroughly, polishing the crowns and treating the gums, and then teach the patient to properly clean the teeth. The true value of these visits lies not alone in the cleaning; many of these patients are paying their first visit to any dentist. It is not unusual to find diseased teeth and roots in the mouth, which as we know, lowers the resistance to disease in any individual. The employee has come to the dispensary to have his teeth cleaned and after the results have been shown to him it is not difficult to convince him that these disease breeders should be removed from his mouth. This is usually accomplished at this sitting and thus his health value is increased to himself and to his employer.

"Good health means personal attractiveness, for nothing adds so much to the appearance of men or women as a wholesome condition of mind and body. The man who is well can concentrate upon his work and can keep at it day after day with no sense of fatigue, depression or discouragement. The man in ill health works spasmodically and is unable to bring to his work that energy and enthusiasm that begets success."

MILLIONS SAVED IN WAGES TO EMPLOYEES

The National Industrial Conference Board, 10 East Thirty-ninth Street, New York, made public an account of the work of the dental department of one of the largest companies manufacturing agricultural implements in the United States which emphasizes the financial saving accruing from such work as well as the bearing of the care of the teeth of the employees upon their general health. In one establishment of this company it was found that 95 to 100 percent of the employees had diseased gums or defective teeth and that approximately 100 percent availed themselves of dental treatment. The lost time saved in the emergency work alone, the company estimates, would amount to about four hours per case, or in other words, each emergency treatment, of which there were 6,010, represented a saving of four hours each to the man and to the company. This saving to the man alone, figuring the average at 75 cents per hour, would amount to \$18,030.75, making a total saving to the men of \$45,260.50. Assuming that each hour lost is worth in production to the company 50 cents per hour the saving to the company would amount to \$12,020.50. Therefore, the total saving to both the company and men through this emergency work would amount to approximately \$57,280 for the year.

MANY ILLS OVERCOME THROUGH DENTAL SERVICE

To emphasize the value of this service I cite a few specific cases gleaned from a large number of reports:

A man, 42 years of age, suffered from anemia. Spent one year at the company's sanatorium. No improvement. In April, 1916, two infected teeth were extracted and in April 1917, one infected tooth was extracted. From that time on he had no further trouble. In fact, in June, 1917, he entered the United States army and came through with flying colors.

A young woman suffered from blurring of vision of her left eye. No cause was found in the eye itself. Two badly decayed teeth and two infected teeth were extracted during November, 1918. Two granulomas

found and both buccal roots opened directly into the antrum. By Jan. 8, 1919, the trouble had all cleared up.

A man of 40 years of age had eleven infected teeth. From 1910 he had suffered from a general rundown condition and considerable abnormality of the heart. In April, 1918, he had the infection removed and from that time has enjoyed perfect health.

Thirty percent of the men who applied for enlistment in the army were rejected because of bad teeth. Governments have demonstrated the fact that one of the primary requisites for an efficient fighting machine is soldiers with good teeth and, in my opinion, it is just as important from an economical and efficiency standpoint that the great army of industrial workers have clean, healthy mouths.

Education is the real solution of the great mouth hygiene problem. The eradication of ignorance will produce a cure. It would be impossible for the dental profession to cope with this situation for it would take 125,000 dentists in the United States each year to fill the 500,000,000 cavities in the teeth of our people. If we could consummate this tremendous amount of work the real cause that brought about this condition would not be removed.

Organized dentistry today is shifting from cure to prevention. In the final analysis, dentistry has for its real aim the ultimate elimination of itself. "A clean tooth will not decay" is a slogan which visualizes in a practical way the aim of modern dentistry. If 50 percent of the citizens of the United States would religiously put into practical use the thought contained in this slogan ten years in the next fifteen years would be added on to the average life of man.

"Live in good health ten years longer, increase your production 18 percent, and save a billion dollars a year," is the message of modern dentistry to the industry.

DISCUSSION

CHAIRMAN QUINBY: The discussion of Dr. King's very able paper is to be opened by Dr. E. L. Pettibone of Cleveland.

DR. PETTIBONE: Any plan which would add ten years to the lives of your machines would be adopted at once. We come to you today with a plan to add ten years to the lives of the human machines in your plant. Industrial dentistry is no longer an experiment. Those in the vanguard of this movement were among the first to profit by its adoption. The dental departments cover all types of industries and all types of employees. There is no question of it being adaptable to your needs, because we can point to some industry very similar to yours in which the dispensary is a success.

The factory eventually becomes an institution, and when it has reached that stage of development a dental dispensary is recognized as a component factor. The number of dispensaries is increasing very rapidly—we have more than thirty in Ohio. And today I am here to extend to you the aid of the National Dental Association and the American Dental Association, through its Council on Mouth Hygiene and Public Education,

and the aid of those men who are engaged in industrial dentistry, the National Association of Industrial Dental Surgeons.

We stand ready to help you in every way, to give you the aid you need in the establishment of dental service in your plant; or, if the proposition is not sold to the higher-ups, to help in presenting it to them, so that it may be adopted.

With the experience we have had in the dispensary we stand ready to furnish you the blanks and material arguments—anything that we can get for you—to make it possible to have a dental dispensary in your plant.

We have illustrations of what other companies are doing in this line, and we have many booklets and many charts which are used throughout the country in the different types of industry. A plant of this type costs no more than an automobile, and it costs no more to run it than most automobiles do. If the matter is presented properly to the executive I believe the number of dental dispensaries can be quite materially increased.

ESTABLISHMENT OF DENTAL DISPENSARY

CHAIRMAN QUINBY: The subject is a relatively new one; I think it was my privilege to start the first strictly industrial dental dispensary about seven years ago. The growth of this movement has been very rapid in recent years—we are constantly receiving inquiries on the subject.

DR. FISK (International Harvester Company): I wish Dr. King had emphasized the economic side a little more. He made a statement early in his paper that the dental department had saved something like 2,000 hours to the employees of his plant. I wish he had gone on and told us how he arrived at that figure.

About a year ago I tried to evolve some plan which would show the higher-ups in our company, in dollars and cents, that a dental department would pay, but I feel that I have only partially succeeded. Dr. Humphrey, our chief dentist, selected at random twenty of the men who had come to him and whose teeth he had restored to the best possible condition. By going over their records—extending over a period of five years—he showed that the average loss of time of each man, because of illness and prior to the time when he had his teeth repaired, was something like twenty days in the year; the men whose mouths he had put in condition had a lost-time average of less than seven days.

I am very glad to say that it is not necessary to do much arguing along that line, because of all the movements that our people have countenanced and have in operation. They regard the dental department as one of the best additions to the work that we are doing.

MR. F. L. LEONARD (Public Service Company of Northern Illinois, Chicago): We are a public utilities company and we do business in gas and electricity in the suburbs of Chicago. We have about twenty different plants, scattered over a considerable territory. Therefore, we are unable to have a dentist. We examine all of our 2,500 employees and when the examining physician discovers something wrong with the teeth he naturally suggests to the employee the need for proper dental treatment.

Our company is ready to give serious consideration to the subject, but we are at a loss to know exactly how to proceed. I would like to ask whether or not it would be feasible for our examining physician to send a man to his own dentist for an examination for which the company would pay?

EDUCATE MEN TO CARE OF TEETH

DR. PETTIBONE: It would not be quite the thing to send a man to a dentist whom he might select, or one who had been his dentist, because there would immediately enter into it the factor of the proper fee for the man to charge. I think the best solution of your problem would be to get a live man to give talks, or to publish talks that would reach your employees. Then have certain mornings for examination, until you have covered your list of employees. You will gradually work into a more elaborate plan, because what you want to do is to prevent the many ailments that are brought about by lack of dentistry, by neglect of the teeth, and to find the focal infection and the resultant things that cause loss of time to your employees. If you have a central place of examination you could keep a man very busy with 2,500 employees—at least for the first year—just doing examination work and making recommendations. If he does not do the work, and if employees are sent to outside dentists to have the work done, you would greatly benefit by obtaining from the Dental Association of Chicago a list of the men in your community who can be depended upon to do the highest type of dentistry.

CHAIRMAN QUINBY: I thoroughly agree with Dr. Pettibone's statement. He is steering you along proper lines. The next paper will be read by Dr. Penberthy, of the Michigan Mutual Liability of Detroit.

EDUCATION OF INDUSTRIAL SURGEONS IN SAFETY METHODS

GROVER C. PENBERTHY, M. D., DETROIT, MICH.

Industrial medicine and surgery is gradually being recognized as one of the growing branches of the practice of medicine and surgery, but there is yet much to be advanced pertaining to the education of physicians and surgeons engaged in this field of work. Industry has progressed in proportion to the world demand for production of the necessities of life, and machinery has, in many ways, replaced the work of human hands. This mechanical means of production has proven valuable from the economic standpoint and has made it possible for the manufacturer to meet the demands. With the development of mechanical devices, such as presses and other labor-saving methods, it was found that, in their use, many known hazards existed and, to overcome these, necessitated the development of a branch of engineering which is today under the direction of the so-called safety engineer.

The safety engineer, employed by the manufacturer or the liability insurance company, devotes much time to the study of the specific hazards met in industry, and from the result of his investigations and research have developed recommendations to the employer or insurance company for safety devices and other protective measures. The latter include the

education of the working man along the lines of safety by the circulation of literature, dramatic posters and safety lectures. The protection thus given assists in keeping manpower intact and the premium of liability insurance reduced to a minimum.

Many employers who might be classed as of the old school have failed to recognize the advantages of the installation of safety devices, but I doubt if this has been intentional on their part, as I am sure the employer today realizes that production depends upon efficiency, and efficiency needs maintaining the working force intact. However, it is true that many have failed to adopt safety methods, either because their attention has not been called to the existing hazards or because of their indifference regarding the details concerned in production.

INDUSTRIAL PHYSICIAN FACTOR IN SAFETY WORK

The foreman and superintendent are relied upon to recognize and report hazards and, although they are in close contact with the work of the day, they many times are blind to some very serious conditions. They are inclined to think that, having passed through this work themselves without accident, their successors and the apprentices will also escape injury. To operate a machine that is a potential hazard requires concentration and a clear mind, and oftentimes accidents occur when the operator's mind is perhaps on the amount of piece work he has turned out or on his ambition to improve this amount. Accidents occurring under these circumstances could well have been avoided had some safety device been in operation.

The industrial surgeon must be included in the group to assist in removing the hazards met in industry, perhaps not directly, but by reporting the cause of accidents obtained from the histories of the injured. He must be more than the plant surgeon to handle the minor injuries, as a work of greater magnitude should be included in his field. To accomplish this may mean the education of the employer to the need of such an interest on the part of the surgeon, as many employers fail to appreciate the need of good medical advice until shown in figures what it means to them. The modern physician leans more to the practice of preventive medicine and preserving public health, and this same thought and interest should be in the minds of all engaged in industrial medicine and surgery. The humanitarian side of industry should be under the supervision of the physician who, in addition to his medical knowledge, should have a keen understanding of human nature. The human machine is essential to industry and should be respected and safeguarded in every way. Safety methods, from the viewpoint of the medical man, should mean not only the need for safety devices for accident prevention, but it should also mean the need for proper classification of employees, made at the time they are employed. Physical examination at the time of employment, as well as subsequent examinations, should be accepted as primarily essential toward guaranteeing safety, because a classification other than that based on experience and ability can then be made. This will assist the management to place the employee where best suited.

The question is always asked when this subject is discussed: "Will this not lead to the production of derelicts?" It should not, as constitutionally every man and woman has the right to carry on, and physical defects should not mean a barrier against employment. It should, on the other hand, work to the mutual advantage of both employer and employee and, following the recommendation of the physician, employment should be given where the individual is best fitted and not where a physical weakness might predispose or lead to an accident.

MEDICAL SCHOOLS SHOULD BROADEN CURRICULUM

Many medical schools have recognized the demand that will be made on their graduates when they enter practice and have, for this reason, added to the curriculum some instruction in industrial medicine and surgery. Some schools may also include this in the curriculum as an experiment, as the members of the faculty, being far removed from industry, may not realize the importance of such education. However, medical students, after graduation, having had this instruction, when called upon to act as industrial physicians and surgeons, should realize that, being somewhat familiar with this work, it has assisted them in approaching the situation with confidence and disposing of it as they would any surgical case.

The education of industrial surgeons should mean more than an understanding of surgical procedures and the relation of these to the compensation laws. Included in the instruction should be practical demonstrations of the hazards met in industry. Where medical schools are situated on the campus with an engineering school it would be to the educational advantage of every medical student to become more or less familiar with machinery and safety devices, as very few medical students, in their early life, have the opportunity of coming in contact with machinery. Furthermore, the average medical student feels that his work is in the field of medicine and not in industry. Medical schools such as the Detroit College of Medicine and Surgery, and many of the schools situated in the heart of industry, have access to industrial plants and should avail themselves of the opportunity to acquaint their students with the principles involved in manufacturing.

SURGEONS SHOULD STUDY SCIENCE OF SAFETY

The above named school has a lecture course in industrial surgery which is a part of the instruction in public health given the senior class. Certain factories grant the class the privilege of inspecting their plants, and I cannot but feel that even with this glance at the wheels of industry the student is impressed with the power of machinery and the many possible hazards that exist. On such a tour of inspection, safety devices are pointed out, but whether an impression is made of their value in so short a time is a question.

With the advent of the work of the National Safety Council in urging safety methods, much has been accomplished through the employers, but still more could be gained by educating and enlisting the industrial surgeons in this great work. It is indeed interesting to compare statistics

before and since the adoption of accident prevention, and the results should be very gratifying to the pioneers in this life-saving field of work.

DISCUSSION

CHAIRMAN QUINBY: We cannot overemphasize the importance of following up leads, as suggested by Dr. Penberthy. Too often we keep our noses too close to the hospital and fail to get the conditions in the factory into our minds.

DR. WOOD: After ten years of experience in industrial work I can say with confidence that one of the principal points on which an industrial surgeon should understand human beings is along the line of personal attitude. The working man is always laboring under a condition of restraint; he has to obey rules and orders; he always feels that he is under more or less coercion. When he goes into the doctor's office, if the doctor follows the same method as the plant, that feeling is somewhat accentuated. If, on the other hand, the doctor meets the man in the same attitude he would meet that man in his own home, with the same courtesy, and treat him with the same respect he would under different circumstances, listens to his side of the story, and defers a little to his wishes in regard to treatment, where it would not be injurious to do so, the employee appreciates it and has a feeling of gratitude. He realizes that he amounts to something. If the doctor does that he has gone a long way toward putting the employee in a frame of mind most adaptable to prompt recovery and a good feeling towards the company for which he works. It promotes a satisfactory relation all around.

The modern medical student, as he comes from college, is not in a position to deal with the employees as a class. Modern colleges and hospitals inculcate the idea that the patients at clinics are but a mass of people. Sometimes they are ordered around, saying, "Sit here!" "Do this or that"—as much as to say: "You don't know anything about it." It leaves the average medical graduate in the attitude of using nothing but his scientific judgment, without taking into consideration the personality of the patient. I would like to say to those in industrial work that I believe the physicians who are best adapted to give employees the best service and who are worth the most money to the company are not the most recent graduates, but men who have practiced five years or more in a place where it is incumbent to meet their patients on an equality as friends and comrades.

PERSONALITY OF INDUSTRIAL PHYSICIAN

DR. FRISK (International Harvester Company): The last speaker has voiced what has been growing in our minds for a number of years, namely, that the personality of the industrial physician is vastly more important than what he can tell you of medicine and surgery. The prime ability of the industrial surgeon is his ability to read human nature, not to do surgical operations or to substitute methods in hygiene and sanitation.

The last speaker said the best industrial man is not a recent graduate, but a man who has had a little more experience. I would not quite agree with that, because you may find a recent graduate who, down in his

heart, is really interested in uplifting the men we find in our shops. I would be perfectly willing to take such a man in preference to an older one who may have had a great deal of experience, but who is not interested in the welfare of the men. Workmen are just as keen to take offense as university graduates. They know when the doctor is bluffing; they know when they are being treated courteously and when they are not.

Industrial surgery is a specialty and I feel that it is very necessary that the industrial surgeon be trained in safety methods. If he understands the safety devices and the machinery the men operate, it will help him very materially in wisely treating the injuries which come to him in his factory.

CHAIRMAN QUINBY: Lead poisoning is an old subject in a great many industries and somewhat controversial, particularly as to symptoms but more particularly as to treatment. The last paper is to be read by Dr. W. H. Wood of the Willard Storage Battery Company.

NEW DEVELOPMENTS IN PREVENTION AND TREATMENT OF LEAD POISONING

DR. W. H. WOOD, MEDICAL DIRECTOR, WILLARD STORAGE BATTERY COMPANY

It is remarkable that in the last decade the treatment of lead poisoning has progressed slowly in comparison with the enormous strides made in surgery and in many branches of internal medicine.

The subject of industrial diseases is becoming more and more important every day and this is especially true with lead poisoning. The affected workmen are collecting, through the courts, enormous damages from helpless employers—helpless because medical therapeutics have lagged behind the developments of the industries themselves. Several States have recognized the importance of these diseases by passing stringent industrial disease laws, but this only shifts the responsibility to the State, which must depend upon the medical profession for real relief.

The oldest method of which I have any knowledge for treating lead poisoning is by sulphuric acid lemonade. This accomplished part of its purpose in forming unabsorbable sulphate of lead, but it not only had no purgative action but dissolved the bones. The use of magnesium sulphate appears to have been the immediate successor of the sulphuric acid lemonade; this had the advantages of not affecting the bones and in having the purgative action necessary to remove these sulphates from the system. Therefore, when one considers what it supplanted, epsom salts are entitled to favorable notice. About this time they also began using milk and eggs, which probably form an unabsorbable albuminate of lead. These, with potassium iodide, are at present the standard lead treatments. Potassium iodide is supposedly used for the action of the iodide, since we all know that iodides dissolve certain organized deposits in the system.

From experience and observation, made possible by the very liberal policy of the company with which I am associated, I have come to the

conclusion that lead poisoning is made possible by free fatty acids in the bowel, which combine with certain lead compounds to produce absorbable lead soaps. These soaps are taken into the circulation which means lead absorption. The formation of these absorbable lead soaps will not occur in an alkaline bowel.

· AVOID FATS WHEN SUFFERING FROM LEAD POISONING

Explaining further: Fats in the food depend upon the alkalinity of the bowel for their digestion, which is really a saponifying process. I have concluded that the deleterious effect of lead on the human system is largely due to the formation of certain lead soaps by reaction between the lead oxides and certain fatty constituents of the diet. Although textbooks claim these are insoluble (and so they are in pure water) some of them, at least, are soluble in certain of the body fluids when the same are in acid condition. Therefore, the first thing to do is to reinforce the alkalinity of the bowel, since under alkaline conditions the fat will be saponified first and no injurious lead compounds formed, much less dissolved.

The second thing to do is to reduce the amount of fat eaten, because of its tendency to use up the alkaline principles of the bile. The normal alkalinity of the bowel is maintained by the bile which is discharged by the liver directly into the upper end of the bowel. Not only can fatty foods not be tolerated when one has a sluggish liver, but most lead patients promptly become jaundiced, and workmen of the bilious type are much more susceptible to lead poisoning. This explains why the Latin races are more susceptible to lead absorption than the Slavic—the Latin races being a more bilious type. It is apparent that an excess of fat in the food has a tendency to exhaust the alkalinity of the bowel and so give rise to a condition wherein lead poisoning can occur. It is very important that lead workers either avoid a fatty diet or take extreme precaution to maintain a high degree of bowel alkalinity.

It may seem odd but we have noticed the change in the number of lead absorption cases by the change of cooks in our company cafeteria; by hiring a cook who served less fatty foods and used less grease in the preparation of foods we decreased our number of lead cases.

This theory also largely explains the fact that there is always more lead trouble in winter than in summer, and to a large extent explodes the theory of poorer winter ventilation. Although it may be true that in some plants the ventilation may be better in summer, due to windows being open, than in winter, we have installed a ventilation system at our plant that is far superior to the natural ventilation of open doors and windows, and still in winter—with windows and doors closed, when our ventilation system worked under ideal conditions—our lead troubles increased. We can now explain that it was due to the more fatty foods our men ate during the winter months. This fact we proved to our own satisfaction last winter.

Years ago I observed that potassium citrate gives quicker and surer relief in cases of gravel than an equal dosage of sodium citrate, and that large and continued dosage of potassium citrate will cause renal calculi

and gall stones to gradually disappear, while sodium citrate in equal dosage gives results much less satisfactory.

POTASH VALUABLE AS DISSOLVING FACTOR

My conclusion was that it is not the citric acid which removes these deposits, else the sodium and potassium citrates would give the same or nearly equal results, but that it is the potash that is responsible. Of course, I knew from the text books that potassium iodide has long been considered the standard treatment for lead poisoning and, as we all know from experience, that lead lines will gradually disappear under long and continued dosage of potassium iodide. It occurred to me that it might be the potash instead of the iodide that had this dissolving power over the lead deposits, in the same way it had over gall stones. This seemed more apparent because I had been getting splendid results in rheumatism with gouty deposits by the continued use of potassium citrate or sodium bicarbonate (baking soda); potassium iodide giving very inferior results. In fact, deposits that can be saponified yield nicely to continued alkaline treatment, so I began using potassium citrate instead of potassium iodide to remove lead deposits and find very much better results are obtained, because much larger and more continuous dosage can be given when using the citrate, as there is no danger of causing grave systemic disturbances as are always to be feared when using any of the iodides.

In speaking of potassium I stated that sodium gives results, which it does, though in less degree than the potassium salt. The best way of getting sodium into the system is by taking sodium phosphate, the phosphate of which has a beneficial action on the lead forming insoluble lead phosphate, and also a mildly laxative action on the bowel. Both sodium and potassium salts greatly increase the alkalinity of the bile, thus directly and indirectly keeping up the alkalinity of the bowel which seems to me to be the determining factor in eliminating lead troubles. As would naturally be supposed, artificially supplying bile by large doses of ox gall gets good results. This ox bile helps to supply alkalinity to the bowel and probably otherwise helps the saponifying process.

The action of alkalies is plainly illustrated by the action of potassium citrate, sodium phosphate, even sodium bicarbonate (common baking soda) or ox gall in quickly alleviating indigestion caused by an excess of fats in the food. The citrate of potash acts best under these cases, just as it does with the gall stones, and the same result is observable in the case of lead, only much more quickly.

MILK AS A THERAPEUTIC AGENT

The reason why magnesium sulphate is not so efficient as potassium citrate in the treatment of lead is because the magnesia which forms the base of this salt is not sufficiently alkaline to form soaps, and hence does not offer some of the advantages which the stronger bases possess.

At the beginning of this article I mentioned milk as a therapeutic agent, and I ascribe its beneficial action to the same general result as that produced by alkalies; namely, the prevention of lead soaps. But it appears to act in a very different way, for whereas the alkali salts, like

citrate of potash, act on the fats so as to prevent them from combining with the lead to form an absorbable compound, the milk acts directly on the lead, producing a permanent, non-absorbable compound, probably albuminate, since whites of eggs are of well known and popular use in lead cases. This beneficial action of milk is exerted both under acid and alkaline conditions of the bowel. Indeed, the tendency of the milk to disarm the lead is so great as in some degree to overcome the effects of a fatty diet. I have observed, however, that the best plan is for the workmen to drink milk between meals, since at this time the alkalinity of the bowel is at a minimum. In other words, in the presence of milk the formation of absorbable lead soap is prevented, even when fatty acids are in the bowel, probably by the formation of albuminate of lead which is unabsorbable.

Convalescent lead cases furnish a most striking example by omitting their alkaline medication for a few days and then eating a quantity of fats without any milk, and the relatives of the patient hardly know whether to send for a doctor or an undertaker, judging from the severity of the cramps which this procedure never fails to produce.

MINERAL OIL DOES NOT HAVE CHEMICAL REACTION

I may mention mineral oil as another choice of therapeutic agents, but I do not consider it as having any chemical reaction. Its sole purpose seems to be that of lubricating the bowel interior and preventing the surfaces from becoming injured by the spasmodic contractions during the actual attacks of lead colic.

The use of such an unsaponifiable oil is especially important in this connection because of the tendency of all other lubricants to exhaust the alkalinity of the bowel which necessitates their absolute exclusion.

Preventing lead lines does not prevent lead poisoning, but merely removes a valuable danger signal. Combinations of fatty acids with lead compounds, as before described, produce certain absorbable compounds which are carried throughout the system. Excessive acidity, however, breaks up this compound and causes the lead to be deposited as seen in the lead line at the junction of the gums and teeth, where it comes in contact with the tartar. It is perfectly possible to keep the teeth so clean and free from tartar as to prevent any lead line from forming, but this will not prevent lead poisoning. Certain mouth washes do wonders in this direction, but should be avoided as the lead line is a valuable danger signal, and preventing it in this method is like taking the red flag away from an open manhole without replacing the cover.

POINTS EMPHASIZED IN TREATING LEAD CASES

In conclusion I wish to emphasize the following points, as a year or more's application of them has shown me the value of them in preventing and treating lead cases: 1. Curtail as far as possible the hiring of the bilious type of workmen for employment in lead work. 2. Advise workmen in these trades what kind of food to eat, avoiding fatty foods when possible. Watch your company lunchrooms because the meal in the middle of the working day has the most effect. Watch your lead patients, especially avoiding the fatty soups and broths that are generally served

to the convalescents. 3. Encourage the drinking of milk, especially between meals when the bowel alkalinity is low. 4. Keep up the alkalinity of the bowel, preferably by using potassium citrate. The therapeutics to be recommended for treating lead are potassium citrate, sodium phosphate, oxgall and mineral oils. 5. Do not bear down too hard on the prevention of lead lines by the use of mouth washes and constant scrubbing of teeth, as that removes one of the few real symptoms of approaching trouble.

Workmen exposed to unhealthy conditions in industry should have competent medical supervision, not alone to cure the disease but to prevent or minimize them for the industry as a whole. The industrial clinic is really the melting pot of old theories out of which is poured our modern therapeutics.

DISCUSSION

DR. FISK: In what percentage of lead poisoning cases does the patient carry a marked lead-line?

DR. WOOD: A very large percentage; in fact, I believe lead workers carry the lead line for years and years—I can imagine conditions in which half of them have lead lines; it depends a good deal upon the instruction they receive. We are always talking to them about cleaning their teeth. The lead line may disappear, but the real effect does not. It throws you off your guard. It depends upon the emphasis you place upon keeping the teeth clean.

CHAIRMAN QUINBY: In our experience in the rubber industry the most notable industrial chemical hazard is lead poisoning.

I wish Dr. Wood had hit a little harder at the element of prevention of lead poisoning—he intimated what might be done. I think it is generally admitted, in our particular industry at least, that most of the absorption or transference of lead into the system comes through the hand-and-mouth method; I mean, handling substances containing lead and in that way communicating it to the mouth. It is brought about by an absence of cleanliness in washing the hands and face prior to eating. The men are very apt to merely dash their hands under the water faucet and then eat their lunch.

Under certain conditions a certain amount of lead may be absorbed through the respiratory tract. Lead in our industry, however, is one of the heaviest solids, and that rather eliminates it as a hazard to the respiratory system.

As applied to the safety man, I would suggest the following: (1) Careful supervision of the cleanliness of the men. See that their hands are washed and that there are proper facilities for eating their food. (2) Educational propaganda against chewing tobacco and chewing gum; this decreases the amount of lead taken into the mouth. (3) Adequate ventilation for the elimination of dusts containing lead. Absorption through the skin is probably relatively small, but it does occur.

REPORT OF NOMINATING COMMITTEE

DR. SHODDY: Your Nominating Committee suggests Dr. Ralph Elliott, National Lead Works, Cleveland, for Chairman; Vice-Chairman, Dr. McGowan of the Commonwealth Edison Company; Secretary, Dr. Schram of the Fairbanks-Morse Company, Beloit. (On motion duly made and seconded the nominees were elected.)

The Section then adjourned.

Metals Section

August 29 and 30, 1922

J. R. MULLIGAN, Chairman,
Safety Inspector, Bethlehem Steel Company, Bethlehem, Pa.

J. A. NORTHWOOD, Vice-Chairman,
Safety Engineer, Cambria Steel Company, Johnstown, Pa.

TUESDAY MORNING SESSION

THE meeting was called to order by Chairman Mulligan. In the absence of Mr. Hart, the Vice-Chairman, Mr. Northwood, acted as Secretary, and made a short report on the program. Mr. T. H. McKenney, Illinois Steel Company, Chicago, reported for the Bulletin Committee.

REPORT OF BULLETIN COMMITTEE

In January of this year Mr. Mulligan asked that I serve as Chairman of the Bulletin Committee of the Metals Section, extending to me the privilege of selecting my own committee and also tendering the services of Mr. J. M. Sandel, the Council's safety engineer, to assist in the work. Being interested and willing to help in the cause I gladly consented to serve and was most fortunate in securing the services of Mr. Clyde Brading, superintendent of safety, Wisconsin Steel Company; F. A. Lauerma, safety engineer, Interstate Iron and Steel Company; J. A. Voss, safety director, Inland Steel Company, and F. Grebe, safety inspector, American Steel Foundries, Indiana Harbor plant.

The first and only meeting of the committee was held in my office on Feb. 3, at which time suggestions for subjects covering bulletins for the year 1922 were formulated and Mr. Sandel consented to prepare the scenarios covering the same. Immediately upon receipt of the scenarios a certain quota of bulletins was assigned to each member of the committee, who arranged through his company to furnish the necessary photographs. The first photos were forwarded to the Council on Feb. 13, others from time to time as they were prepared. The splendid cooperation of all members of the committee made it possible to prepare material suitable for bulletins for this particular Section. As to how well we performed this task we must, of course, leave that to the judgment of the membership who use this type of bulletin; in any event, we did the best we could and hope our efforts have not been in vain.

In the preparation of bulletins the committee at all times tried to keep in mind the thought that in order to serve all industries in the Metals Section the bulletins should cover a variety of subjects and we hope that we have been successful in carrying out this feature. Another important thought which the committee tried to remember was that the greatest care should be used in preparing bulletins so that in teaching one safety lesson we did not kill the effect by showing up another unsafe practice. I have in mind, particularly, a bulletin sent out by the Council to illustrate the danger of loose handles in sledges. Our safety inspector ordered a supply of the bulletins and they were posted on our bulletin boards, where they occasioned considerable comment and much criticism on the part of the workmen because of the unsafe method employed by the man handling the sledge. In other words, if the man had been standing in the proper position, even if the sledge did fly off the handle, the man would not have been hit on the head as depicted. The conclusion naturally follows that the men posing for the picture had not been properly instructed in safety.

T. H. McKENNEY, Chairman.

CHAIRMAN MULLIGAN: I want to thank Mr. McKenney and his committee for the services they rendered the Metals Section. The committee took up the work at a time when there was no material on hand for bulletins, but as a result of their prompt action we have had the kind of bulletins the Metals Section has been receiving.

I will appoint the following Nominating Committee: Chairman, Mr. A. C. Gibson of the Spang-Chalfant Company, Pittsburgh; Mr. J. B. Ayres of the National Tube Company, McKeesport, Pa.; Mr. Philip Heyne of the Alloy Steel Company, Canton, Ohio; Mr. R. J. Young of the Illinois Steel Company, Chicago, and Mr. J. M. Woltz of the Youngstown Sheet and Tube Company, Youngstown, Ohio. The committee will report at our session tomorrow morning.

INFORMAL REPORT OF CHAIRMAN

There will not be a formal report on the part of the Chairman at this time, but the members of the Metals Section should note particularly the trend of our work. After ten years in an organized body like the National Safety Council, we should be able to check up as to whether we are on the right track or not.

Some things have happened in the Metals Section during the past year which show the result of educational work in the reduction of accidents. We shall have a report this morning from two companies which have achieved wonderful records in accident prevention. These reports, coupled with the program which your committee has outlined, seem to summarize the high spots in our work, so that after we are through with our sessions we can go home with a fairly accurate idea of how we stand and have clearly in mind the lines we should follow in the future.

We have with us this morning one of the fathers of the National Safety Council and also of this Section. I take great pleasure in introducing Dr. L. W. Chaney.

DR. L. W. CHANEY: I hope you will be interested not only in the summary which I will present in this paper, but in the details therein. Your attention is also called to a bulletin which I have been promising you for several years past—to a considerable number this bulletin will come by reason of your office, but if you do not get a copy, kindly drop a line to the Bureau of Labor Statistics. I want you to give it due and careful consideration and nothing would make me happier than to have a letter from you on the subject of this bulletin, particularly the things you do not like—I know the good things in it just as well as anyone.

I want to particularly direct your attention to chapter 3, which deals with the causes of accidents. We have heard, in the course of our experience as safety men, a great deal about the necessity of studying the causes of accidents. This bulletin goes the limit in analyzing causes and if it is really useful I hope that you will use it to good advantage.

OUTSTANDING SAFETY FEATURES IN THE IRON AND STEEL INDUSTRY

LUCIAN W. CHANEY, UNITED STATES BUREAU OF LABOR STATISTICS, WASHINGTON, D. C.

It is the purpose of the present paper to consider this subject under three heads, namely, historical, practical and prophetic. What have been the steps by which the safety movement has advanced, what have been the practical results of the movement, and what may be confidently expected in the future? It is a salutary proceeding to review any developing movement at reasonably frequent intervals. Such a review, to be worth while, must present with due emphasis the favorable facts and must also submit the claims of the movement to the acid test and point out with entire frankness the places where it fails to measure up to standard. Like all such efforts the safety movement has reached a mixed result—it is mainly praiseworthy but cannot flourish on praise alone; its fibre will be toughened by wholesome constructive criticism.

HISTORICAL

In 1906 the general solicitor of the United States Steel Corporation called into conference the casualty managers of the various subsidiary companies and discussed with them the question of possible reduction of accident occurrence. There was emphatic reason why such a conference should be called—American industry reached a climax of slaughter in the years 1905 and 1906. For this climax there were several reasons: 1. Industry had been setting a faster and faster pace and since machines and appliances were designed with practically no attention to their safe operation, but entirely with reference to securing output, the hazards of industry had been steadily increasing. 2. Into American industry there had been coming in steadily increasing numbers alien men unfamiliar

with intensive industrial methods and handicapped still further by being unable to communicate freely with their immediate superiors. The conjunction of these factors was most pronounced in the years mentioned and especially was 1906 a year of most intense industrial activity. The demand for men so far exceeded the supply that there was great shifting from employer to employer and from place to place, each shift bringing the men into new surroundings in which their inexperience contributed to an increased hazard.

Nowhere were these conditions more serious than in the iron and steel industry. The character of the work which it had to offer did not attract the American-born laborer and the immigrant was not only willing but anxious to undertake any labor which proffered him a means of subsistence. The standard illustration of the influence of a high proportion of non-English-speaking foreign-born employees is to be found in Bulletin 298 of the United States Bureau of Labor Statistics, pages 176 and 177. The table there given shows that per 1,000,000 hours exposure American born had, during a period of eight years, 30.2 cases of accident; English-speaking foreign-born had 32.9 cases; while non-English-speaking foreign-born had 70.9 cases. The story from the standpoint of severity is similar. The severity rates per 1,000 hours exposure are: American-born, 5.3; English-speaking foreign-born, 6.8, and non-English-speaking foreign-born, 7.5.

STEEL CORPORATION A PIONEER IN SAFETY WORK

While the facts, as we now know them, were by no means familiar to the assembled casualty managers of the Steel Corporation, enough was known to send them back to a study of the problem with renewed attention and purpose. It was not, however, until the early part of 1908 that definite plans began to take form. In that year a central safety committee of the Steel Corporation was formed and the subsidiary companies began taking steps in the same direction. In March, 1908, the blast furnaces of the South works of the Illinois Steel Company organized a departmental safety committee. In April, 1908, the Lorain works of the National Tube Company instituted a complete system of committees in each of the several departments. In August, 1908, the South works of the Illinois Steel Company extended its committee system to other departments beside the blast furnaces. The curious inquirer can doubtless find scattered instances of similar organizations in other industrial fields, but the committee system as an important feature of the accident-prevention program began with these organizations and has, beyond question, contributed more largely than any other single feature of that program to its present degree of success.

Some other factors in the early development of the movement deserve mention. For example, it certainly was a spur to activity that the magazines began to publish statements regarding accident mortality such as William Hard's "Making Steel and Killing Men." The steel companies were considerably irritated by this and similar publications, believing, as they then did, that the nature of their business was such that any great improvement was quite out of the question. Time has demonstrated that this view was wrong and that condemnation of the conditions which had

prevailed was largely justified. What was not justified was the implication that the men engaged in the steel business were callously indifferent to the fate of the men who suffered the hazards of the business. The steel men were honestly of the opinion that the element of high trade risk was inseparable from their business. An engineer on an important new plant of the Steel Corporation remarked to the safety consultant: "What you want to do is to enclose this plant in a glass case and operate it from the outside." In the course of time this same engineer developed into a convinced and most enthusiastic safety man.

DEVELOPMENT OF COMPENSATION PLANS

It was of the utmost importance that early in the development of safety effort the Steel Corporation gave up the treatment of its personal injury cases according to the old liability law and established for itself a compensation plan. Under liability it would happen only infrequently that a verdict would be rendered against the company and even this had a rather vague interest, due to the fact that it was nearly always handled by an insurance company. In the development of the compensation laws of various jurisdictions the fact that the Steel Corporation and other powerful interests had already set up plans of their own was an advantage which can scarcely be overestimated. With the advent of compensation every personal injury case became a potential cost item and the importance of keeping down this cost was emphasized almost daily. Instead of looking for defenses against a possible suit casualty managers began to look into the causes of accidents and seek some method of dealing with them before the accident happened.

As the movement spread into all parts of the iron and steel industry the Association of Iron and Steel Electrical Engineers became interested. First they began giving a considerable section of their annual program to the consideration of safety topics. Then the chairman of their safety committee, Mr. Lew R. Palmer, conceived the idea of a general organization which should unite the scattered interests which were concerned with the means and methods of accident prevention. The Electrical Engineers sent Mr. Palmer on a missionary tour of industrial concerns and governmental bureaus and, as a result, the first Co-operative Safety Congress convened Sept. 30, 1912, in the city of Milwaukee. It would have made a rather meagre showing but for the presence of the foster organization, the Electrical Engineers. The program was not the huge affair that it has since become but it was of good quality and was received with a greater degree of interest than had been anticipated. The aftermath of the Congress was a committee on organization which made the arrangements for the Second Congress and prepared a formal constitution which was adopted during its sessions.

THE CASUALTY MANAGER BECAME THE SAFETY ENGINEER

The safety departments of the steel companies were very largely developed from casualty bureaus and the period under consideration witnessed a beginning of the transformation of the casualty manager into the safety engineer. In the effort to utilize the tools of his trade, namely,

the safety committee and the compensation system, he began to demand statistical information of a kind which had not hitherto been available.

In response to this demand the United States Bureau of Labor Statistics began to collect data. It almost at once became apparent that the then standard method of presenting the facts by means of frequency of accident occurrence did not by any means tell the whole story and did not always tell an accurate story. When there are combined in a single group items as different as cases involving a single day of disability and other cases involving absence from work for a year the opportunities for error are very great. To meet this difficulty the Bureau began to experiment with rates which should be based on the severity of the accidents rather than on their frequency. The final outcome of this experimentation and prolonged discussion was the adoption by the International Association of Industrial Accident Boards and Commissions of a scale of weighing by which the dissimilar elements of accident occurrence may be reduced to common terms.* The first extended application of this system of severity rating was made in the iron and steel industry.† When the results of applying the method became evident it appeared that severity rating disclosed a much higher degree of importance for death and serious mutilations than had been realized.

The study of fatalities further disclosed that serious accidents were in large measure due to failures to apply engineering knowledge to the problem. This directed attention anew to those changes embraced under the expression "engineering revision." It may be said, therefore, that historically the iron and steel industry has made five outstanding contributions to the safety movement: 1. The industry represented by the Steel Corporation initiated the movement. 2. It established the committee system. 3. It made the first large trial of compensation. 4. Through the Association of Iron and Steel Electrical Engineers it laid the foundation of the National Safety Council. 5. It has directed attention in a new way to the importance of the engineering factor in accident prevention.

PRACTICAL

What has been the outcome of the effort which has built up the present extended organization and brought together from year to year such a gathering as this? It would be perfectly possible to develop an organization and make a brave showing of interest and progress when the real object was far from being attained. It may be said at once that the ordinary expression of success, namely, such and such percentages of decreased accident occurrence, are very apt to be quite misleading. Nothing is more striking than the decline of minor injuries which can be secured by certain kinds of appeal to the men. They respond remarkably and to outward appearance success has been very great, when closer analysis may often show the old stubborn difficulties scarcely touched. It is only by maintaining a continuous record for a considerable period and massing a sufficient body of data that it is possible to secure dependable results. The industry now has more than a decade of such records.

*See Bulletin 276 U. S. Bureau of Labor Statistics.

†See Bulletin 298 U. S. Bureau of Labor Statistics.

If the five-year period from 1910 to 1914 be compared with the five years 1915 to 1919 it will be found that the industry, considered as a whole, showed a frequency in the first period of 59.2 (per 1,000,000 hours exposure) and in the second of 41.6. In severity the record is 4.1 and 3.6.

These are substantial and considerable decreases. They represent both a sufficient exposure and a period of time such that the indications may be accepted as reliable. Some of the more important departments show such severity records as the following: Blast furnaces, 1910-14, 7.0, and 1915 to 1919, 6.1; open hearths, 6.6 and 6.5; sheet mills, 2.6 and 1.5; mechanical, 4.0 and 3.5. It must not be forgotten that these lower severities for the second five-year period were secured under the enormous stress and difficulty of the world war. When the war years are examined in detail it is found that they present a picture of rising accident rates but, for the most part, these rates did not rise so high as in the period of industrial activity immediately preceding the war.

SHOWING MADE IN ACCIDENT PREVENTION

The pictures presented by the several departments are not all thus satisfactory. For example, the Bessemer department while making a frequency reduction (89.8 to 57.7) has severity rates of 6.4 and 6.9 in the two periods. The electrical department has a small decline in frequency (47.1 to 40.3) but severity goes from 6.3 to 7.2. This is distinctly a disappointment, since individual plants have shown that the electrical department can be conducted with much greater safety if due attention is given to it.

The most hazardous employment in which men engage, namely, the erection of structural steel, shows a very interesting improvement. Severity drops from 31.4 to 22.3 when the second period is compared with the first. The exposure is, however, rather small as a basis for a positive conclusion. There is enough, however, in this and other compilations bearing on the hazard of building operations to indicate a very hopeful field of safety effort. When twenty-five departments which can be compared for the five-year periods 1910 to 1914 and 1915 to 1919 are considered it is found that seventeen register an improvement while eight show a less satisfactory condition.

When the causes of accidents are subjected to critical study it appears that the results of effort show a well-balanced effect. The results secured have not come about by excessive attention to some easily controlled cause or group of causes. The study of the nature, anatomical location and results of injury each of them lead to the conclusion that a very pervasive force has been operative, tending steadily toward a lowered accident rate. This may be taken as evidence of the general soundness and efficiency of the safety program.

PROPHETIC

The most interesting and the most dangerous thing to attempt on the basis of such a study as this is prophecy. It is most interesting because of the natural desire to look into the future and see the ultimate result of the forces and activities with which experiment has been undertaken. The danger lies in the possibility of wholly unknown factors

which may be involved. Recent years have been so disturbed industrially that it is most difficult to isolate the permanent factors of the situation from those of merely transient significance. First, it may be said that the day of spectacular accident reduction in large individual groups is practically over. Individual plants in which standard practice is introduced will still make records, but the present trend of events is toward a slow decline, with fluctuations corresponding to the variations of industrial condition. The great variable in the accident record is the number of cases of minor injury. Once these are under control and reduced, as they may easily be, from 50 per cent upwards, further progress will necessarily be slower. The standard illustration of the extreme possibilities of minor injury reduction is the experience of a large group of plants in which a foreman's accident reduction bonus was in effect. Under the conditions prevalent before safety activity began 50 per cent or more of the accidents were such as to cause disability of one week or less and about 25 per cent of the disabilities terminated in the second week. Immediately on the establishment of the foreman's bonus minor injuries began to decrease in a surprising manner. The number terminating in the first week steadily and rapidly declined until finally they were less in number than those terminating in the second week. This is entirely contrary to established opinion. It has been accepted without question that these minor injuries were due to the careless habits of the workers and that they would be hard to eradicate. Experience now demonstrates that this class of injuries is the easiest of all to control.

Second, with a clearer view of the importance of the engineering factor a progressive though probably slow decline in the severity of accidents may be expected. The importance of eliminating minor injury to the greatest possible degree is very great. It has an excellent effect on the morale of the working force. The results of efforts in that direction can easily be displayed and made intelligible. All such considerations enforce the importance of efforts directed toward eradication of minor injury. However, the serious problem which now confronts the safety movement is the control of the severer forms of injury.

RENEWED STUDY NECESSARY

In Bulletin 298 of the Bureau of Labor Statistics the severity of accidents is charted in various relations. The bars of which these charts consist have three portions: a black portion representing fatality, a shaded portion representing permanent disability and a white portion representing temporary disability. In almost every instance the black portion of the bar is the large and conspicuous element. This means that when the various kinds of accidents are weighed in some reasonable relation to their importance, death is shown to be conspicuously the most important. Death is the dark shadow in the field of accident prevention.

Third, as the relative seriousness of fatal injury becomes more evident there will be a renewed study of the causes and remedies of this class of accidents. It is one of the chief merits of severity rating that it does throw up in true proportions the importance of death. Under ordinary conditions, even in the most hazardous industries, death is com-

paratively rare and if judgment is based on this rarity rather than on the seriousness of the occurrence, such judgment is likely to be much in error.

Fourth, if the movement is to progress satisfactorily this more thorough study of death cases must result in further reconstructions and rearrangements as radical as any which have hitherto been attempted. A broad and intensive application of engineering skill of the highest order must be demanded. Finally, it is the high privilege of this Section of the National Safety Council to maintain and extend its fine traditions of service and forward-looking progressiveness in accident prevention into that new industrial day into which we are now slowly and painfully emerging.

DISCUSSION

MR. J. D. JAMES (New Jersey Zinc Company): According to Dr. Chaney, the main object of the movement would be to control both serious and minor injuries. I am very anxious to know how this can be done.

DR. CHANEY: Of course, only a very general answer can be returned to such a general question. Three things can be utilized by the Safety man. The first of these is the educational method. The safety bulletin tends to throw up the idea "Be Careful!" I think safety bulletins ought largely to stop saying, "Be Careful!" and to say "Be Skillful!" We do not lay emphasis enough upon the skill with which the thing is done. If you educate your men right along lines of skillful operation it will cut out many of the minor injuries. The second is supervision—close, careful, personal supervision. That is a matter of educating your foremen and getting them to put the education you give them into practice in the supervision of their men. The third thing is what I call "engineering revision"—the application of engineering skill to conditions under which the work is done. That is a very broad expression and I think we are beginning to understand how broad it is; it covers all of the adjustments of industry, the working conditions. When you really get machines built as they ought to be built, when you really get plants arranged as they ought to be arranged, your death rate will go down. We are conscious of the fact that, even with all that has been done, our plants are not yet engineered from the safety standpoint as closely as they ought to be. There are the three things: Education, supervision and engineering revision.

MR. DEWITT LOOMIS (Carnegie Steel Company, Clairton, Pa.): I would like to ask Dr. Chaney why, in the frequency rating, the minor accidents are not included—accidents where there is no loss of time, or a loss of time for less than one day.

DR. CHANEY: It is unnecessary to include them in order to bring out the facts; there are enough lost-time cases. The practical difficulty is to get an accurate record. You can get an accurate record of lost-time cases, but you cannot of cases not involving loss of time.

That does not apply to the individual safety man. He ought to consider cases where no lost-time occurs, because very often in these cases he will get an idea of the method of procedure which will tend

to lessen them. But for general statistical purposes the cases which lose no time are not useful, because you cannot tell how many of them there are.

RECORD MADE AT SOUTH WORKS

CHAIRMAN MULLIGAN: I think we generally agree with Dr. Chaney in his statement that after ten years of organized work in accident prevention we are not looking for sharp reductions over what has previously been accomplished. There are some exceptions to that rule and we have with us this morning the superintendent of labor and safety in the South Works of the Illinois Steel Company, South Chicago—the man who carried his plant through thirty-six days without a serious accident. I will call on Mr. T. H. McKenney to tell us how he did it.

MR. T. H. MCKENNEY: I hesitated when Mr. Mulligan asked me to come before the Section and tell how we went through a month without a lost-time accident. The idea of blowing your own horn does not appeal to me. I hesitated to try to tell the members of the various companies how we did it, because they are all doing the same thing; they are organized in the same way and will eventually get the same results. So that we may not have a misunderstanding as to what we mean by a lost-time accident I want to say that we consider a lost-time accident one in which a man loses time other than the turn in which he was injured.

We put on a drive every year and for several years we have been trying to accomplish this result; in fact, we are trying to go a year without a lost-time accident. Our goal is the irreducible minimum—zero. That is what we are shooting at all the time. We may never get it, but we will keep on trying.

The following is our record in over-seven-day accidents:

- In 1917 over 1916, 55% reduction.
- In 1918 over 1917, 3% reduction.
- In 1919 over 1918, 7% reduction.
- In 1920 over 1919, 27% reduction.
- In 1921 over 1920, 35% reduction.

All accidents:

- 1917 over 1916, 17% reduction.
- 1918 over 1917, 13% reduction.
- 1919 over 1918, 25% reduction.
- 1920 over 1919, 15% reduction.
- 1921 over 1920, 38% reduction.

WORKING DOWN TO THE MAN WHO GETS HURT

This year I scratched what little hair I had on my head to think how we might do a little better. We got the ear of the general superintendent and told him the thing to do was to go after all accidents and not pay particular attention to the over-seven-day ones. So at the first meeting of the year our general superintendent—an enthusiastic safety man—lined up all the superintendents and said: "We are now going to discuss, every day in this meeting, all accidents, whether they are seven-day, one-day or whatever they may be if they come to our atten-

tion." The word was then passed down the line to the foremen, from the foremen to the subforemen, and on down to the workman. That is the boy you have got to get—the workman—he is the fellow that gets hurt.

In years gone by our safety committees in various departments met once a month or every two weeks; we believe now that is not often enough. You call meetings and discuss accidents, but a lot of the work is forgotten before you have another meeting. The blast-furnace department in our company was the first to adopt the group safety week; in other words, they have five or six safety meetings every day. Six or eight fellows get together, have a little meeting and discuss the particular dangers of their work. That is important because the man that is interested in a particular job is, of course, more interested in the hazards of that job. It looks to me like a good system of holding meetings, because they have gotten good results through that method.

We seldom have an accident around the blast furnaces, but when we do it is a bad one. The only fatality we had this year was in this department. We went eight months without a fatality in our plant. In 1906 approximately forty men were killed in our plant.

After the safety group scheme was worked out for the blast furnaces our structural mills and other departments took it up. However, they have individual more than they do group instruction. The committee grabs off a man here and there and finds out how he is working and what he knows about the hazards of his job and what he is doing for the safety movement.

One of the big things I think we have to get into is the educational end of it; taking care of the fellow the engineering department cannot provide for—that is, hand labor. About 45 per cent of injuries are to this class of labor, for which safety devices cannot be installed. This is our weak spot—something we have to go after. Your committee cannot reach down to that fellow, but you can get six or eight of his fellows on the job to explain the right way to do it. I agree with Dr. Chaney that you must teach the man a more skillful way of doing the work rather than telling him to be careful.

The man who is instructed in being careful sometimes gets stage fright, just as one of you men might if called upon to make a speech. When I am called upon to talk my heart begins to beat a little faster. So it is with a great many fellows on safety matters; they become self-conscious and for that reason they are liable to be hurt. Teach a man the skillful way of doing a job, that is the real way that we should proceed to reduce our accidents.

GETTING RESULTS THROUGH GROUP EFFORTS

The drive for no accidents developed rivalry as it went on. In the last days of the month the general superintendent said to the superintendent: "If any of you fellows have an accident in your plant it will be a disgrace. I do not want to see it. You go after the other fellows." Believe me, they were all on the job! Word went down to the foreman, the foreman said the same thing, and so on down to the men.

Then it became a contest and the men themselves would go after a fellow who was pulling off some boner. If a man did not do his work in a safe manner he was told immediately: "Don't you know that we have got a wonderful record in this plant? Do you want to have the blast furnace department disgraced? Get off of that!"

The movement spread with enthusiasm. Frankly, up until this time I was not in favor of the so-called drive. I have maintained that we should have a drive on all the time and I kind of kidded myself, when I talked to other people, that we did have it going all the time. But we do not. I am thoroughly convinced that you can put on drives and get results. You cannot keep your men keyed up all of the time, but you can part of the time. I know that every organization in the country is doing the same thing. They will not get there by luck—there is no such thing as luck; you have to go out and do the job. The only way is by eternal vigilance, ever at it, twenty-four hours in the day.

CHAIRMAN MULLIGAN: Mr. Trusel will tell us how the Braddock plant ran for a considerable period without a serious accident and about the foremen's school for safety instruction.

100 PER CENT SAFETY IN A STEEL MILL

JOHN B. TRUSEL, BRADDOCK PLANT, EDGAR THOMPSON WORKS, CARNEGIE STEEL COMPANY, BRADDOCK, PA.

This story may seem an impossibility, yet it is a record of absolute fact. It is the record of a steel mill which went through a period of sixty-seven days without a lost-time accident; that is, an accident which would cause a man to lose more than the balance of a turn.

This steel mill is the Edgar Thompson works of the Carnegie Steel Company, located at Braddock, Pa. The plant consists of eleven blast furnaces of 500-ton capacity, seven of which were operating; four 18-ton Bessemer converters, fourteen 100-ton open-hearth furnaces, one blooming mill, four rolling mills, one splice bar fabricating shop and three foundries. The working force, during the sixty-seven-day period, was 4,300 men, about 60 per cent of whom are foreigners.

First and foremost in this great accomplishment stands the general superintendent, O. J. H. Hartsuff, who is back of the movement with all his heart and soul. Safety with him is the first consideration—by example, advice, encouragement, discipline; in every way possible he promotes safety at all times.

Next comes the safety organization, consisting of the general safety committee and seventeen departmental safety committees; 600 safety men in all—there being one safety man to about every seven employees. These committees meet at least monthly, some of them weekly. The department superintendent is always present at the meeting of his safety committee, thereby showing his interest in the work. The department safety committees are made up largely of foremen, who are permanent members of the committees and are not rotated. This safety organization is now practically the same as that built up by one of the

pioneers of safety, Mr. John A. Oartel, who for a number of years was safety engineer at Edgar Thompson and is now chief of the safety bureau, Carnegie Steel Company.

LECTURE COURSES FOR FOREMEN AND WORKMEN

To give the complete history of the truly wonderful safety record achieved by the Edgar Thompson Works we must go back to the spring of 1921, when approximately 150 foremen from this plant attended the lecture course of the Western Pennsylvania division of the National Safety Council at Pittsburgh. The succeeding summer the Edgar Thompson foremen requested that a similar course be put on in Braddock so that more men from the plant could attend the meetings. The Safety Council not being able to handle the matter, the course was put on as a company proposition. The course of six lectures for foremen was held in the fall of 1921, each lecture being attended by approximately 1,200 foremen from the Edgar Thompson Works and the plants of the Braddock district. National Safety Council certificates were given to some 900 foremen, all of whom attended at least four of the lectures.

At the conclusion of the foremen's meetings a course was developed for the workmen. It consisted of sketches or playlets written and acted by the men of the different departments of the plant. These sketches illustrated the various dangerous practices which the workmen engaged in. The benefit derived from this course was twofold. The sketches brought a safety message to the foreign workmen far better than a formal lecture would have done, and, again, the various departments which put on the sketches developed a greater interest in safety than ever before. Approximately 10,000 workmen were reached in the Braddock district. A very distinctive contribution to the success of the two lecture courses was the presence at every meeting of Mr. Hartsuff and all the department superintendents, who demonstrated to their men by their attendance at the meetings that they were taking a real interest in safety.

NO-ACCIDENT RECORDS IN TRANSPORTATION DEPARTMENT

The records of some of the departments at the Edgar Thompson works illustrate in a forceful way the manner in which safety has taken hold. For instance, the transportation department with 250 men, doing all sorts of hazardous railroad work in the shifting of cars, went through the month of February, 1922, with only one minor injury and repeated the same wonderful record in July. Only a couple of years ago this department had a record of from six to ten lost-time accidents monthly. In this department each gang of men is given a five-minute safety talk by the foreman at the beginning of each turn. The careful instruction of new employees or of men sent to new work is rigidly maintained throughout the plant. Before a new man is put to work or before a man is sent out on a strange job he is thoroughly instructed in safety by his foreman or someone delegated by him.

The meetings of the safety committees are large factors in results being obtained at this plant. All employees who have sustained injuries, if only of a minor nature, are brought before the safety committee meet-

ing and given a safety talk. All employees observed engaging in dangerous practices are also brought before the safety committees. These hearings before the committees are not in the nature of discipline, but take the form of a plain, common-sense heart-to-heart talk by the superintendent of the department or the chairman of the safety committee. A sincere attempt is made to teach each workman that the practice of safety will promote his best interest; however, should a workman persist in dangerous practices he is disciplined in proportion to the seriousness of the offense.

To sum up, this very wonderful safety record in a steel mill has been achieved by a very live interest on the part of the management, superintendents and foremen, and by the education of the workmen in all possible ways until each takes the same vital interest.

DISCUSSION

MR. JOHN OARTEL (Carnegie Steel Company, Pittsburgh): I am glad to announce that, in my opinion, safety has developed into an exact science—that we have come to that stage in our work. In the early days, as a lot of the old-timers know, we thought it was all a matter of luck or chance. Sometimes, when I hear of wonderful records, I find myself questioning them, as an old-time steel man who has seen the growth of the movement inside the mill, I ask myself: Is it really true that we are making these wonderful records? It is true, ladies and gentlemen? We have proven that it can be done. Mr. McKenney and Mr. Trusel have told you how it is done. Anyone, in any plant, anywhere, by doing the same things, will get the same results.

I cannot forebear to say a word about the National Safety Council in this connection. The foremen's lecture course, which the Council has put on all over the country, has been a large factor, both at Chicago and Pittsburgh, in making these wonderful records, by teaching the foremen how to do it. I am looking forward to even more marvelous results. The day is here when the iron and steel industry can publish to the world that it is not the most hazardous of occupations, but that a man working in an iron or steel mill is just as safe, in fact, safer than if he were working in many other occupations. We are living in glorious days for safety work and I am very glad to be in it and to lend my little contribution to the movement.

CHAIRMAN MULLIGAN: Mr. Feehan is present and will read his very interesting paper.

PROTECTIVE CLOTHING FOR IRON AND STEEL WORKERS

FRANCIS FEEHAN, SUPERVISING INSPECTOR, DEPARTMENT OF LABOR AND
INDUSTRY, PITTSBURGH, PA.

It is generally agreed by all safety engineers that next in importance to providing mechanical safeguards comes the matter of providing safe and protective clothing for workers in the iron and steel industry. Although the need for both forms of safeguarding against death and

injury were recognized about the same time, the safety movement has made much more progress in obtaining the use of mechanical safeguards than it has in establishing the use of protective clothing. The reason for this is known to all safety advocates and is due to the opposition of workers generally to wearing and using the clothing and the laxity, on the part of the management and foremen in industry, to require employees to wear the same. There are few objections from workers against the introduction of mechanical safeguards, but in every instance there are objections on their part to the use of protective clothing and appliances for the head, eyes, hands, feet and limbs, resulting from the discomfort which the workers experience. Another reason why mechanical safeguarding has made the more rapid progress is because the advocates of accident prevention had less difficulty in convincing the management of industry of the necessity for mechanical safeguarding than they had in convincing them of the necessity for protective clothing. It must also be admitted that Department of Labor and governmental inspectors have not given sufficient consideration to the subject. The safety rules and regulations on this subject are extremely inadequate; in some instances there are no requirements for protective clothing in the iron and steel industry. In others, they are merely recommendations and their use is optional with the management and the workers.

PROTECTIVE CLOTHING AND APPLIANCES

In recent years the different kinds of protective clothing and appliances relating thereto for the protection of all parts of the human body have become so numerous that I shall not attempt to enumerate them. This class of clothing and appliances are usually graded to meet the requirements of the different departments of the industry. The supply companies have aided materially in the development of protective clothing and appliances that go with it, and plant foremen, safety engineers and the workers who wear these garments and accessories have made many valuable contributions in devising the best and most practical forms for general use. Statements from reliable safety engineers certify that protective clothing and appliances relating thereto have reduced accidents in the iron and steel industry, in many instances, more than 50 per cent; this is sufficient proof for the necessity of this form of protection for the workers and nearly all the articles written on the subject have dealt with the necessity of such apparel. I shall, therefore, devote my time to dealing with the subject from another aspect.

STANDARDIZATION OF PROTECTIVE CLOTHING

It occurs to me that we have made sufficient progress in the use of protective clothing and similar appliances to standardize their use and, with this object in view, may I suggest that a committee representative of the iron and steel industry be appointed by the officers of the National Safety Council to draw up rules and regulations that would form the basis for a code of safety standards that would specify the best forms of clothing and safety devices related thereto that would be applicable and practical for general use in the iron and steel industry? These rules and regulations would be readily adopted by the various state depart-

ments of labor and would aid the management of iron and steel plants in determining the needs of the industry. It would standardize the safety equipment so that it could be obtained more readily and much cheaper and would aid materially in establishing the use of protective clothing and appliances in a very large number of plants that have up to the present given this matter little consideration. It would also enable the inspector to enforce the provisions of the law in the many plants referred to. Manufacturing and supply companies could then supply standard clothing and equipment of the different grades provided for in the protective clothing safety standards and have the same ready for prompt distribution.

PROTECTIVE CLOTHING AND HEALTH PROTECTION

I have worked for twenty years in the industry, part of this time in steel mills, and I know too little attention is given to clothing from the standpoint of health protection. It is gratifying to note that large employing concerns are engaging highly efficient industrial physicians to provide proper health protection for the workers, but the average worker is extremely careless about the kind of clothing he wears while at work. I was perhaps among the most careless in this respect and one of my old foremen, in speaking of me recently, charged that I "frequently went to work with hardly enough clothes on to pad a crutch." Industrial physicians have stated that the health hazard in industry exacts a greater toll, and is a greater loss to employing concerns, than accidents occurring from all sources.

The lack of proper working clothes subjects the worker to frequent colds and seriously impairs his efficiency, weakens him physically and often completely destroys his health, and plant managers and safety engineers will do well to investigate the health hazard in their respective plants and co-operate with the industrial physicians in seeing to it that their workmen wear protective clothing to guard against health hazards; also that they are given a comfortable place and adequately protected during their rest periods. I look forward to the time when the working clothing for the health protection of the worker in the iron and steel and all other industries will be designed by the industrial physicians and furnished the employee by the employing concerns at actual cost.

COMPULSORY USE OF PROTECTIVE CLOTHING

I am a thorough believer in the compulsory use of protective clothing in all industries. Laws of almost every state provide that adequate protection shall be afforded for the life, health, safety and morals of persons employed in industrial occupations. It is, therefore, the duty of the employer and the management of industry, in conformity with the law, to provide adequate protection against accidents or the destruction of the life of the employee and the wearing of suitable clothing for the protection of the life and health of the employee should be a condition of employment. When a workman is engaged the hours of labor and wages are specified, the character of the work he is to perform is explained to him and the employer has not done his full duty if he does not acquaint

the workman with the hazards of his employment and provide him with protective clothing and other appliances that will safeguard him from accident or injury to his health. I know that workmen generally, rather than suffer the discomfort and annoyance of protective clothing, if permitted to do so, would prefer to risk their lives and health. Much of this can be charged to the fact that they have become accustomed to risking their lives and health in previous employment. The workers at first strenuously objected to the use of goggles which afforded protection to their eyes. If the employer does not make it a condition of employment and the workman is furnished goggles he puts them in his pocket and takes a chance on getting his eye knocked out. Where it is made a condition of employment he puts on the goggles; they may be broken by an accident but he saves his eyes.

It is gratifying to observe that the largest employing concerns in the iron and steel industry are making the use of protective clothing a condition of employment and have their industrial physicians actively at work devising means to combat all kinds of hazards resulting from the wearing of improper garments. The plant manager, in this advanced and progressive industrial age, who is not providing protective clothing and the appliances relating thereto for the safeguarding of his workmen, and making it compulsory for them to wear and use the same, is unnecessarily destroying human life, violating the law, imposing a financial loss on his company and is totally incompetent to serve in this capacity.

DISCUSSION

MR. J. B. AYRES (Superintendent of Safety, National Tube Company, McKeesport, Pa.): In our company we do not believe in charging the man for protective measures that we introduce. We give him the goggles and expect him to use them. We provide protective aprons and hand protectors of a certain type. When it comes to shoes—all-around wearing shoes,—we furnish them at cost prices.

After we had a fatality caused by the dangling strings of an apron wrapping around a revolving body we immediately took steps to prevent the recurrence of such an injury. We devised an apron that would present a smooth surface, have durability with safety, and could be quickly released in the event of its being caught. We immediately equipped 250 men with these aprons, at the expense of the company, for the purpose of inaugurating the scheme into our plant and encouraging the men to adopt them. Subsequently they will be sold to a man when his old apron wears out, which may be after a year or two of service.

We have developed a glove for acetylene welders that offers protection to the exposed wrist and forearm from flashes. It is made of split horsehide, is waterproof and fireproof, has a gauntlet top, reinforced palm and reinforced at the junction of the middle fingers with the palm; the seams are all at the top of the fingers, thereby enabling the man to have a good grip on the torch. Under the thumb is a reinforcing patch and, in addition to the stitching, they are clinched with small rivets,

which add to the life of the glove. The wide gauntlet top has a cord and snap button, making it possible for the man to pull it over his shirt sleeves or even his coat sleeves when using the torch above the ground level. In cutting down overhead work the sparks do not fall upon his bare arm, and thereby prevents burns which are likely to become infected. The gloves also protect his clothing.

In the matter of receiving flashes we have adopted ordinary oilskin material, such as is used in the fish-packing industry. This is a cotton fabric, oil treated and light in weight; flashes and sparks striking it immediately glance off.

PROTECTIVE CLOTHING CHARGED AT COST TO MEN

MR. OARTEL: I would like to ask whether you should charge the man for goggles or protective clothing.

MR. NORTHWOOD: That same question has been up in our company and has been settled in this way: The man is charged with protective clothing the same as he is charged with tools taken from the toolroom; he is held responsible but not asked to pay for them. The rule covers goggles and all kinds of protective clothing.

MR. FEEHAN: So that there would be no misunderstanding as to the recommendations contained in my paper, I finished the article by saying that employing concerns should provide their men with protective clothing at actual cost—I meant the ordinary clothing worn by employees, not only the iron and steel industry but every industry; every department of industry needs a certain type of health-protective clothing. The iron and steel worker has gotten away from the use of the old clothing that was worn years ago. Instead of the flannel shirt and socks, which would absorb perspiration and protect the worker from the colds he was subject to, some of the men are wearing silk ones now, but some men seem to think that any old thing is good enough for use when at work in a factory. This is not good safety practice and I have noticed that a large number of employing concerns have had their safety physicians and safety engineers design a certain kind of uniform for their employees. I think this system will show good results.

CHAIRMAN MULLIGAN: Mr. Feehan offers the suggestion that the Metals Section recommend to the officers of the National Safety Council the drawing up of a safe practice code on safe clothing for workers in industry.

A motion was made, seconded and carried that the recommendation be concurred in.

The Section then adjourned.

WEDNESDAY MORNING SESSION

CHAIRMAN MULLIGAN: We will have the report of the Nominating Committee for the officers of this Section for the ensuing year.

MR. GIBSON: Your Nominating Committee is pleased to announce the following: Chairman, Mr. J. R. Mulligan of the Bethlehem Steel Com-

pany, to succeed himself; Vice Chairman, Mr. Walter Hart of the Jones & Laughlin Steel Company of Pittsburgh; Secretary, Mr. T. H. McKenney, Superintendent of Labor and Safety of the South Works, Illinois Steel Company. The report is signed by A. C. Gibson, J. B. Ayres and J. M. Woltz. (Vice Chairman Northwood put the report to a vote, whereupon the nominees were unanimously elected.)

CHAIRMAN MULLIGAN: I want to thank the members of the Metals Section and to assure them that I will do my very best to further the interests of our Section.

All who are familiar with the hazards of the Metals Section know that the blast furnace is a source from which we may at any time have a catastrophe resulting in the death of many men through the unsafe handling of gas. It was with that in mind that we put on our program Mr. G. M. Hohl of the Bethlehem Steel Company.

THE SAFE HANDLING OF BLAST FURNACE GAS FOR GAS ENGINE USE

**GEORGE M. HOHL, SUPERINTENDENT OF BLAST FURNACES, BETHLEHEM STEEL
COMPANY, BETHLEHEM, PA.**

The installation of large gas engine plants using blast furnace gas, in the past twenty years, has added a new problem to the duties of the plant manager and the blast furnace superintendent. The poisonous and explosive properties of furnace gas have long been recognized, and the methods of handling it, from the furnace, through the washers, and to the stoves and boilers, have been practically standardized.

In the modern plant there should be little hazard from the poisonous effects of furnace gas. Masks are in use that successfully absorb carbon monoxide and, with the passing of top filling, it should never be necessary for men to work steadily in a polluted atmosphere. Some jobs—such as cleaning washers and mains, or oiling the top mechanism—expose men to gas, but by using masks and having well-trained foremen these can be done with a minimum of risk.

The admirable paper of Mr. F. H. Wilcox describes all the standard methods of handling gas during blow-ins, stops and blow-outs most thoroughly and nothing can be added to the precautions he recommends.

At some plants having gas engines the number has been increased in the past ten years more rapidly than the number of blast furnaces. This has changed a condition of excess gas to gas shortage and has made numerous safety devices necessary to help provide enough gas for the engines at all times. The number of installations using blast furnace gas engines in this country is shown in table I. It is the purpose of this paper to show some of the hazards arising from trying to use more gas

in engines than is available, and to describe the safeguards for blast furnaces, gas-cleaning plants and power-houses necessary to insure a uniform supply of gas.

Blast Furnace Gas Engine Installations in the United States

TABLE I

COMPANY	Plant	Gas Engines			Gas Holder
		Fces.	Blowers	Elec-trics	
Indiana Steel Company.....	Gary, Ind.....	12	23	34	Yes
Illinois Steel Company.....	So. Chicago, Ill....	11	9	8	Yes
Illinois Steel Company.....	Joliet, Ill.....	4	4	3	Yes
Illinois Steel Company.....	Milwaukee, Wis....	2	..	1	No
Carnegie Steel Company.....	Rankin, Pa.....	7	4	6	No
Carnegie Steel Company.....	Braddock, Pa.....	11	2	1	No
Carnegie Steel Company.....	Duquesne, Pa.....	6	4	2	No
Carnegie Steel Company.....	Youngstown, O....	6	4	7	No
Minnesota Steel Company.....	Duluth, Minn.....	2	5	5	Yes
Amer. Steel and Wire Company.....	Cleveland, O.....	4	2	4	No
National Tube Company.....	McKeesport, Pa....	4	4	2	Yes
National Tube Company.....	Lorain, Ohio.....	5	4	3	—
Lackawanna Steel Company.....	Buffalo, N. Y.....	9	21	8	Yes
Bethlehem Steel Company.....	Bethlehem, Pa.....	7	13	11	No
Bethlehem Steel Company.....	Sparrow's Pt., Md..	6	12	5	Yes
Bethlehem Steel Company.....	Steelton, Pa.....	5	10	2	Yes

GENERAL DESCRIPTION OF PLANT

A general arrangement of a complete four-furnace plant is shown in Fig. 1. The gas from the furnaces, after passing through the dust-

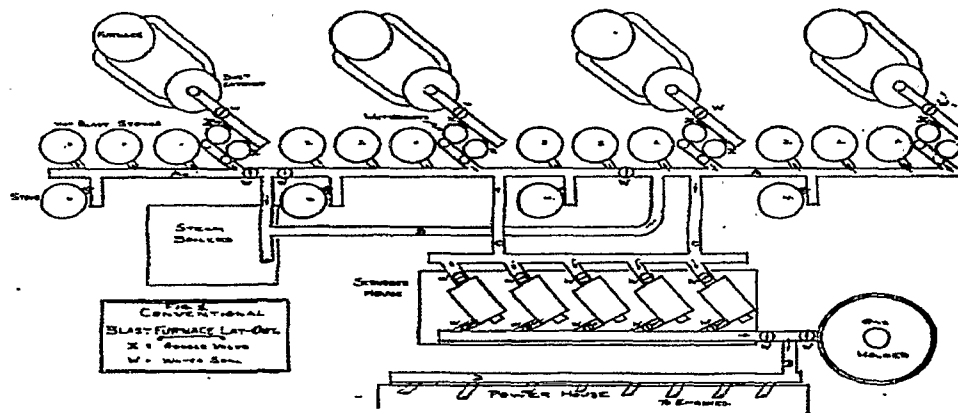


Fig. 1. Blast Furnace Layout.

catchers and washers, enters the general main (A). The stoves are supplied by offtakes from the general main and the mains (B) lead to the boiler-house. The gas to be used in the engines must be fine-cleaned and passes through the main (C) to the Theissen scrubber-house. After the scrubbers it goes to the blowing engine and power-engine house, through the clean gas main (D). Where a gasholder is used it is usually connected into the clean gas main.

There are a number of variations of this arrangement. At some plants, where the power-house is distant from the scrubbers, booster fans are placed between the scrubbers and the power-house. There is generally more than one boiler-house and some of the larger plants have sev-

eral complete installations of gas-cleaning houses, clean-gas mains and power-houses instead of one large one.

GENERAL OPERATING CONDITIONS

In the normal operation of the gas-handling plant only two hazards can arise: (1) The demand for more gas than is available, resulting in suction in the mains; or (2) too high gas pressures, causing the water seals to blow out and allowing the gas to escape. The usual pressure in the main before the scrubbers is eight to ten inches of water. The scrubbers are really wet fans and add six to eight inches to this pressure.

When there is suction in the gas mains, air is drawn in from many points and explosive mixtures result, which only need a spark to be set off. The air filters in from stove and boiler burners and explosion doors. A film of mud coating the inside of a main will often make it gas tight, yet still allow air to leak in if the pressure inside is changed to suction.

The problem of maintaining pressure in the mains is greatly simplified by the addition of a gas holder to the system. This also acts as a reservoir to supply gas when there would normally be a shortage.

PRODUCTION OF GAS

Without a gas holder many complications arise. The supply of gas is varying, as the blast is taken off the furnaces, for casting, pulling down, changing tuyeres, or any major delay. The volume of gas used by the blowers and power engines is practically constant, the same every minute.

With three 500-ton furnaces in blast the production of gas is about 150,000 cubic feet per minute. For six blowers and eight electrics about 61,000 cubic feet of gas per minute are required. As 45,000 cubic feet per minute are used by the stoves there is a balance of 44,000 cubic feet for the boilers. These are average figures. The pressure in the main line, under these conditions, is from three to six inches of water. When the blast is off any one furnace the supply drops to 100,000 cubic feet per minute, but the power-house demand is the same. In order to hold the pressure at two to three inches some stoves and boilers must be shut off.

A worse situation is when one of the three furnaces has a delay of several hours or more, leaving only two furnaces making gas, and the blast must be taken off of each of these occasionally. Enough engines must be shut down so that the total gas used by the powerhouse is less than is produced by one furnace. Then, when either furnace casts, all the gas from the remaining stack goes to the engines, all stoves and boilers being shut off, until the second furnace is gassing again.

Operating this way is a minute-to-minute proposition and is a constant adjustment of gas-consuming units to the gas supply. The problem is to have all branches work together as a homogeneous system.

NORMAL OPERATION

(A) With a Gas Holder

Most plants have one man on duty all the time who is held responsible for the gas system. His duties are to watch the clean-gas pressure, the amount of gas in the holder and the amount being used. His headquarters are generally in the scrubber-house or power-house. In this

office are recording and indicating gauges of the gas pressure at one or more points in the line before the scrubbers and recording gauges for the clean gas and water pressures.

The amount of gas in the holder is indicated either by a mechanical device or by a series of colored electric lights, operated by contacts on the holder as it rises and falls. There should be means of quick communication to the boiler-houses, stoves and engines, either by lights, horns or direct telephones.

The holder should contain enough gas to operate the full number of engines for at least five minutes. This is ample time in which to shut down, if necessary.

The operation of a plant like this, when there are three or more furnaces in blast, is almost automatic. The power-house seldom demands much more than 40 per cent of the total gas produced, and if the blast is taken off two furnaces at the same time the checking of the stove and boiler burners will hold up the pressure in the general main. Even if there should be a complete water failure at the blast furnaces, forcing the blast to be taken off of all at the same time, the holder will supply the gas while they are safely shut down and sealed off.

When only one or two furnaces are in blast more precautions must be observed. The Maryland plant of the Bethlehem Steel Company had one furnace on from Feb. 28, 1921, to April 14, 1922, and ran the gas blowers and power engines continuously with no mishap.

This plant has a number of safety devices that have worked satisfactorily and surely. A 200,000-cubic foot capacity gas holder is connected to the clean-gas main. The Theissen scrubbers are automatically stopped by a switch that is thrown out when zero gas pressure is reached. Whenever gas is being drawn from the holder a whistle blows, calling the engineer's attention to this fact. The height of the holder is shown by a series of colored lights, visible from any point in the power-house and operated by contacts on the holder. When the holder is full a white light shows, when it is two-thirds full a green light is shown and when the one-third full position of the holder is reached a red light is thrown on. The red light is sufficient warning for the engineer to shut down the power engines.

AUTOMATIC GAS-REGULATING APPARATUS

The success of the operation has been chiefly due to an automatic gas-regulating apparatus, the invention of and patented by Mr. J. P. Powell. This apparatus consists essentially of an air-operated gate valve, inserted in the clean-gas line between the engines and the holder. This valve is actuated by a regulator consisting of a suitable gasometer with levers operating a four-way air cock, which distributes compressed air to the air-operated gate valve. When the gas pressure falls below a pre-determined minimum, which happens when the blast is off the furnace, the gate valve is automatically opened and thus allows gas to flow from the holder back through the clean-gas main feeding the engines. The valve remains open until the furnace is gassing freely, and the pressure is increased to a pre-determined maximum, corresponding to a full holder;

the valve is then automatically closed. The regulator is simple in construction and very dependable.

It must be understood that the gas engines are operated practically all of the time on direct gas from the furnace, and it is only during periods when the wind is off the furnace that the holder is actually feeding gas to the consuming units.

An average of 200,000 K. W. hours per day was generated during this one furnace operation and the high daily output was 260,000 K. W. hours. From 65 to 75 per cent of the total gas produced was used by the engines and during peak loads 80 per cent was used. So far as we know this is a greater percentage than is used at any other gas-engine plant and, besides the obvious economies resulting from producing all the power for the plant, it was done with perfect safety. The only time steam-blowing engines had to be put on was when there was an unusual delay at the furnace, such as changing a cooler. Once there was a breakdown of the filling mechanism, causing an eleven-hour delay. While this was being repaired one gas blower was kept on all the time. It ran as slowly as possible, keeping just enough blast on the furnace to hold the tuyeres bright. In about two hours the holder would drop to a minimum and the engine was speeded up until the holder was full, when the pressure was again reduced. This method of holding pressure in the main has been used successfully several times.

The Bethlehem plant of the Bethlehem Steel Company has operated gas engines since 1911, using the gas direct from the furnaces with no reserve supply. This operation requires a closer control and is less automatic than is possible with a holder. The maximum gas requirement of the power-house today is about 100,000 cubic feet per minute, or all the gas from two furnaces. When four or more stacks are in blast there is always plenty of gas, but with only two or three furnaces on the situation is more difficult.

SIGNAL SYSTEMS AND THEIR OPERATION

(B) With No Gas Holder in the System

The headquarters of the man in charge of the gas supply are in the scrubber-house. Fig. 2 shows this place. For quick signalling to the stove-tenders and boiler-houses a series of alarm horns are provided. If the pressure drops to one-half to one inch of water the scrubber-tender turns a switch starting the horns. The stove or boiler tenders throw a return switch that, by lighting a lamp in the scrubber-house, shows the signal is received and that the gas is being shut off of their unit.

When the pressure is high enough again—from two to four inches of water—two short blasts of the horn allow the stoves and boilers to use gas. This signal is acknowledged by the tenders turning the light switch off. With this system the operator in the scrubber-house can close down all the stoves and boilers in about thirty seconds. A telephone to the engine-house is used if it is necessary to take any engines off.

There is a general signal light system between the furnaces, controlled by a switch thrown in any casthouse. The lights are at many

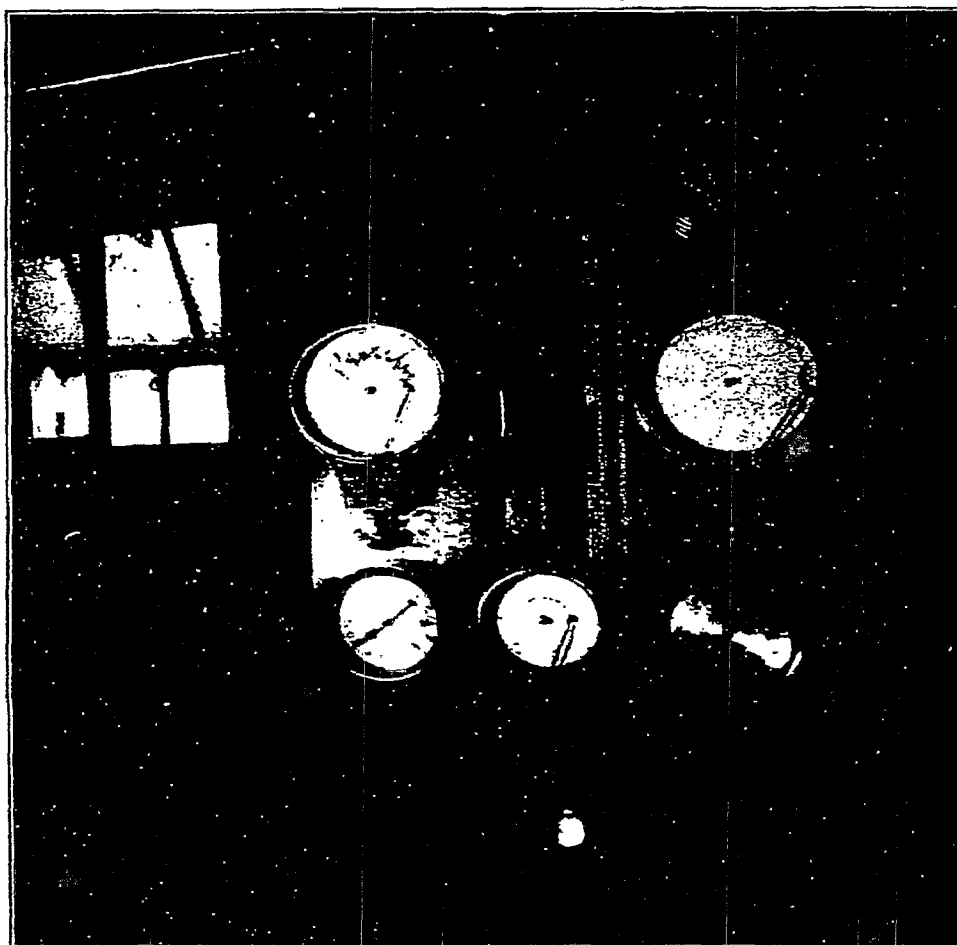


Fig. 2 Indicators and Switches Within Easy Reach of Man Who Controls Gas Supply.

places, at each stovetender's house, in the scrubber and boiler houses and in the casthouses. The signals used are:

Two flashes—furnace is starting to cast.

Three flashes—a tuyere to be changed after cast.

Four flashes—the blast is about to be put back on the furnace.

Light on—the blast is off.

No keeper or blower is allowed to take the wind off of his furnace while the light is lit. This effectually prevents two furnaces being off at the same time. The two-flash signal is a warning to the other fur-

naces, and the three flashes are to give everyone an idea of how long the delay will be.

For giving alarm, in case the water supply fails, there are two automatic whistles that give warning when the pressure has dropped five pounds, and a large whistle that is used only in case of a complete failure.

This plant had two furnaces in blast from May, 1921, to April, 1922. During this period an average of 45,000 cubic feet of gas per minute was used by the gas engines. The pressure before the scrubbers ranged from one to three inches of water, except during casting periods, when it was raised to eight to ten inches. When the blast was taken off either furnace all stoves and about half the boilers were closed. This rule was strictly enforced. The light system kept everyone informed about what was happening on the furnaces.

VALUE OF RESERVOIRS

There were two breakdowns requiring one furnace to be shut down for over six hours. When the remaining furnace cast there was no gas produced for several minutes. To put on steam blowers and close down all the gas engines would have meant some delay in starting again. To prevent this, just before cast, one steam blower was put on the furnace and all the gas engines but one blower were stopped. Only one Theissen was kept operating. At the end of the cast the hole was closed with two to three pounds of blast on the furnace. This made enough gas to keep the mains full and hold four to six inches of pressure. As soon as full wind was on, the gas electrics were started.

The value of large gas mains or of some sort of a reservoir before the Theissens was shown by an accident in July, 1921. The gas for five of the seven scrubbers passes through a Zschocke tower between the main gas line and the scrubbers. The other two draw gas direct from the main. The towers are not used as gas washers, but apparently act as a cushion for violent changes of the gas pressure. In July, 1921, while a tuyere was being changed on one furnace, the second furnace slipped, and the rush of gas blew the water from the seals of the two direct-connected Theissens. The house filled with gas and one man was asphyxiated. The seals of the five Zschocke connected scrubbers, although the same height as the other, did not give way. The overflow seals of all the scrubbers were raised. The four-flash signal showing that the blast is about to be put on a furnace gives warning to the stove and boiler tenders to start using gas and prevents any momentary high pressures. With these safeguards there is no fear of any gas trouble at Bethlehem.

The gas pressure before the scrubbers has been from one-half to three inches of water for periods of months, with no danger at all, either of a shortage or any excess of gas. In 1916, before the present system was installed, a break in the water main forced all the furnaces to take the blast off at once, and before the engine could be shut down air was pulled into the mains. A series of explosions resulted, wrecking three Zschocke towers and three Theissens, and blowing the roof from the scrubber-house. Everyone escaped but one man who was hit by a portion of the

falling roof and killed. With the signals used today the engines can be stopped within one minute after the water pressure drops.

STARTING AND SHUTTING DOWN

It is occasionally necessary to shut down the entire plant—furnaces, engines and all. This is not difficult, but should always be a one-man job and all orders should come from him. It is best to have a definite schedule prepared and checked over, to make sure that there is no chance of trying to use more gas than is being produced at any time. As the furnaces are shut down and sealed off the same can be done to the Theissen until, finally, only one of each is operating. These can both be stopped at the same time. If the shutdown is for only a few hours, the mains can be left filled with gas, from the washer seals to the scrubber outlets. A four-inch steam line connected into the clean-gas line will thoroughly purge this main in ten minutes. For any prolonged shutdown all mains should be purged with steam and a slight amount kept passing through them.

To start up, the process is reversed. One steam blower on one furnace will provide enough gas to follow the steam to the power-house and after the mains are filled and the first engine operating, starting the other units is comparatively easy.

GENERAL

Safety devices have great value in making gas-handling plants danger free, but one of the best safeguards is a smooth-working, wideawake organization. All parts of the system must work together or the value of lights, whistles or alarms is lost. Close co-operation between the furnace men, the scrubber tender and the engineers is essential. In a plant operating with no holder it is sometimes a matter of seconds in adjusting consumption with supply. Divided authority and responsibility in such work will cause mixed orders and eventual trouble.

Gas troubles, such as Theissen explosions, are about the most expensive delays any plant can have. There is the double expense of the explosion itself and the loss from other departments idle on account of the lack of power. Money spent to make the gas system safe is a cheap form of plant insurance.

It may be possible to have too many safeguards, in an effort to eliminate the element of human fallibility. This is always present and the best method is to have a few sure-working horns or lights and orders that can not be misunderstood—all operated by intelligent, responsible men.

DISCUSSION

MR. E. L. NEWKIRK (Foid Motor Company): I wonder what effect either the hand regulation or automatic induction of steam into the main, in case of failure of water or the blast, would have in tiding over for a few minutes and allowing the engine a chance to be shut down?

MR. HOHL: I do not think the gas engine would run on a mixture of gas and steam. Without the gas engine, it would probably be effective—shut off all your boilers and put the steam in right away.

MR. NEWKIRK: There seems to be a difference of opinion as to whether you should walk a man who has been gassed and keep him moving, or whether you should allow him to lie down and apply heat to his feet or body.

MR. HOHL: If we have a man who is badly gassed—we only had one in the last year—we rush him to the dispensary, where they use the pulmotor.

MR. NEWKIRK: In isolated plants a man sometimes has to be handled by the workmen in the gashouse.

MR. HOHL: We try to keep him moving.

CARE OF MEN GASSED AT BLAST FURNACES

CHAIRMAN MULLIGAN: Medical science has gotten the matter of blast-furnace gas down to the point that they declare it a slow and insidious poison; that is, getting it in small quantities. The other method is by stepping down into a great volume of it and being overcome. We have had accidents of both kinds recently. I will relate one: A man had been about the furnace for some eighteen years, but had been off for seven months on account of a broken leg; then he came back and worked about the furnace, on odd jobs, for two months. On this day he went with the regular oiler to oil the heads of the furnaces, oiling two before noon. Upon going down he was unable to eat his lunch. In the afternoon he told the other man that he did not feel well, that he was sick at the stomach, had a headache and was unable to eat. The other man, according to rules and regulations, instructed him to get down, but he refused. Then he instructed him to keep off the furnace and keep away from the gas, but this man, after being off for quite a long time and having a large family, imagined, like the rest of us, that he ought to keep on working. So he remained and worked on the furnace for a good part of the afternoon, slowly getting the gas. As a result, late in the afternoon his buddy noticed him attempting to sit down and falling over. He got him out from the furnace head over onto the runner. He was not unconscious; he walked him over to the elevator and down; I think he walked him to the blast furnace office, where Mr. Hohl took him over to the dispensary. When he got him over there he did not look so very bad—he was like other cases that had been taken in by the doctors and brought about all right. After two hours' work he suddenly collapsed. There was a case of getting the gas gradually all day long, until it so poisoned the system that he died from collapse.

In the matter of blast-furnace gas you cannot see it, you cannot always smell it, but you are slowly getting it, and it is slowly poisoning the system. We cannot be too particular in warnings given to the men working about blast furnaces. Under Mr. Hohl, at our Bethlehem plant, the rules are that as soon as a man feels that he is getting gas—that is indicated by a sick headache or a sick stomach—he must report to the foreman at once, who must send him to the dispensary.

The old method of treating a man for gas poisoning was to walk him about, thinking that if he walked about for a short time he would get the poison out of his system and would come around all right. We

have changed that opinion now that we know blast-furnace gas poisoning is slow and insidious. It takes some time to get it out of the system and our method at Bethlehem is to get the man to the doctor as soon as possible. The doctor takes care of him, generally by putting him on a cot in the dispensary and giving him attention, if possible, the whole day, until he gets the gas out of his system and pronounces him safe to go home. The doctor possibly keeps him at home for a few days.

QUICK WORK NECESSARY TO SAVE LIFE

MR. JOHN R. BROWNELL (Safety Engineer, Department of Safety and Personnel, Equitable Life Assurance Society, New York): I wish to say one more word about carbon monoxide poisoning. The point was not brought out that the poisonous effect is due to the removal of oxygen from the blood. Therefore, the big thing is to get oxygen to replace that which has been taken away. That is why, in cases of unconsciousness or when the patient ceases to breathe, the prone-pressure method is to be used until the accident apparatus can be applied by one who knows how to apply it. This insidious breaking down of the blood corpuscles is a process that is apt to kick a man over unexpectedly. I am talking particularly of the extreme case, where you find a man has been exposed to a great deal of it at once. I would urge anyone who has anything to do with such a case not to hesitate, but to start the Schaffer method and let someone else get the surgeon with the apparatus. If he has to be moved, keep him up while he is being moved. That will save lives.

MR. NORTHWOOD: The first two or three minutes mean a great deal when a man is unconscious—it means the difference between life and death.

MR. MCKENNEY: We have the man handled by the Schaffer method and we have oxygen tanks ready. As soon as a man begins with the Schaffer method another man gives him oxygen—we have the apparatus arranged so that we cannot give a man too much.

MR. NORTHWOOD: Do you walk your man around?

MR. MCKENNEY: No; that is old stuff. We keep the man warm.

MR. NORTHWOOD: That is our plan, too; keep him warm, but do not walk him around on account of the heart action; it is a question of the heart failing or going completely bad.

MR. J. D. JAMES (New Jersey Zinc Company): We have gas from two sources, both very dangerous, at our plant. If we find a man not unconscious but feeling weak or with a headache, if he is able to walk about, we walk him. If he is not able to walk, we give him oxygen; if he is unconscious, we use the pulmotor.

WELL TRAINED ORGANIZATION ESPECIALLY VALUABLE

MR. L. A. TOUZALIN (Superintendent of Blast Furnaces, Illinois Steel Company, Joliet): Mr. Hohl's paper has again drawn attention to the fact that a safety organization, trained in safety methods, is worth a good deal more than safety appliances.

In regard to the use of steam in gas making, it has been my experience that steam is very valuable, especially in hot gases, but in cold

mains not so much so. There is always danger of explosion, where you have no brick lining, because quick cooling tends to suck air in the cracks where leakage occurs. The mains are ordinarily hot and are more subject to explosion from the infiltration of air than those mains which are cool. In a great many plants they put steam in hot mains and simply seal the cold mains and allow them to stand in normal shut-down. Mr. Hohl's paper shows the organization at Bethlehem is very well trained in the handling of gas, and the results they have obtained indicate that also.

CHAIRMAN MULLIGAN: We will now have the next number on our program.

SAFETY IN CRANE REPAIRING

E. E. REMINGTON, ASSISTANT SUPERINTENDENT OF MAINTENANCE, FORD MOTOR COMPANY, DETROIT, MICH.

I presume that few of us fully realize the responsibility that rests upon those responsible, directly or indirectly, for the safe workings of the cranes in the various plants we represent. In the modern plant we have learned to depend upon the crane for the quick transferring of stock from one location to the other, the same as we do the truck or delivery in the street.

We have, in the Highland Park plant of the Ford Motor Company, about forty cranes, varying in capacity from five to fifty tons. These cranes handle approximately 6,500,000 pounds of steel daily, not including scrap; besides this, they handle, on an average, 135 cars of incoming miscellaneous stock. I have made no mention of outgoing freight, a part of which is handled by cranes, but you can form some idea of what that would be in a plant turning out 4,000 or 5,000 cars daily. This brings us to where we can see that a most rigid system of inspection and repairing is necessary.

The crane service in our factory is divided into two territories, with two foremen in charge of each, one for electrical and one for millwright repairs. In each territory we have a man who inspects our cranes each day. A report of anything that needs attention is given the foreman and arrangements are made to make the repairs as early as possible when the crane can be taken out of service; if the repairs needed are such that it renders the crane dangerous for use it is taken out of service at once.

LOCATION AND SAFETY DEVICES ON CRANES

The location of the crane alone makes it more or less dangerous to repair, being anywhere from twenty-five to seventy-five feet from the floor. Every means is taken at our plant to make conditions as safe as possible for the men who have to make these repairs, by having walks along each side of the bridge with good handrails, toe boards, etc. Planking is cut to fit between the girders, which makes a good, safe place for men to work. We are also fortunate, at our plant, in having a bridge or balcony over which the crane can be passed while being repaired.

We have added a great many safety features to our cranes, which we feel are needed; for example, we use two clamps instead of one in making our cables fast to the drum. We feel that one of these is sure to be drawn tight.

We have nearly all of our cranes equipped with the Q-type brake. We find that this type of brake is more dependable than the one that comes with the cranes.

Safety in crane repairs reaches farther than the repairing of the crane itself—we have the track to keep lined up and level. We have safety rules—very rigid ones governing this work. We do not allow a man on the rail without first setting a bumper between the crane and the point where the repairs are to be made. At a certain distance between the bumper and the crane a white flag is placed on the rail. This warns the operator that bumpers are set a short distance ahead.

MEN IMPRESSED WITH SAFETY INSTRUCTIONS

Guards are placed over all trolley wire gears and wheels, so that it is almost impossible for a person to be injured. It is very gratifying to one who is interested in safety to read the yearly report of the safety department of the Ford Motor Company and to learn that in a plant where there are 55,000 men employed there was not a single fatality. In analyzing the reason for this wonderful record we find that the same system that was applied throughout the factory was applied in the repairs of our cranes. First of all the safety department is alive. Next, they have the hearty support of the management, for these men make safety for their men the first rule of their life in the factory.

It means a great deal in educating men in the safety movement to hear a man at the head of a company say, "Stop this or that machine and do not start it until it is safely guarded." The man's thought at once is that in this mad race for production they are willing to lose the use of a machine for a day or two; that safety is paramount.

DISCUSSION

OSCAR F. MEINHARDT (The Bettendorf Company): I would like to ask Mr. Remington what protection he has for the repairman while he is working on the crane, where there is more than one crane in one bay?

MR. REMINGTON: Where we have more than one crane we always take it to the extreme end of the building for repairs. We have three craneways, where we have three cranes, and in the center of the building is a balcony, so that we have a place to locate each crane and repair it. Under no consideration is the man to make repairs except in this one place.

MR. MEINHARDT: We have a system in our factory where the repairman gets on the crane and throws on a red light. No one is allowed to throw that light out except under orders from the repairman.

MR. REMINGTON: We also have the red-light system. In making repairs to the tracks we do not allow any man to go on the track without first placing a bumper between the point to be repaired and the crane. In addition, a white flag is used to give warning.

MR. WILLIAM WATTERS (National Malleable Castings Company, Chicago): We tried the red lights and flagging signals, but have found them no good. The only safe method, where you have more than one crane on the runway, is to put a man in the cage with the crane man and an emergency stop on the rail. The duty of the extra man is solely to see that the crane is not run into the bumpers. He is able to control the crane just as well as the crane operator. In other words, he must also be a crane operator. Red lights and flags do not constitute a secure system. When a craneman or repairman goes on a crane to make repairs he may take a half-dozen men with him. There is a switch that he throws out which will accommodate a half-dozen locks. Each man going on that crane is required to put on a lock, and the crane cannot be put into service until the last lock is taken off. Suppose the man in charge wants to repair the hoisting system; he pulls out the switches for the trolley and bridge motors, also the hoisting motor, until the repair is made. After the repairs are made, he then wants to see whether everything is all right; he puts the switch on his motor, leaving the trolley and bridge switches out. He cannot make a mistake. These devices we have found to be the best up to this time.

REPORT BLANKS FOR CRANE REPAIRS

CHAIRMAN MULLIGAN: What system of inspection do you have over both the cranes and chains?

MR. WATTERS: We have printed sheets that are put into the hands of the crane men and inspectors—two separate sheets, printed differently. The crane man must make out a repair slip every day when coming off of shift. The crane inspector must fill out his slip when coming off of the inspection. These slips contain all items of importance, for instance, all the different gears. We have no chains, we use cables, whether on the auxiliary or on the main. The chief electrician must make an inspection once a week. He also has a slip to fill out. Once in awhile, my assistant or I check up on cranes, but we find the slips to be important.

CHAIRMAN MULLIGAN: Do you train your chain hookers? What inspection do you have on them?

MR. WATTERS: The chain hookers are trained by the assistant safety inspectors, of which there is one in each of our eight departments. The crane operator takes signals from the hooker only. If the manager were to come into the plant and give a signal to the crane operator he would not obey it.

MR. BROWNELL: I would like to ask Mr. Remington what, if any, provision is made as a warning under the area of the crane when it is under repair? Do you have drop signs?

MR. REMINGTON: We rope off the ground or floor under the crane and we have danger signal signs pointing upward.

ALL CHAINS FURNISHED BY MILLWRIGHT DEPARTMENT

MR. L. H. HOPKINS (International Harvester Company): I would like to say a word in regard to the proper inspection of chains and cables

used for lifts. We have periodic inspection of lifting chains—they are issued by the millwright department. No foreman has the right to make up a chain for his own department; he gives an order to the millwright department, who makes his chain for him. Once each three months the chains are put into a furnace and annealed. We have experienced some difficulty because a chain does not always show when it is ready to break. We are gradually replacing the chains with cables.

MR. NORTHWOOD: Has anyone had experience in using cables with hot steel; that is, with hot billets?

MR. MCKENNEY: This question came up a year ago in this Section and I said at that time that we used cables. We use them, but not ones with a hemp center—we use wire centers. We use cable slings altogether in our hot-metal work. We find them better than chains.

MR. ADAIR: We use soft metal cores on cables and we find they do not wear out faster than chains. We won't go back to the old chain method of handling hot metals.

MR. WATTERS: I would like to ask what can be done, in handling cables, to overcome injury to the man's hand when the wires begin to break. I am positive that the cable is not taken out of service just as soon as one wire is broken. We have had bad blood poisoning cases where the wires stuck into the man's hand.

DANGER FROM SHORT WELDS

MR. AYRES: We have 1,600 wire rope slings in one department; they are from twelve to eighteen feet in length, with a loop spliced back. We have two men splicing loops for wire cables all the time. We have met with the experience where broken wires punctured the hands of the workmen. A molder in the foundry conceived the idea of protecting the rope. Inasmuch as we are in the pipe business, he thought that by using a pipe sleeve, and putting it on the cable before the splice was made, that it would slip down. It took a two-inch pipe. That was crude, but it gave us an idea. We have a machine that makes pipe of the necessary taper, and we use it a little larger than the size of the cable; larger at one end to take up the double thickness of the splice. It comes down a little below the splice. A man hammers the upper edge of the splice and pinches it together. *We have not had a puncture case on wire cables in six years.*

MR. WATTERS: That will take care of it only where a splice is made. *You cannot always catch it when the first wire is broken. There is where the trouble arises. The wire may be inspected in the morning and it may break at noon or it may break an hour after it is inspected.*

MR. REMINGTON: We have been up against the same proposition at our plant. *The only places where we use wire cables is in our drop forge department and sometimes in cases of handling heavy machinery; where we use more than one crane we use cables; aside from that, we use chains exclusively. Our chains are inspected and heat treated. On all our four-cable cranes we use an equalizer. I do not know when we have had a broken chain. As soon as we break a hook we put on one of our own standard.*

MR. BRANCH (The Pullman Company): We use slings and before we make a splice we slip on a short piece of pipe.

MR. BROWNELL: We had a three-quarter-inch chain that was repaired and annealed two weeks before an accident occurred. It looked perfect. It had lifted a load heavier than the one under which it broke, but it threw the man and he was killed. The danger of repairs to chains, I think, is enormously serious. The right way to weld is with your surfaces meeting each other and pressed in. We found that the chain in question actually had one-quarter of the area taking hold that should have been in the weld. It was overstrained on the first load and broke on the second. The man who is depending on a chain is in a far worse position than a man running cables.

MR. WATTERS: The chain was too small for the load they were handling. If you are to handle a five-ton load pick out a chain that will stand the strain. In our plants, we will not allow a smaller chain than five-eighths. Such a chain will lift any load that we are likely to handle in the plant.

AN EFFECTIVE CRANE STOP

CHAIRMAN MULLIGAN: If we would check up the load that the chain can stand and fit the load to it, we would have less chains breaking.

MR. REMINGTON: We have had trouble with poor welds. After a new chain is inspected, after it is put in service and after it is annealed, still we have had cases where the weld was not absolutely right; we would open it up and it showed that it was only a short weld. We have a man who does nothing but test and repair chains.

MR. NORTHWOOD: We have had a number of chains break at the weld and we have overcome that by having a regular testing machine. We had a serious accident, a man lost his hand on a crane rail, and one of our master mechanics got up a device that was absolutely new as far as we are concerned—a guard very much the same as a cow-catcher on an engine. Many of our stops are grooved to fit the wheel and the question came up as to what kind of a wheel guard to use in order to be able to use a stop. The guard was so arranged that just before reaching the block or the stop it opened up that way. (Illustrating.) As it came back from the stop it closed again.

MR. C. H. COTTON (Walworth Manufacturing Company, Kewanee, Ill.): We have to use a good many pipes and leave them out in the open air for weeks; also chains. I would like to know if a cable would be better to use in such a condition.

MR. AYRES: We have traveling cranes in the field and we use cables exclusively. If we are carrying a large load of pipe we have a stretcher between the two cables to keep the loose pieces from falling together. When handling single or small pieces—maybe one piece of twelve or fourteen-inch pipe—make a wrap around the pipe with a hook, and that makes a binding hitch that won't slip.

The Section then adjourned.

C. L. COLBURN, Pittsburgh, Pa., United States Bureau of Mines and National Safety Council.

M. L. CLINE, New York City, American Smelting and Refining Company.

WILLIAM CONIBEAR, Ishpeming, Mich., Cleveland-Cliffs Iron Company.

H. R. COPELAND, San Francisco, Calif., Continental Casualty Company.

FRANK R. CLARK, Clinchco, Va., Clinchfield Coal Corporation.

G. C. CASSELL, Wilder, Va., Clinchfield Coal Corporation.

F. C. CARSTARPHEN, Trenton, N. J., American Steel and Wire Company.

H. N. DAMBMANN, Ogdensburg, N. J., New Jersey Zinc Company.

L. T. DUBLIN, New York City, Metropolitan Life Insurance Company.

T. C. DESOLLAR, Hancock, Mich., Quincy Mining Company.

J. A. DAMSON, Clinchco, Va., Clinchfield Coal Corporation.

C. H. DELL, Mapleton Depot, Pa., Pennsylvania Glass Sand Company.

E. H. DENNY, Pittsburgh, Pa., United States Bureau of Mines.

L. A. DEBLOIS, Wilmington, Del., E. I. DuPont de Nemours & Co.

A. H. FINDEISEN, Madison, Wis., Industrial Commission.

R. DAWSON HALL, New York City, McGraw-Hill Company, Inc.

RUSH N. HOSLER, Harrisburg, Pa., Coal Mining Institute of America, Pennsylvania Coal Company Rating and Inspection Bureau.

H. T. HARPER, Copperhill, Tenn., Tennessee Copper Company.

FRANK E. HARR, Dante, Va., Clinchfield Coal Corporation.

M. K. HASKINS, Cleveland, Ohio, Davis & Farley Company.

L. L. HALL, New York City, National Bureau of Casualty and Surety Underwriters.

G. W. HAGGERSON, Ironwood, Mich., Steel and Tube Company of America.

H. G. HENSEL, Chicago, Ill., Steel & Tube Company of America.

WM. W. JANZE, Mayville, Wis., Steel and Tube Company of America.

RUDOLF KUDLICH, Washington, D. C., United States Bureau of Mines.

D. P. KENNEDY, Pittsburgh, Pa., Pittsburgh Plate Glass Company.

E. O. KEATOR, Dayton, Ohio, Consulting Civil Engineer.

E. T. LEDNUM, Denver, Colo., E. I. DuPont de Nemours & Co.

B. E. McKECHNIE, Franklin, N. J., New Jersey Zinc Company.

M. S. MURRAY, Curtisville, Pa., Ford Collieries Company.

O. L. MANTHEY, Duluth, Minn., Oliver Iron Mining Company.

THOS. MCNEER, M. D., Dante, Va., Clinchfield Coal Corporation.

M. D. MCINTYRE, Cleveland, Ohio, Pickands, Mather & Co.

E. M. PARLETT, M. D., New Castle, Pa., Pittsburgh Limestone Company and Carnegie Steel Company.

G. W. PIKE, Dante, Va., Clinchfield Coal Corporation.

D. J. PARKER, Pittsburgh, Pa., United States Bureau of Mines.

J. T. RYAN, Pittsburgh, Pa., Mine Safety Appliances Company.

E. W. ROBINSON, Salt Lake City, Utah, Continental Casualty Company.

J. W. REED, Fairmont, W. Va., Consolidation Coal Company.

A. J. M. ROSS, Lead, S. D., Homestake Mining Company.

J. F. RING, Clinchco, Va., Clinchfield Coal Corporation.

W. L. RUNGAY, Wilder, Va., Clinchfield Coal Corporation.

W. D. RYAN, Kansas City, Mo., United States Bureau of Mines.

C. J. RAIDER, Baltimore, Md., United States Fidelity and Guarantee Company.
H. L. REESE, Wilkes-Barre, Pa., Susquehanna Collieries Company.
W. A. ROWE, Detroit, Mich., American Blower Company.
R. H. SEIF, Franklin, N. J., New Jersey Zinc Company.
J. C. STEPHENS, Franklin, N. J., New Jersey Zinc Company.
BEN S. STORY, Cleveland, Ohio, Pickands, Mather & Co.
R. R. SAYERS, M. D., Washington, D. C., United States Bureau of Mines.
H. J. SPOERER, Chicago, Ill., Steel and Tube Company of America.
R. T. SOLENSTEN, Chicago, Ill., National Safety Council.
B. F. TILLSON, Franklin, N. J., New Jersey Zinc Company.
H. H. WILLIAMS, Flat River, Mo., Federal Lead Company.
A. E. WATSON, Dante, Va., Clinchfield Coal Corporation.
A. W. WHITNEY, New York City, National Bureau of Casualty and Surety Underwriters.

STATISTICS ON ATTENDANCE

Number of sessions.....	4	Number of other companies represented	23
Total attendance, all sessions.....	140	Number of State or governmental departments represented.....	2
Average attendance, each session.....	35	Number of countries represented....	1
Total number attending sessions.....	67	Number of states represented.....	21
Number of coal mining companies represented	5	Number of papers presented.....	16
Number of metal mining companies represented	10		

TUESDAY MORNING SESSION

CHAIRMAN TILLSON opened the meeting with a few words of greeting. He stated that co-operation with the United States Bureau of Mines had been extended for another year and that Mr. Colburn would visit most of the members of the Mining Section during the coming year. Mr. Tillson was hopeful that the effect of these visits would become daily more evident and show the cumulative influence which such trips should produce.

Mr. Tillson then spoke of the difficulty in preparing annual programs; he wished to express his appreciation for the splendid work that had been done by Mr. D. E. A. Charlton, Chairman of the Program Committee, in arranging for this year's program. Although a definite plan had been laid out a year ago, and assignments made and accepted, yet it was necessary at the last minute to secure additional papers to complete the sort of a program that was desired. Mr. Tillson said: "The feeling is all too prevalent that we belong to an organization like the National Safety Council in order to receive rather than to give—if everyone practiced that policy we would not exist. I have mentioned the question before and I am merely emphasizing it, that really we could not have a good time here unless some of our members were generous with their time and their thoughts. It is well for us to realize that those who practice such a policy of generosity, reap the greatest benefit from interest and activity."

The Chairman then called upon the various officers for their reports. Mr. Boardman, Chairman of the Committee for Organizing Local Councils, stated that during the past year it was not practicable to organize locals of the Mining Section; that he had discussed the matter with the officials of his company, but on account of the depression in mining it was thought

best to organize a local chapter of the Joseph A. Holmes Safety Association among the men; then when times were more prosperous to go ahead with the organization of the chapter of the Mining Section among the officials. Mr. Boardman was hopeful of organizing locals during the coming year.

Mr. Ryan, Chairman of the Membership Committee, reported that elaborate plans had been adopted for the solicitation of new members, but that the plans were being held up on account of the depression in the mining industry and the coal strike—the committee was all ready to go ahead as soon as the situation cleared.

The Secretary had no report to make.

The Chairman announced as the next order of business the appointment of a Nominating Committee to consider candidates for office for the next year, to report at the Thursday morning session. He appointed Dr. R. R. Sayers to serve as Chairman of this committee, with Mr. J. T. Ryan and Mr. Joseph W. Reed as the other members.

There was no other business and the meeting proceeded at once with the papers. Dr. R. R. Sayers was announced as the first speaker.

MINE HYGIENE AND SANITATION

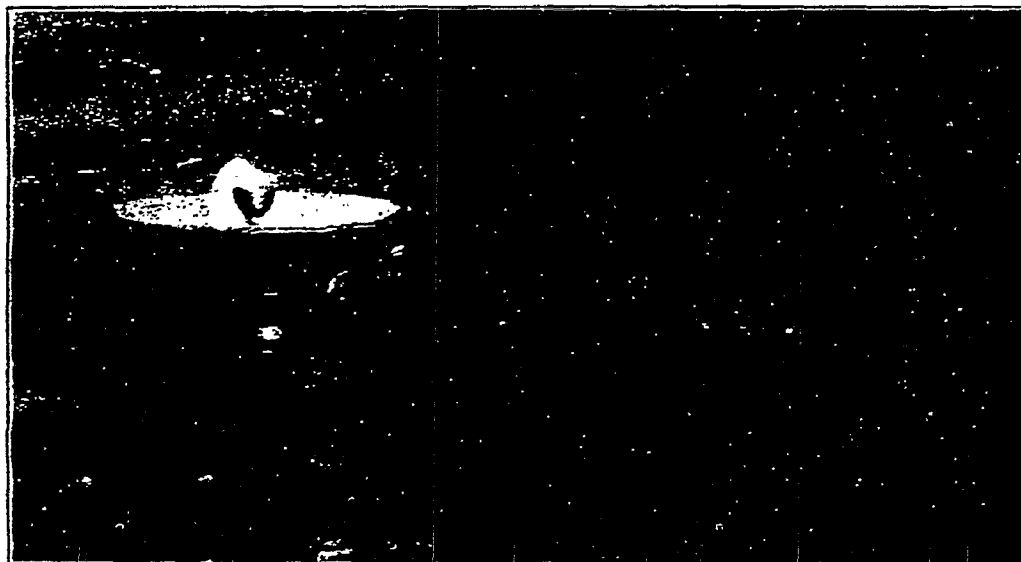
R. R. SAYERS, CHIEF SURGEON, UNITED STATES BUREAU OF MINES;
SURGEON, UNITED STATES PUBLIC HEALTH SERVICE.

[Sanitation was defined as "the common-sense application of the principles of cleanliness." The paper was limited to three phases of sanitation: (1) Safe practices with drinking water, (2) safe methods of sewage disposal, and (3) safe practices in ventilation.]

DRINKING WATER

Pure drinking water may be defined as that which does not contain any substance injurious to the health. The purity of drinking water underground is dependent on its freedom from contamination (1) at its source, (2) during distribution and (3) by the users. The most satisfactory drinking waters are clear, odorless, colorless, have no or very low mineral content, are well aerated and are free from bacterial contamination.

Water for drinking should be obtained from a source known to be pure. To be assured that it is pure, it is advisable to have the water or the sources of water examined and approved by the State department of health. Where the water is known to be infected, or its purity is unknown, it may be made safe for drinking purposes by distillation, by boiling or by chlorination. One of the most convenient methods of purifying water is by the use of chlorinated lime (bleaching powder). For treatment of water on a small scale a stock solution should be made by mixing a teaspoonful of fresh chlorinated lime with one quart of water. Use one teaspoonful of a stock solution to ten gallons of the water to be treated—thirty-six drops to one gallon—mix, and let stand at least fifteen minutes before using. The stock solution should be kept in a well-stoppered bottle in a cool place. Small filters of the household type are not usually satisfactory and their use is not advised.



Drinking fountain underground. The jet of water is delivered at an angle and there is a faucet so the miners can fill their pails

The piping of drinking water underground is the safest method of its distribution. If containers, such as barrels or kegs, are used in taking water underground, they should be kept tightly closed with only a tap or drinking fountain head, or both, for withdrawing the water. Such containers should be washed thoroughly and disinfected at regular intervals, at least once each week. Sanitary drinking fountains should be so designed that it is impossible for the mouth of the drinker to come in contact with the outlet. Those fountains which direct the jet of water at an angle with the vertical are usually most satisfactory. Taking drinking water underground in individual pails usually has the disadvantage of the water being obtained from many sources, often of unknown purity, but it has the advantage of decreasing the danger of transmission of disease through drinking water, as each miner generally drinks only from his own pail. Where ice is used for cooling water it should be made from distilled water or water from a source approved by the State department of health. In cooling the



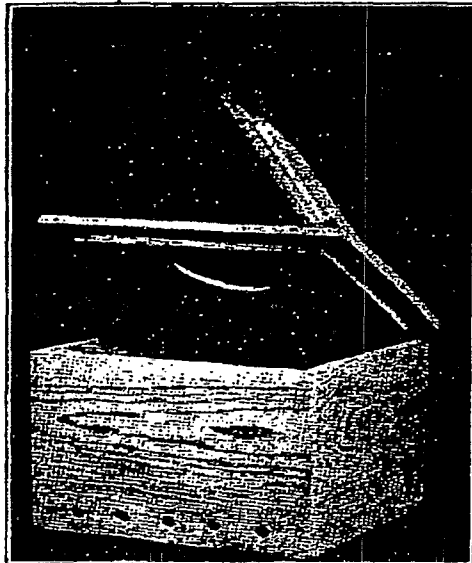
Drinking fountain faucet at entrance to mine. Jet of water is delivered at an angle.

water the ice and water should not be in contact, in which case the purity of the ice is of less importance.

SEWAGE DISPOSAL

The disposal of sewage is an important item of underground sanitation. It can best be emphasized by reviewing some of the dangers from its improper disposal. The diseases spread by unsafe methods of sewage

disposal in mines are typhoid fever, cholera, amebic dysentery, hookworm and other intestinal parasitic diseases. Hookworm disease (bunches, ground itch, miners' anemia), while usually limited to tropical and sub-tropical climates on the surface, is in some sections of the temperate zone a very serious disease among miners. The first epidemic of miners' anemia (hookworm disease) was among workers driving the St. Gothard tunnel through the Alps mountains in 1879. Since then hookworm disease has been found in coal mines in Hungary, Germany, France, England and South Africa. In the United States the disease occurs in coal mines of West Virginia, Alabama, North Carolina and probably other States, and in gold mines of California and Nevada.* For the disease to spread, conditions must be favorable to the development of the hookworm eggs and larvæ (young worms).

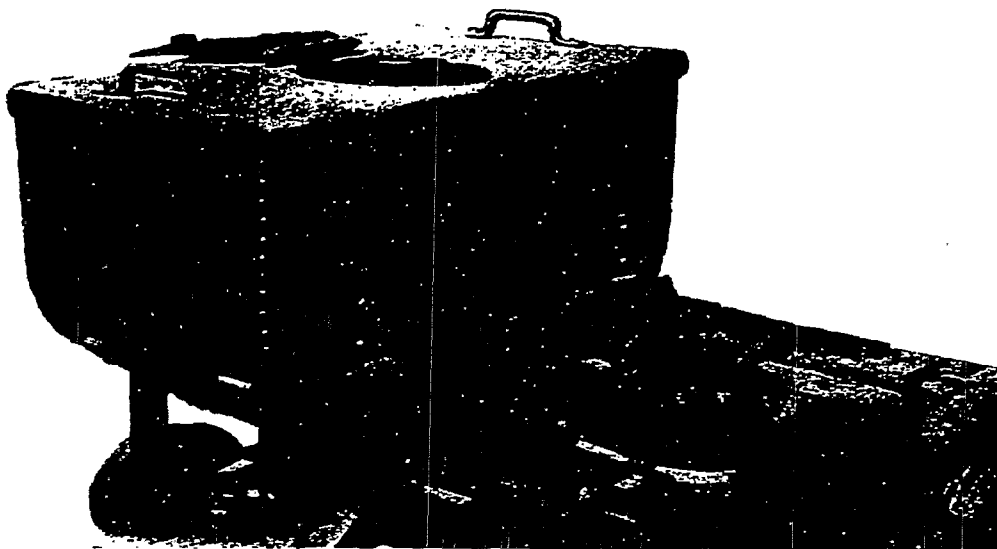


Privy box of one-can, adjustable-cover type, showing certain details of construction.

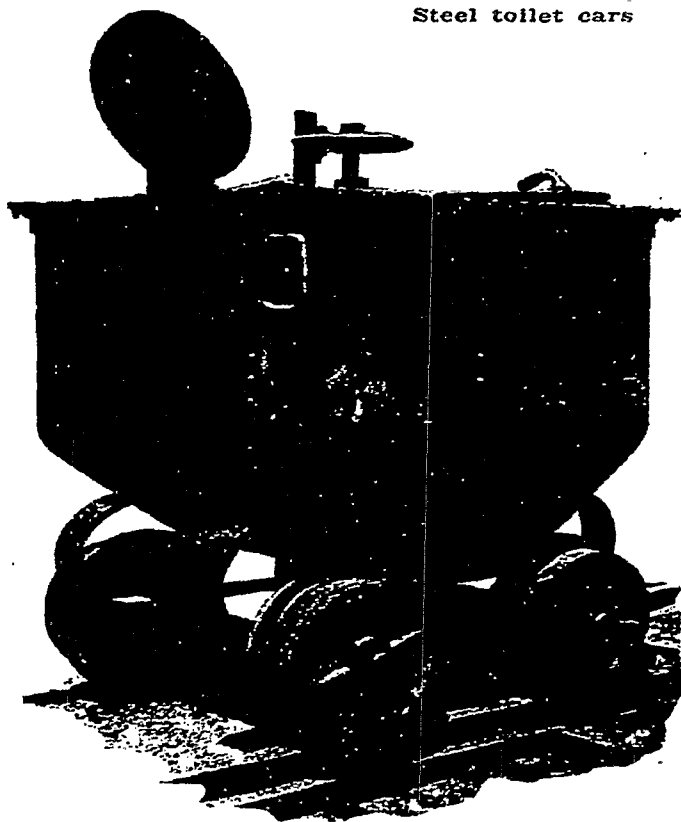
Water-carriage systems for the disposal of sewage underground are impracticable in most mines, due to the high cost of installation and maintenance. Underground toilets should be so designed as to prevent the spread of disease germs contained in human excretæ. The receptacle for the feces should be such that their spread by any or all agents—as flies, mice, rats, water—is avoided. The toilets should be in a well-lighted location convenient to the workers, and their surroundings should be kept clean, the roof and walls being whitewashed.

There are several disinfectants in use, each having its advantages and disadvantages. Lime is a very cheap disinfectant and is cleanly and easy to handle. However, its disinfectant efficiency is low and it must be used liberally to be at all effective; all excretæ must be covered completely at all times. Chlorinated lime, while effective for killing bacteria must be used in sufficient amounts to allow for oxidation of organic matter. Furthermore, hookworm eggs are very resistant to the action of

*Thompson, W. G., *The Occupational Disease*, p. 450, New York, 1913.



Steel toilet cars



chloride of lime. It has been shown that from twenty-two to forty hours' exposure fails to kill them. The use of chlorated lime is, therefore, not recommended where hookworm disease is known or likely to exist. Cresol or tricresol, or other disinfectants of this group, have been found satisfactory if used in the strength of one part solution to nineteen parts of water. Caustic soda (sodium hydrate) in a 1 per cent solution destroys all bacteria, but a 3 per cent solution is required to destroy hookworm eggs. This chemical is an excellent deodorant and disinfectant, but a mechanical agitator is necessary to insure effective sterilization. Fur.

thermore, caustic soda hastens the rusting of iron and all receptacles should be painted on the inside, at least, with a good grade of asphaltum paint. In the use of any of the disinfectants where percentage strength is given, sufficient quantities should be used to provide for that percentage when the receptacle is full. Watertight cans as receptacles have been found to be satisfactory in many mines when properly cared for. These cans may be made of eighteen-gage galvanized iron reinforced at the top and bottom with two-inch iron bands. The cans should be sixteen inches high and sixteen inches in diameter; the corners inside should be rounded and a removable cover provided. A removable handle, or two attached handles, have proved satisfactory.

SPECIFICATIONS FOR TOILET CANS

To prevent the access of flies, mice, rats, or other small animals to the contents of a toilet can, it may be placed in a box of special design with tight joints of sound lumber, not less than one-inch thick and dressed on one side. It should be provided with a closely fitting lid, the seat to be covered with a self-falling hinged lid. A box for a single can should not be less than twenty inches wide, twenty-two inches long, and sixteen and one-half inches high—inside measurements.

Toilet cars are another type of sanitary toilets for underground use. These mine toilet cars should be made of about three-sixteenths-inch steel, about four feet long, two feet wide, and two and one-half feet deep. There should be no sharp corners or projections inside the car, thus lessening the opportunity for excretæ to adhere to the sides of the car. Such a car as described is usually provided with two seats.

Practical experience has shown that sewage disposal systems need regular attention if they are to remain sanitary and satisfactory. One man should be assigned to the duty, and the care of the toilets should be made at regular stated intervals. These intervals will vary from daily attention to once in several weeks, depending upon the type used, the disinfectant provided and the number of miners served.

The effect on underground sanitation of the proper facilities for sewage disposal on the surface should be borne in mind by all operators. The surface toilets should be placed in convenient, clean, well-lighted and comfortable surroundings. Water-carriage sewage systems are, of course, the most satisfactory. Mines having modern change houses should include sanitary toilets as part of their equipment. When toilets of the above type are so located, their regular use by the miner follows naturally. This lessens the amount of sewage underground and encourages regular habits that are important to the health of the miners.

VENTILATION

Miners who work in mines in which the rock contains a high percentage of silica and use dry-mining methods have been found to be prone to pneumoconiosis. Miners' phthisis or pneumoconiosis has been found to predispose to tuberculosis. Good ventilation, wet drilling, and wet mining methods materially lessen the amount of pneumoconiosis. Physical examination at regular intervals, at least once a year, followed by proper

precautions by those found to be affected with pneumoconiosis or tuberculosis, materially lessens their prevalence. Some dusts, as those from the more soluble lead, zinc or arsenic ores may cause illness, due to the toxic effects of the respective salts of these metals. The precautions mentioned above are applicable here.

Air low in oxygen causes more rapid breathing and an increase in heart rate. If sufficiently low, unconsciousness and even death may result. The flame of a safety lamp may be used to detect air deficient in oxygen. No one should attempt to enter an atmosphere in mines which will not support an acetylene flame, unless protected by self-contained oxygen-breathing apparatus. Increased percentages of carbon dioxide in air cause an increase in the depth and rate of respiration, headache, dimness of vision and tremor. Carbon dioxide may be detected and the amount present determined by a special portable apparatus developed for this purpose. Nitrogen, hydrogen and methane have no toxic effect upon the body, but may act as diluents of oxygen and thus indirectly cause the effects of oxygen deficiency. The flame of a safety lamp, or a Burrell detector, may be used to determine the presence of marsh gas. Hydrogen sulphide and sulphur dioxide may occasionally occur in mines in sufficient quantities to be dangerous. In low concentrations they cause irritation of the eyes and respiratory organs. The presence of hydrogen sulphide and sulphur dioxide may be detected by their respective characteristic odors.

Carbon monoxide (white damp) has caused the death of many miners. Its presence may be detected by its effect upon canary birds or by the use of a carbon monoxide detector. Animals without red blood are not affected by this gas. It cannot be emphasized too strongly that efficiency, comfort and good health are dependent to a large extent on pure air, and that ill effects or symptoms arising from variations in the composition of the air, caused either by the lowering of the oxygen or by the addition of gases, such as carbon monoxide or carbon dioxide, are best treated as follows: (1) By getting the victim to pure fresh air in the quickest time possible; (2) by breathing pure oxygen, if available; (3) by using Schaefer method of artificial respiration when the victim has ceased to breathe or is breathing slowly, irregularly and shallow; (4) by keeping the victim warm and at rest.

High temperatures and humidities decrease the efficiency of miners and probably have a deleterious effect upon their health. Good ventilation will prevent the ill effects of all gases referred to above.

DISCUSSION

In reply to a question as to the nature and effect of the gases usually given off from blasting operations, such as burning fuses, the complete or incomplete combustion of explosives and the treatment for such cases of gassing, Dr. Sayers stated that the gases given off vary with the explosives, but that the dangerous gases are usually carbon monoxide, hydrogen sulphide and nitrous oxide; that the treatment of a man gassed with any of these is difficult and the patient should be taken to fresh air and a physician called. Mr. Tillson mentioned that a man who has been

gassed very often faints when brought into fresh air. Dr. Sayers stated that this is more or less characteristic of carbon monoxide poisoning, but he did not know whether it was due to excitement or to the letting down of the man himself; it might be due to the fact that he had taken exercise.

This discussion brought up the question of using carbon dioxide and oxygen instead of only pure oxygen in reviving men who had been gassed. Dr. Sayers stated that 5 per cent carbon dioxide in oxygen has a definite effect upon the rate of respiration; that in experiments conducted at Pittsburgh he found that when pure oxygen was administered it would remove the carbon monoxide from the blood about four times as fast as ordinary air. Eight to ten per cent carbon dioxide in oxygen will cause the elimination of carbon monoxide from the blood five or six times as fast as when ordinary air is used—that is, 25 to 50 per cent greater than in the use of pure oxygen. He felt that carbon dioxide in oxygen could be used to advantage by a physician in reviving a man, but he was not ready to recommend it to be used by first-aid men, because he found that the use of carbon dioxide was apparently deleterious to the heart action when used in quantities as high as 8 or 10 per cent. It may be that future experiments will show that 5 per cent carbon dioxide in oxygen will be safe for first-aid men to use.

AVOID CONTAMINATION OF WATER SUPPLY

In the discussion of drinking water, Mr. Boardman stated that the Anaconda Copper Mining Company is not worried about its drinking water; city water is piped into the mines. The pressure is reduced by means of tanks at 200-foot levels and these tanks are adjusted to give a maximum of forty-three to eighty-six pounds pressure. At levels there is installed a wooden tank about twelve feet or more in length and three feet inside diameter. Through this tank the water pipe is passed back and forth in such a manner that there is a large surface of pipe exposed. Ice is packed in the tank around the pipe. The drinking water, after passing through this pipe, has an outlet to the drinking fountain where men can drink or fill their pails. This system has been found very satisfactory because when the men wish a chunk of ice they can get it without contaminating the water. Dr. Black stated that the control of drinking water was very important, a great many illnesses being due to impure water and he requested that Dr. Sayers explain what "B. coli" means in water. Dr. Black emphasized the importance of a regular inspection of the entire watershed from which the water supply is obtained. He also spoke of the pipe connections and the danger of contaminating water by cross-connections, such as placing fire pumps, power pumps, etc., cross-connected with the drinking water supply. The entire system should be carefully inspected periodically to see that the water is not contaminated. Dr. Sayers explained that B. coli is *Bacilli coli*, a characteristic of bacteria that is found in feces from practically all animals and is not characteristic of human feces. If in testing samples of water a B. coli is found the water is pronounced bad.

Mr. R. Dawson Hall, in referring to hookworm disease, asked Dr. Sayers what he meant when he stated this disease "occurs." Dr. Sayers answered that the hookworm disease had been found in West Virginia, Alabama and North Carolina, and that the infection had been traced from one person to another, due to soil contamination at the mine. Hookworm has also been found in the deep mines of California and also in Nevada.

Mr. Hall stated that a disease to which Dr. Sayers had made no reference is the chronic spasm of the eyeball, known as nystagmus, and he asked Dr. Sayers if he thought it arises from illumination in any way or whether it comes from a germ disease. Dr. Sayers stated that in the examination of men exposed to poor illumination, where they used their eyes constantly under a strain, there is a tendency to develop nystagmus; that he is told that the miners in England use mostly safety lamps which give very poor illumination, while in this country the carbide lamp or the electric safety lamp is used, and as far as he knows there is no nystagmus among the miners in this country.

METHODS OF SEWAGE DISPOSAL

In the discussion of sewage disposal underground, Mr. M. S. Murray stated that at one of their mines in Pennsylvania they have installed, for the use of some twenty-five men who work close to the bottom of the shaft, a sewer system which consists of a septic tank. This septic tank is simply an iron cylinder about three feet in diameter and about ten or twelve feet long, set in a room of its own. The refuse that goes into this tank is treated chemically and consumed. The outlet leads to a sump. It is a clear fluid and is handled by the regular mine pump. Chairman Tillson asked Mr. Murray what was the chemical reagent used. Mr. Murray did not know; Dr. Sayers stated that he thought it was caustic soda, that 3 per cent caustic soda kills the bacteria and all eggs of parasites. One per cent will kill all bacteria. Dr. Sayers stated that the system described was successful as long as toilet paper was used, but where toilet paper was not furnished trouble would be had with the pumps. He also stated that the material must be agitated or it will not liquefy all the feces and the paper. The agitation is important. Mr. Bawden asked if it is not possible to use the caustic soda mixture to liquefy the contents of water-tight cans and to pour the contents of the can into the sump without the use of septic tanks. Dr. Sayers answered that this was possible and that 3 per cent of caustic soda would be sufficient. Chairman Tillson asked how long it would take for the contents to liquefy and Dr. Sayers answered that it would take twenty-four hours; he then brought out that one objection to the use of this system was that the caustic soda would hasten the rusting of the can, that it would take off the zinc or any galvanizing material, but that asphaltum paint would withstand the action of the caustic soda. Mr. Bawden asked what grade of caustic soda was recommended and Dr. Sayers answered that the regular commercial caustic soda was all right.

Dr. Parlett told of a toilet which is fitted with dual vaults. The first side is used until it becomes three-fourths full of refuse, mixed with or-

dinary earth and a little lime. Then this side is sealed and the second side used until it is three-fourths full. By that time the first side would have shrunk to about one-fourth full and the material would be deodorized and pulverized which makes it very easy to handle. Dr. Sayers stated that he knew of no place in the United States where this dual vault system had been tried, and that if the system should be tried underground the vaults should be made large enough so that one vault could be used for thirty days. The chief objection to the dual vault system would be the difficulty of ventilation. Dr. Sayers recommended the liberal use of lime and pulverized dry earth. In general, this type is not to be recommended for underground use.

Chairman Tillson told of the difficulty of sewage disposal of mines that are located in villages, that it was difficult to dispose of the contents of a toilet car hoisted to the surface, and he asked if an incinerator could not be used to good advantage. Dr. Sayers stated incinerators can be used, but that the cost would be considerable.

TRUE CAUSES OF MINE ACCIDENTS

W. W. ADAMS, STATISTICIAN, UNITED STATES BUREAU OF MINES

The true causes of accidents in the mining industry are not fully revealed by the reports received annually by the Federal Bureau of Mines from the various operating companies; indeed, they are not adequately shown by any available statistics. So numerous are the influences that contribute to the mine-accident record that it becomes a very practical question as to how much of the story may profitably be told, particularly for any large part of the industry. More information should certainly be made available, because accident prevention depends upon a study of the record of accidents; hence an incomplete record restricts the scope and the effectiveness of safety work. The glaring defect in all accident records of national scope is the omission of the important element of exposure to accident. Until this defect is remedied the industry's accident record will be an incomplete and unsatisfactory basis for prevention work and the accident rate for American mines will continue to be unjustifiably high.

Investigative work has been conducted over a sufficient area and for a sufficient period of time to disclose in a general way the actual causes of mine accidents. The practical problem that confronts us is to discover the significance of the known causes and to determine their relative importance so that prevention work may be most effectively and economically conducted. The angle of attack cannot wisely be determined without adequate knowledge of the relation between the causes of the accidents and the extent or severity of the injuries resulting therefrom.

The chief physical causes of accidents as usually classified are sufficiently well known, so that they need not be enumerated here. This classification affords a convenient and necessary presentation of the general accident situation in the mining industry. It would aid greatly in accident prevention if more specific information regarding these physical causes could be obtained. But a classification of such causes does not

give sufficient insight into the fundamental and controlling influences that result in accidents. Back of the familiar physical causes are numerous factors that are believed to be contributory to the accident record. Without knowledge of these contributing influences the accidents themselves can neither be well understood nor prevented. Opinion and general knowledge are not adequate. Specific information of wide scope will be a powerful aid to the industry in the elimination of preventable accidents in the shortest time.

ACCIDENTS SHOULD NOT BE CONSIDERED UNAVOIDABLE

A mine accident may be classed as being one of two kinds: Preventable or unavoidable. This classification is relative only. The two groups shade into each other gradually and no one can say where one leaves off and the other begins. Accidents should not be considered unavoidable that result from conditions for which employees, management, or both are responsible. Economic conditions appear to measure the financial expenditure for accident prevention and safety education which an operating company may authorize and still remain in competitive industry. Hence the difficulty of formulating any hard and fast rule for properly classifying accidents into the two groups. For practical purposes it is well to consider all accidents as preventable and to direct effort toward their complete elimination.

All of the factors that contribute to the accident record are chargeable directly or indirectly to the miners or operators, or both, or to conditions for which either or both are responsible. The miner may be careless, ignorant, inexperienced, fatigued, discontented, disobedient, or otherwise ill-adapted to mining conditions or to use particular types of machinery. The operator may refuse or neglect to install necessary safety devices, to train the employees in safe practices, or to give adequate support to the safety engineer. He may regard accident prevention as welfare or philanthropic work instead of its being a legitimate and necessary part of production activity at all times and thus be responsible for the accident-producing conditions that result from this attitude. Holding this view he may be unwilling, or feel financially unable, to engage in what he considers two independent lines of activity, namely safety work and directly productive work, and so may curtail or eliminate the former and devote his entire thought to the latter.

It is clear that some or all of these conditions bear a more or less direct relation to accident frequency. Equally clear are the difficulties that attend any attempt to learn the relative accident potency of the conditions as applied to the American mining industry. Here and there attempts have been made by operating companies and others to inquire into the subject, and it is to these concerns that credit is due for whatever information is available. These isolated and sporadic inquiries, applicable to restricted areas of the mining field, indicate the importance of results that might be attained by similar inquiries covering the whole industry. Investigative and preventive work should go hand and hand and be of equal scope, if the highest state of efficiency in accident prevention is to be established and maintained.

PERSONAL RESPONSIBILITY FOR ACCIDENTS

Among the causes of accidents most frequently referred to is the carelessness, ignorance and disobedience of the miner. To what extent miners are responsible for the injuries they receive is largely a matter of opinion, based upon the experience and the field of observation of the individual spokesman. Little or nothing is definitely known for the industry in the United States. Any assignment of responsibility is relative only and applicable alone to conditions prevailing at the mine to which it relates. The classification of responsibility is determined largely by the sympathy or predilections of the compiler and hence is of very limited value. The correct grouping for a single mine might be greatly at variance with that for the whole industry. Indeed, the responsibility for accidents could be definitely placed if the circumstances surrounding the accidents could be classified in sufficient detail.

At the mines of South Africa it is one of the duties of the government inspectors, in making their reports, to indicate the responsibility for the accidents that occur. Their reports (over a two and one-half year period, covering about 2,500 fatalities among 200,000 employees) indicate that the mine employees were wholly responsible for 17.1 per cent of the accidents and partly responsible for 3.4 per cent. The accidents for which the miners alone were considered responsible were further classified to show that 8.2 per cent were due to carelessness, 2.2 per cent to ignorance and 6.7 per cent to actual disobedience of orders. Thus the relation between the miners' carelessness, ignorance and disobedience is approximately as 4, 1, and 3. How nearly these figures would hold true for the United States cannot be stated. For some districts they would be more nearly applicable than for others. Applying them to the quarter million fatal and nonfatal accidents in the mining industry in the United States, they would indicate that the mine employees in this country are wholly responsible for nearly 43,000 accidents each year, or 43 per thousand men employed.

As compared with these figures, indicating the employees' responsibility for accidents, those for the management show a responsibility for 17.5 per cent of the fatalities; the management being responsible directly for 2.2 per cent, the companies' foremen for 11.3 per cent and defective plant or material for 4 per cent. Applying these figures to the total number of accidents in the United States, management is indicated as being responsible for slightly more than 43,000 accidents each year. Employer and employee therefore appear to be nearly equally responsible for all preventable mine accidents. The South African reports classified 56 per cent of the accidents as unavoidable and 5.9 per cent as caused by others than company and employees. The 56 per cent of unavoidable accidents seems high and I do not think it should be considered the irreducible minimum in mine safety work in this country.

LACK OF A COMMON LANGUAGE

The nationality of the employees, or rather their inability to understand the English language, is generally considered a contributing cause of mine accidents. There can be little doubt that the lack of a common

language in the mines is responsible, to some extent, for the high accident rates in American mines. Reports covering fatal and serious accidents among 420,000 men in the mines of Pennsylvania and West Virginia during a two-year period showed that the non-English-speaking employees had an accident rate 37 per cent higher than the English-speaking employees at the anthracite mines, 20 per cent higher in the Pennsylvania bituminous mines and 48 per cent higher in the mines of West Virginia. It should be stated that the actual inability of the foreign employees to understand English was not specifically shown by the reports, but the inability is assumed to be fairly indicated by their nationality. The higher rates for non-English-speaking employees may not be altogether due to the inability of the men to understand English. The figures contain an element of error in that the respective hazards of the two groups of employees are not indicated. The reports do not segregate the nationalities by occupation. If this could be shown it would probably be found that the foreign employees outnumber the others more than two to one in the dangerous jobs and are greatly outnumbered by the English-speaking men in the classes of work where the hazard is less. It is regrettable that existing records do not more clearly show the effect which the lack of a common language has on the mine-accident rate and that the facts of the case must to a great extent remain a subject of conflicting opinion.

COAL CUTTING MACHINES

The installation of cutting machines in coal mines apparently introduces new hazards into certain branches of the work which tend to increase the accident rate in those particular branches. This is evidenced by increased fatality rates from electricity and machinery in those mines having the largest percentage of machine-mined coal; slight increases are also indicated in haulage accidents. The increased rates from these causes, however, seem to be more than compensated for by reductions in accidents from explosives and gas and dust explosions. Figures covering a period of seventeen years seem to bear out these conclusions and at the same time show that with the installation of the machines no appreciable change occurs in the frequency of accidents from falls of roof and coal, or accidents of a miscellaneous character. Therefore, the effect of mining machines on mine accidents in general is an important reduction in the total number of accidents per thousand employees and an increase in the daily output of coal per man. A contributing factor to this result is that mines using the largest number of machines are, as a class, well managed from both production and safety standpoints, but the extent of this influence in contributing to a lower accident rate cannot be stated.

LENGTH OF WORKING DAY

In such an occupation as mining, does the length of the work day bear any relation to an employee's liability to accident? Does the long day produce unusual fatigue? Does it make for a higher accident rate? There are no really satisfactory figures on this point. Reports from mining companies for 1921 received by the Bureau of Mines show that for underground operations at iron mines the highest accident rate is among the ten-hour workers, the lowest rate among the nine-hour men, and for eight-

hour workers the rate is somewhat above the nine-hour rate but only two-thirds as high as the ten-hour rate. For each million hours of exposure the rates were 114 for the eight-hour men, 88 for the nine-hour men, and 170 for the ten-hour men. At open pit mines the eight-hour men showed a rate of 44 per million hours of exposure, the nine-hour men 82 and the ten-hour men 80. General surface work at iron mines showed a nearly uniform rate for all three groups of workers, the rates for the eight, nine and ten hour shifts being 49, 52 and 45 respectively. At beehive coke ovens the rate was 43 for the eight-hour men and 55 for the nine-hour men. By-product coke ovens showed the highest rate; 90 among the eight-hour men, as compared with a rate of 24 each for the ten and twelve hour men. At marble quarries the figures showed a declining accident rate with the lengthening of the work day, the rates for the eight, nine and ten-hour men being 50, 40 and 13 respectively. A similar situation is shown for quarries producing slate; the rate for the nine and ten-hour men being 37 and 31 respectively. These figures are confusing. While they are as complete as the returns would permit some of them relate to comparatively small groups of workers and it is reasonably certain that occupations with different working hours also have different degrees of accident hazard. They are, however, submitted without further comment except to call attention to the need for additional light on this subject.

MINING METHODS.

The variation in accident frequency in different methods of mining offers a striking illustration of the inadequacy of accident reports that do not take into consideration the numerous influences that contribute to accident occurrence. In 1920 falls of roof injured 64 men out of every thousand employed at metal mines. This rate, while true for all kinds of metal mining operations, is altogether misleading if applied to any single mining method. For example, the rate for falls of roof in chamber and pillar work in metal mines was only 31 and for caving methods it was 97. Likewise, accidents from run or fall of ore while loading resulted in rates varying from 41 per thousand for caving methods to 136 per thousand for underhand stoping; the average for all methods being 51. Similar variations in accident rates are noted for other causes. They emphasize the necessity of giving more consideration to the influences, both physical and human, that cause mine accidents than is usually given in the official reports of state mine inspectors.

Were figures available it would be highly instructive to present definitely for both metal and coal mines the relation between accident frequency and such factors as the experience of the miners, the labor turnover, the thickness of coal bed and other influences that are widely believed to affect the accident rate among mine employees.

SUGGESTIONS

Specific suggestions for improvements in mine accident records that will make possible a more scientific study of the subject in the United States: 1. That all primary or original reports of accidents and accident exposure shall relate to a single mine and not to a group of mines. 2. That all states adopt a uniform blank for use by mine operators in report-

ing accidents and that any additional data needed by certain states be obtained without changing that portion of the blank adopted as standard. 3. That a standard list of the more common mining occupations be adopted, with a clear definition of the duties of each occupation. 4. That the number of hours of work paid for in each occupation be reported at stated periods to the proper state official and that standard blank forms be used for this purpose. In the event that the hours worked cannot be shown, then such other basis be adopted as will most accurately indicate the amount of occupational exposure to hazard. 5. That the foregoing information be collected for the whole mining industry and that additional collateral data needed from time to time be requested from representative groups of operators that may be able and willing to furnish the same.

In general it may be stated that increased safety increases production. Men cannot work efficiently when they are in fear of danger, even though the fear be subconscious. It is not known to what extent production is curtailed by industrial accidents, but it is a safe assumption that output is lower than it would be if accidents were eliminated or their number reduced. The actual monetary loss due to accidents is ascertainable and should be added to the cost of production. In fact, the cost of producing a ton of coal, a pound of copper or an ounce of gold is not truly stated unless it includes the cost of the accidents that occur and also the cost of prevention work. Herein, unfortunately, will be found a feature that is unfair to the progressive operator or the progressive state, namely the inequality in compensation awards. States and companies where the award is most equitable are at a disadvantage when compared with those whose compensation for accidents is not as nearly in keeping with the losses resulting therefrom.

DISCUSSION

CHAIRMAN TILLSON: A year ago at the Mining Section meeting there was some discussion on the question of accident statistics. Mr. F. J. Bailey, assistant to the director of the United States Bureau of Mines, was present. Those of us at that meeting rather urgently pressed the Bureau of Mines for a more extensive service along the line of accident statistics and also urged upon Mr. Bailey to use his influence in persuading the bureau to enlarge its statistical work so as to better serve the mining industry. The result has been a valuable one and so long as the bureau finds that men in the industry, such men as are represented here, are desirous of information of this sort and are willing to help, the bureau will do its share of the work. The Bureau of Mines has installed tabulating machinery, such as is used in the Census Bureau, for the sorting of data with respect to accident reports, and now has available the means for getting at the root of the cause of accidents. One of the problems Mr. Adams mentioned in his paper is that of uniformity in reporting. This is necessary in order that the information can be tabulated and be made of value. The task is really a stupendous one. The value of statistics depends upon the truth embodied in the original records and upon the correct interpretation and analysis of the information. You all realize, I think, that it is essential to your Section, in aiding accident

prevention work, to know the dangerous elements so that we can concentrate our attention on them.

Mr. Adams, assisted by Mr. Colburn, has attempted to develop the field of usefulness of accident statistics by outlining certain forms which are suggestive in nature and which have been brought here for your perusal and for your suggestions and criticisms. I think it well for us to have in definite detail the reason for any items we put on these forms. We must strive for greatest simplification, because all of us have been burdened with many questionnaires during the past few years, and it bores us to see another one come around. I believe, and am sure you do, that the keynote of accident prevention must rest upon the firm foundation of a knowledge of what we are trying to prevent. Unless we learn what practices are dangerous we have no suitable foundation for doing accident prevention work. So, much as we may dislike the details of having to make out reports of this sort and having to reply to questions we must realize that the results that should be obtained are worthy of the effort involved.

Mr. Adams, in explaining the blanks, stated that it was not only necessary to learn the details regarding individual accidents, but it was also necessary to know the number of men working at the same occupation, in order to get the exposure hazard. It is not enough to learn that a motorman was killed by coming in contact with a trolley wire. In addition, one must know how many motormen in the mines reporting were exposed to a similar hazard. In order for the Bureau of Mines to give to the members of the National Safety Council the information they request regarding accidents, it is necessary to have three kinds of information. 1. There must be a report giving information about the mine so that it can be classed with other mines that are similar. 2. There must be made, from time to time, a report regarding the employment in that mine; that is, the number of men employed and the nature of their employment. This gives the exposure record. 3. There must be made a report of each individual accident, giving complete details on how the accident occurred and the extent of the injuries.

REPORTS FROM EACH MINE IMPORTANT

In order for the mine accident statistics to be of greatest value, all three of these reports must be made out for each mine reporting. Mr. Adams emphasized the reporting by mines instead of mining companies. One individual mining company may operate several kinds of mines; for instance, shaft mines, open pit or slope mines. In classifying accidents, mines should be grouped according to the mining method used. All mines using top slicing, for instance, can be placed in a group by themselves and their accident rates compared. It would be unfair to include open-pit mining in this group, because the work is so dissimilar that comparisons would be unfair.

Mr. Adams explained each blank in detail. A great many suggestions were made by the delegates. After a general discussion of these blanks it was decided to hold an extra session on Wednesday afternoon in order to consider them further.

SPECIAL ROUND TABLE DISCUSSION

Wednesday Afternoon, August 30

This meeting was called to give the delegates an opportunity to discuss the forms that were proposed for use in collecting mine accident statistics. Chairman Tillson opened the meeting and called on Mr. Adams to briefly explain the forms and the objects of each.

Following the remarks made by Mr. Adams each form was discussed, question by question. Some questions were eliminated, some were added and some were changed. The meeting lasted three hours and at the conclusion the revised form was adopted and Mr. Adams was authorized to have it printed, and to send the member companies of the National Safety Council sufficient copies of the form to be used by them in reporting mine accidents. This method of collecting statistics is new and is to be tried out with the companies who are members of the National Safety Council.

The plan for collecting statistics and the instructions to be sent out by Mr. Adams are as follows:

DEPARTMENT OF THE INTERIOR, BUREAU OF MINES, WASHINGTON.

(In co-operation with the National Safety Council)

ACCIDENT EXPOSURE REPORT (COAL)

[This questionnaire was initiated by the National Safety Council for the securing of more complete data regarding accidents in mines. Only a limited number of the more progressive mines are co-operating in the securing of these complete statistics. Additional facilities have been provided so that the Bureau of Mines will be able to handle all details regarding these reports.]

The information furnished by you will be strictly confidential to the Bureau of Mines. It will not be disclosed to anyone and will be used only to compile group totals for use in a comparative, statistical way. Individual reports regarding your own mine will be furnished to you periodically for the purpose of giving you a summary of your own record. These statistics are being collected for individual mines rather than companies. The success of this system depends upon your separating the information so that each report will relate to only one mine being operated by your company. In order to keep the record complete, it is necessary that reports be made each month whether the mine is operating or not. These statistics will be more valuable to you if the questionnaire is completely filled out each month and promptly forwarded to Washington.

REPORT FOR MONTH ENDING.....19....

Name of Operating Company.....

Address

Name of Mine

Location of Mine: State.....County.....Town.....

Kind of Coal Mined.....

Have you reported every accident that occurred during the month,

including those that caused no loss of time?.....

(Signed)(Title)

Mine official to whom correspondence regarding
this report should be addressed.

Date:

ACCIDENT EXPOSURE REPORT

Occupation. 1	Total full shifts worked 2	Total hours worked 3	Total days mine worked (each occupation.) 4
UNDER GROUND—			
Mine foreman or manager (official hav- ing charge of underground work)...			
Assistant mine foreman or manager (having control of subdivision of mine)			
Fire bosses or mine examiners (officials who examine mine for gas or dan- gerous conditions before workmen are allowed to enter).....			
Shotfirers (men whose special duty is to fire shots or do blasting in mines)			
Fire runners (after shooting).....			
Miners (pick miners only; men who undercut coal by hand or shoot from solid)			
Miners' loaders, or miners' laborers (men who help miners in pulling down coal and loading coal in car)..			
Machine runners (men operating coal- cutting machine or drill).....			
Machine runners' helpers or scrapers (assists machine runner).....			
Machine miners or loaders (men who mine coal cut by machine).....			
Operators of mechanical loaders or scrapers			
Spraggers, carcouplers, switch tenders and greasers (does not include trip riders)			
Stablemen (men who look after stable and animals under ground).....			
Boss drivers (men in charge of drivers).			
Drivers (in bituminous mines) and run- ners (in anthracite mines), (persons who drive mule or horse in the mine in gathering cars)			
MOTORMEN—			
Trip riders, brakemen, and motormen's assistants			
Doorboys or trappers (boy who opens and closes mine door before and after the passage of a train of mine cars) ..			
Trackmen			
Bratticemen			
Timbermen			
Rockmen			
Brushers (men who take down or take up bottom)			
Pump men			
Pipe men			
Hoist men			
Electricians			
Electricians' helpers			
Cagers			
Underground shopmen (includes under- ground repairmen, tool sharpeners, machinists, blacksmiths, etc.).....			
Other laborers			
All others			
TOTAL			
OPEN PIT—			
Pit foremen and assistants			
Drill men			
Shot firers			
Steam or electric shovel runner and as- sistants			
Cranemen			
Oilers			
Coal loaders			

ACCIDENT EXPOSURE REPORT—CONTINUED

Occupation.	Total full shifts worked	Total hours worked	Total days mine worked (each occupation.)
1	2	3	4
Motormen and locomotive men.....			
Trip riders or brakemen.....			
Trackmen			
Pump men			
Pipe men			
Firemen			
Pitmen			
Dirtmen			
Car knockers			
Electricians			
Electricians' helpers			
Drivers or teamsters.....			
Blacksmiths			
Blacksmiths' helpers			
All others			
TOTAL			
SURFACE PLANT (not to include strip pits)—			
Superintendent (official supervising the mine, both surface and underground) ..			
Mining engineers, electrical engineers and chief electricians, safety engi- neers, surveyors, mechanical engineers or master mechanics (working partly underground, on surface and in office).			
Top foremen			
Top cager and check puller.....			
Blacksmiths			
Blacksmiths' helpers			
Carpenters and carpenters' helpers.....			
Hoistmen or hoisting engineers.....			
Enginemen or engineers (who operate stationary engines and motors).....			
Firemen			
Machinists and helpers.....			
Trackmen and helpers.....			
Top stablemen			
Weighmen			
Spraggers, couplers and car oilers (working on tippie).....			
Slate pickers, men			
Slate pickers, boys (at anthracite mines)			
Railroad car trimmers and droppers....			
Lampmen			
Watchmen			
Laborers			
TOTAL			
Office employees and officials.....			
Coke-oven employees			
Washery employees at anthracite mines.			
Dredge employees at anthracite mines..			
Average number of men employed during the month:			
Underground			
Open pit			
Surface, excluding office workers and coke-oven employees			
TOTAL			

DEPARTMENT OF THE INTERIOR—BUREAU OF MINES, WASHINGTON

Company's Report of Accident to Employee (Coal Mines)

Company's Accident

Serial No. —

Please mail this report to Bureau of Mines, Washington, as soon as injured employee returns to work, but in any event within ten days after accident. If disability lasts more than ten days (including day of injury,

Sundays and holidays) mail this report on eleventh day, but detach supplementary report at bottom of page and mail it when employee returns to work or when disability ceases.

1. Name of operating company.....
2. Address
3. Name of mine.....
4. Location: Town..... County..... State.....
5. Date of accident..... Hour of day..... o'clock..... M
6. Date disability began.....
7. Name of person injured..... 8. Payroll number.....
9. Age..... 10. Nationality (country of birth).....
11. Occupation when injured.....
12. Could he understand English: Slightly?..... Well?.....
13. Length of experience in and about mines.....
14. Had he been physically examined?.....
15. Average earnings per week.....
16. Number of working hours per shift.....
17. What was injured person doing when accident occurred?.....
18. Give exact location in mine where accident occurred.....
- If underground, state whether in the shaft, at shaft station, in slope, in entry, in room, pump room, stable, etc.
- If on surface, state whether on tippie, breaker, in power plant, in blacksmith shop, etc.
19. If underground, was injured person working in extracting coal from pillars or from the solid.....
20. If underground, state whether in pitch working or flat working.....
21. If by cars, state whether on slope, in haulage way, in room, etc.....
22. Initial cause of accident (fundamental cause).....
23. Immediate cause of accident.....
24. Part of body injured (mark on diagram).....
25. Nature, extent, and location of injury.....
26. If dismemberment, state part of body lost.....
27. On a separate page, give story of accident in your own words, with a rough drawing.
28. Has employee returned to work?..... 29. If so, give date.....
30. Was accident fatal?..... 31. If so, give date of death.....
32. Dependents: Wife?..... How many children?..... Other dependents.....
33. Was the place or machine provided with protecting devices?.....
34. By what means could similar accidents be prevented in the future?.....
35. Total liability for compensation \$.....
36. Date of this report..... 37. Made out by.....

(Signed).....

Company official to whom correspondence should be addressed regarding this report.

SUPPLEMENTAL REPORT OF ACCIDENT TO EMPLOYEE

Fill in answers to questions Nos. 1, 2, 3, 4 and 5, when above report is filled in. This supplemental report should be detached and held when disability lasts longer than ten days, and then mailed to Bureau of Mines, Washington, D. C., when disability ceases or in sixty days if disability lasts longer than that time.

1. Name of operating company.....
2. Address
3. Name of mine.....
4. Location: Town..... County..... State.....
5. Name of injured employee..... Payroll number.....
6. Is employee still disabled?.....
7. Date of accident.....
8. What permanent disability of the employee is the result of this accident?.....
9. Date employee was able to resume work.....
- At what occupation?.....
10. Number of calendar days disabled.....
11. Has earning power been reduced as a result of the accident?.....

12. If employee is still disabled, estimate the probable number of days before employee will recover.....
 If employee has left company's service, state probable length of disability.....
 Date of this report..... Date of previous report.....
 This report made out by.....
 (Signed).....
 Company official to whom correspondence should be addressed regarding this accident.

[Practically the same forms are proposed for mines other than for coal.]

WEDNESDAY MORNING SESSION

CHAIRMAN TILLSON officiated. The meeting proceeded at once to a consideration of the prepared papers.

MINE FIRE PREVENTION AND FIGHTING

R. H. SEIP, SAFETY ENGINEER, THE NEW JERSEY ZINC COMPANY,
 FRANKLIN, N. J.

An underground or mine fire constitutes a cause for continual worry or anxiety upon the part of mine officials. They well know that such a fire may not only cause sufficient material damage to make the mine inoperable for a long period of time, and thus entail great financial loss both to the operator and the workmen, but though the material damage to the property may be small, the loss of life may, in turn, be large. Fortunately, mine fires are not of frequent occurrence and the accompanying loss of life has been small, compared with the number of fatalities due to other causes. This is true of the industry as a whole, yet great mine fire disasters have occurred in this country in which the loss of life has been appalling.

It is, therefore, of the greatest importance that every possible means be employed, first, to prevent the occurrence of fires, and, second, to combat fires which may occur despite all preventive measures.

CAUSES OF MINE FIRES

Mine fires originate in many ways and, frequently, from the most unexpected sources. Some of the more common causes are: The ignition of timber, wooden stoppings and brattice cloths. The ignition of hay or oil-soaked materials by open torches. The ignition of coal by blown-out shots, or explosions of fire damp or coal dust, or the improper use of explosives. Short circuiting of electric currents, due to falls of ground, loosened trolley wires, or poor insulation where wires pass through combustible materials. Surface fires communicated to the mine through shafts, slopes or tunnels. Fires originating in underground shops. Ignition by friction of oily, wooden rollers on rope haulageways. Fires occasioned by spontaneous combustion of timbers, coal, greasy waste, etc. Ignition by chemical decomposition of sulphide ores. Fires of incendiary origin.

The introduction of the carbide lamp and the electric lamp within the past few years has greatly minimized the hazard of direct ignition, which was always present when the candle, grease torch and oil torch were in general use. Few of the last type are in use at present, except that open

torches are still used to some extent in some coal mines. The extensive use of permissible explosives has also reduced the hazard of fires originating from blow-out shots, with their consequent ignition of gas, coal dust, or both. The gradual increase in the use of electrical equipment underground has had a tendency to increase the danger of fire from this source, although more thought is being given to proper installation than was formerly the case.

In most states it is now required that inflammable structures shall not be erected near any mine opening. Wooden headframes, shafthouses, breakers, etc., are rapidly disappearing, and are being replaced by steel, or steel and concrete structures. The various other causes are always a source of danger and require the exercise of eternal vigilance in order that conflagrations jeopardizing the lives of workmen, and also causing serious damage to the property, may not occur. Both coal mines and metal mines are subject to some of these causes and some of the most serious disasters have occurred from the so-called trivial causes.

PREVENTIVE MEASURES

Naturally, it is the duty of the operator to take all of the steps necessary for the protection of his property from fire and for the protection of the lives of his workmen, in so far as mechanical equipment is concerned. It is also of the utmost importance that the workmen be equally responsible for the protection of their own lives and of their employer's property. The protection of lives is, of course, the most important consideration in either case. Therefore, the first step is to make the mine as free from the possibility of fire as may be possible.

Surface Plants: Fires originating near the mine opening may be readily communicated to the mine workings, especially if such openings are heavily timbered, as is frequently the case. This is especially true where the opening constitutes the intake of the ventilating current. The greater part of this danger may be readily eliminated by the construction of head-structures, hoisthouses, shops, etc., of fireproof materials. As has been previously stated, this practice has become a law in most states. Accumulations of waste materials near the mine mouth, the construction of wooden platforms at the surface of the shaft for loading purposes, the storage of hay, carbide, or explosives near the mine opening are all hazards which can be eliminated.

TO PREVENT SPREAD OF FIRE TO SHAFT.

Shafts, Slopes or Drifts: Fire originating in a shaft is especially difficult to combat and control. The heat generated may reverse the air current and thus endanger men in the mine. This is similarly true of any fire in a mine. As the main shaft is, in most cases, the most direct means of communication with the underground workings it is especially important that it be kept free from the danger of destruction. In this country the majority of mine shafts are timbered. Some have been concreted for special purposes—to keep them free from water inflow from the surrounding rock strata or to increase their efficiency as air passages.

Where timber is used it is advisable, as far as possible, to use timber that has been treated to retard decay. Decayed timber in any part of the

mine is a greater source of danger than solid timber, as it is more easily ignited. In one case fire was known to have jumped a distance of 1,500 feet to a point where decayed timber was located, the heat of the gases from the original fire having ignited this decayed timber.

To prevent the spread of a fire from the shaft to the mine workings, all entrances to the shaft should be provided with fireproof doors, which may be closed and thus confine the fire to the shaft. At the Proprietary mine, Broken Hill, Australia, steel doors have been located just below the surface chairs. These doors are hinged and held in place against the sides of the shaft. In case of fire these doors can be closed immediately. All approaches to the shaft are also protected by steel doors.

Slopes and drifts may be similarly protected, but there is another hazard which develops, especially on slopes, in connection with rope haulage. Frequently, wooden rollers, mounted in wooden grooves, serve as idler pulleys for the rope. These pulleys are lubricated by the direct application of oil or grease and soon become soaked with the lubricant. Should one or more of these pulleys run hot they furnish the origin of a fire. Iron pulleys, mounted in proper bearings, provided with grease cups will tend toward the elimination of this hazard.

WASTE MATERIAL CONSTITUTES SERIOUS HAZARD

Shaft Stations: The accumulation of waste material probably constitutes the most serious hazard at shaft stations. It is to these points that most of the refuse from the mine is brought for transportation to the surface. Decayed timber which has been removed, powder boxes, waste from stables, etc.—all such material as may accumulate on the station during the shift. A carelessly dropped match or cigarette may start a fire which will soon be beyond control. It is at these points, too, that inflammable materials are handled. Was it not the handling of a bale of hay at one of these stations that caused one of the most disastrous mine fires that this country has known—namely, the St. Paul mine at Cherry, Ill.?

Stables: Where stables are maintained in the mine it is generally customary to have them located near the main shaft. Safe practice now provides that such stables should be of fireproof construction throughout, with fireproof doors at each opening. Some companies provide fireproof walls between sections of about ten stalls each in the stable. Thus, fire originating in any section may be easily confined to that section. Such stables are lighted safely with electricity and are ventilated by a separate split of air. Not more than one day's supply of hay should be stored in the mine at any time.

Underground Structures: The modern mine of any size—coal or metal—must necessarily have certain underground structures, such as hoist houses, power substations, pump stations and, in many cases, blacksmith shops. The same precautions apply here as in the case of stables, except that it is not always possible to provide a separate split of air for ventilation.

DOORS SHOULD BE AUTOMATIC OR HAVE ATTENDANTS

Haulage Ways, Traveling Ways, Etc.: Mine passages used as haulage ways, traveling ways, etc., that are timbered, fall into the same class with

timbered shafts, slopes and drifts. All decayed timber should be replaced as soon as necessary. In passages used for electric haulage, trolley wires improperly hung from hangers may be sources of danger. Large circuits should, whenever possible, be divided into smaller units and each unit equipped with an automatic circuit breaker. In this way arcs from short circuits, which may be caused by roof falls, will be shortened and the danger from fires of this origin minimized.

Doors on main haulage roads should be, preferably, of the automatic type or, if this is not practicable, all doors should have attendants. Such doors should be double, with room between them for a full trip of cars. Trappers' benches should not be located near doors, especially where doors are constructed of combustible material. At points where electric wires pass through doors or other timber, such openings through which the wires pass should be protected with porcelain tube insulators. Main haulage should not be operated on the return-air current, especially in gaseous mines.

Working Places: It is in the working place that the greatest care must be exercised by the workman. Ventilation may become deranged, due to a door becoming broken or being thoughtlessly left open, thus permitting the accumulation of gas, which may be ignited. However, where such conditions are possible, it is better to provide the miner with an electric lamp and a safety lamp than to permit the use of any open light. Lights carelessly placed against timbers or brattice cloth may start a fire, as may also the careless use of explosives. The constantly increasing use of the electric cap lamp and permissible explosives is gradually decreasing this hazard.

Where considerable timber is used in the working places, as in some metal mines, where mats are laid down in caving systems, extreme care must be taken. Fire once started in the mat may in a few moments spread to such an extent as to be beyond control, due to its inaccessibility. The oxidation of some sulphide ores also constitutes a common source of fires in some sections of the country. This might, more properly, be termed a chemical fire, and probably can best be prevented by adequate ventilation.

VENTILATION, ELECTRICITY AND INSPECTION

The proper and efficient ventilation of any mine is one of the most effective preventives of fires; this, however, is not true unless it is possible to control the air currents at all times. Ventilation removes the inflammable gases; when properly humidified prevents the mine from drying out, and prevents to a large extent the origin of fires in sulphide ores. By proper control, fire originating in a certain section of the mine may be confined to that section or, at least, the gases of the fire may be prevented from traveling through other sections of the mine. With this point in view many companies have provided their foremen and bosses with ventilation maps which show the locations of all doors, stoppings, overcasts, etc., together with instructions as to the direction of the ventilating currents in case of fire in any particular section.

Many electrical installations in a mine are, necessarily, of a temporary nature in some sections. Nevertheless, the same care should be exercised

as though the installation were permanent, as one careless installation may prove to be the weak spot in the entire system, and cause the fire prevented by all of the other installations. It is peculiarly true that most roof falls occur at night when the mine is ordinarily not working. For this reason, and for the reason that few men are normally in the mine at night, it is advisable that the mine, or any section of the mine, may have the power thrown off when that particular section is idle. Short circuits from roof falls will not then cause fires to start and remain undiscovered until they have gained considerable headway.

A fire occurring during the time that the mine is working will not go long undiscovered. Should the fire occur near the close of the shift, or after the men have left the mine, it may be hours before its presence is known and the fire may have assumed such proportions as to make its immediate extinguishment impossible. Under the laws of the coal-producing states the mines provide fire bosses to make inspections of the mines *before* the men enter the mine, to ascertain the safe or unsafe conditions of all working places as regards ventilation, roof conditions, etc., so as to prevent, as far as possible, fires, explosions and other accidents. Is it not equally important that inspections should be made *after* the men have left the mine, following the use of lights, explosives, electrical machinery, etc ?

It is well recognized that mine fires discovered in their incipiency are usually extinguished within twenty-four hours. Therefore, it would seem most important that all mines should, in the interest of fire prevention alone, establish such inspections. It will be well worth while, as an insurance investment, to pay a few men to make such inspections, rather than to pay thousands of dollars to combat a fire with a few hours start.

FIRE FIGHTING AND EQUIPMENT

Organization: Lack of thorough and efficient organization in the combat of mine fires is probably more serious than lack of equipment. The establishment of a proper organization will be followed, naturally, by the provision of the necessary equipment. This lack of organization will be found, principally, at mines where fires have not occurred and, for this reason, are not expected.

In an organization prepared for a mine fire each official, from the superintendent to the smallest sub-boss, should have a definite duty to perform. It is utter folly for the entire force to rush to the seat of the fire and leave no directing head outside. Supplies must be ordered and moved, behavior of air currents must be watched, sufficient water supply must be maintained, the use and maintenance of rescue equipment must be supervised and relief must be provided for the men actually fighting the fire. These and many other details cannot be successfully handled without prior organization.

IMPORTANT TO ACT QUICKLY

The equipment required to fight mine fires varies with mines and with conditions. It is a well-recognized fact that a fire discovered in its early stages usually can be readily extinguished and for this reason it is highly desirable that the mine be fully equipped with portable hand ex-

tinguishers. Some mines use the ordinary three-gallon acid-soda type of extinguisher, others use the foam-producing type or the carbon tetrachloride type, while still others use various combinations of all of these types. Considerable controversy has arisen relative to the use of the last type in confined places, due to the effect of the gases developed. Nevertheless, it would seem advisable to use this type of extinguisher on fires, especially those of electrical origin where the space is not so confined as to permit a rapid retreat to better air.

Many mines maintain chemical engines of large capacities, equipped with hose and mounted on trucks so that they can be moved readily to any part of the mine. These engines vary in capacity from 40 to 100 gallons. Some companies, operating a number of mines, supplement this underground equipment with a chemical engine of larger size, housed on a railroad car, for rapid transportation to any particular mine where it can be transferred to the mine track. Water barrels and pails are frequently placed near trap doors. Their efficiency depends on their maintenance in good order at all times. This is likewise true of portable extinguishers.

Whenever possible, the direct application of water to the fire is, undoubtedly, the most effective method of combat. To this end the mine that is thoroughly equipped with water lines is best equipped to overcome fires in their early stages. The advisability of connecting the air lines with the water supply for use in case of fire has been a subject for much discussion. It naturally obviates the expense involved in the installation of separate lines for water. Not all mines are equipped with compressed air lines, so that in such mines a water line must be installed. The most favorable argument for combining the air lines and the water supply is that the air lines extend to nearly all points in the mine and, therefore, water is available at all of these points. Further, foremen, bosses, and workmen are usually familiar with the locations of such lines and the valves controlling them.

WATER LINES BEST FIRE-FIGHTING EQUIPMENT

Despite these arguments it would seem more desirable to have a separate water line for fire purposes only. This line may be so constructed, with proper valves for the reduction of pressure where necessary, and with regularly spaced outlets of uniform standard size, that, with an ample supply of hose at hand, there would be but little confusion in putting the system into operation.

The question also arises as to whether or not it is desirable to use the water column from the mine pumps as the source of water supply, or if the water supply should be secured from surface mains. The latter arrangement is, by far, the better. If, for any reason during the fire, the source of power to the pumps should be cut off, the water supply from this source is no longer available. If the water column is tapped at various levels, it might not be possible, due to conditions arising from the fire, to reach these valves. This disadvantage can be overcome by tapping the water column at the surface only. In all cases the main control valve should be located on the surface and, as the experience of at

least one company has shown, it should be located at least 100 feet from the collar of the shaft, so that a shaft fire will not render it inaccessible.

As the shaft in many mines constitutes the principal means of access to the mine, it is vastly important that it should be amply protected so that shaft fires can be quickly extinguished. A number of mines have installed sprinkler systems for this purpose. So far as can be ascertained, none of these systems is automatic but all are controlled by valves which are air or hand operated. Rings of perforated pipe have been installed at regular intervals in the shaft and one company has an arrangement whereby a fire occurring in the shaft above any certain level, only the sprinklers above that level are brought into play. Water lines installed in shafts which are downcast shafts are subject to freezing in winter. Some of the anthracite mines have overcome this liability by placing the water line in the same protective or insulating covering with a steam line.

A well-constructed pipe line for fire purposes is useless if hose is not available or is maintained in a condition unfit for use. Canvas hose has the same disadvantage that all canvas possesses when used underground; if the mine is damp or wet it is only a matter of a short time until mildew has destroyed the fabric. Many companies have found rubber-lined and rubber-covered hose of about two and one-half inches in size to be the most satisfactory. The standard two and one-half inch hose connection is used by nearly all municipal fire departments and this size is recommended for mine use, as it might be necessary in some cases to secure additional hose from a local fire department or neighboring mine. Spray nozzles or the standard underwriters' nozzle with a discharge opening of seven-eighths to one inch in diameter are sometimes used.

Outlets spaced 200 feet apart on the pipe line, with 50-foot lengths of hose at frequent intervals, will serve to cover all of the territory included in the fire system. It may be more desirable, from the standpoint of maintenance, to have a portable reel of hose available at some convenient point for transportation to any section where it is required. Where fire lines are installed they should be indicated on a map or print. Copies of this map, showing all pipe lines, valves, hoselines, and auxiliary supplies should be furnished to each foreman and boss. Regular tests of all valves and equipment should be made to insure their proper condition.

AUXILIARY EQUIPMENT

It may be necessary at times to supplement the standard mine fire-fighting equipment with extra supplies. With this possibility in mind, some companies operating a number of mines maintain a railroad car containing extra pipe, fittings, wrenches, hose, rope, brattice cloth, bars, axes, saws, hammers, shovels, drills, picks, etc.; this car is always maintained in readiness and may be dispatched quickly to the mine in which a fire has been discovered.

A fire existing under fallen coal, in the gob, or under fallen timber is difficult to reach with water from a hose. For this purpose some of the anthracite equipments include special nozzles, consisting of pieces

of pipe about ten feet in length, one end of which is closed to a point. The other end can be connected to standard hose fittings. These pipes are perforated for about four or five feet of their length with holes one-fourth to three-eighths inches in diameter. Such a pipe may be forced or driven into a pile of burning material and thus enable the water to reach the seat of the fire and cool the material to the point where it may be loaded out.

Finally we come to one of the most important units of the fire-fighting equipment, namely, the oxygen-breathing apparatus. The introduction of this apparatus has made possible the fighting of fires otherwise almost impossible to combat. It has reduced the hazard to the men engaged, not only in combating the fire itself but also in the recovery of the mine after the fire.

The make of equipment to be used is a matter to be left to the decision of the operator. The methods of operating under conditions incident to fires and explosions are explained in another paper presented before this Section. Yet this equipment is useless—yes, more than that, it is an added hazard—if it is not maintained in the best condition and if a sufficient number of men trained in its use are not available. With the apparatus an ample supply of electric lamps, safety lamps, co-detectors, life lines, etc., should be maintained. Gas masks should not be used in fighting mine fires unless a definite supply of oxygen in the air is assured. Their use for this purpose is not recommended in this paper.

METHODS OF FIGHTING FIRES

The direct attack of the fire itself is the quickest and most effective method of fighting when it can be employed, but many conditions arise that render the direct method impossible. Smoke, fumes, gases, falls of ground, coal or timber, etc., may make approach to the fire impossible, so that an indirect method must be employed. In some metal mines, where explosive gases are not generated by the fire, it has been found feasible, with the aid of portable ventilating equipment, to force the smoke and gases back toward the fire and thus eventually reach the fire itself. Where firedamp exists this constitutes a dangerous proceeding, as it may lead to an explosion which would be of far greater seriousness than the original fire.

All other means of attack failing, it becomes necessary to seal off that particular section of the mine and in some cases the entire mine must be sealed. In a paper presented before this Section last year it was found to be the practice of one coal mining company, when it became necessary to seal off a section containing a fire, not to seal it immediately, but to permit the fire to burn and increase in size so that, when finally sealed, the rapid generation of the gases of combustion served to extinguish the fire in a shorter period of time than if the section had been sealed immediately. Another method which has been tried with some degree of success has been the introduction of inert gases into the fire zone; both carbon dioxide and sulphur dioxide have been used for this purpose. The results of this method have not been such as to make its

general use recommended as, to date, it has not been possible to produce these gases economically.

To cover this subject fully would require much more space than has been available in this paper. Nothing new has been offered for discussion. The danger of mine fires, however, with their frequent disastrous results to life and property, is ever present, and the reiteration of some of the things that have been brought out in previously presented papers may serve to re-awaken our interest in the prevention of such serious accidents.

DISCUSSION

Chairman Tillson opened the discussion by mentioning the advantages of using standard fire department hose and couplings for the underground water supply. This would enable the mine in case of an emergency to extend their lines by borrowing additional hose from fire departments in the vicinity. On account of low roofs in most mines it is necessary to have a strong pressure in the hose line in order to throw the water any distance. The size of the nozzle and the pressure of water in the pipes was considered by Chairman Tillson to be very important.

Dr. Sayers suggested that the Grinnell system, in which the heat melts the solder in the pipe, so that a number of small sprays will be formed, might be made practicable in protecting shafts from fire. Mr. Conibear stated that a two and one-half inch hose, the same as approved by fire departments throughout the United States, was adopted by his company. He recommended that a water tank be maintained on each level, filled with 500 to 1,000 gallons of water, and also be furnished with other necessary equipment so that it can be attached to the air line. In case of fire this tank could be either taken to the fire or could deliver water through the air line to the fire, provided that the air line was convenient. He mentioned one fire that was fought for an entire day with fire extinguishers without gaining much headway; as soon as water, under pressure, could be secured the fire was extinguished in about thirty minutes.

Mr. Bawden stated that he felt that standard two and one-half inch hose means nothing, that his mine had been equipped with two and one-half inch hose, such as is used by the fire department, but when it was necessary at one time to call on the fire department for help and additional hose, it was found that the standard hose used at the mine had eight threads to the inch, whereas the fire department hose had only seven and one-half threads to the inch. Mr. Bawden suggested that the mining company equipping its mine with hose and fire fighting apparatus should investigate what the local fire department is using before purchasing.

MINE RESCUE TRAINING AND OPERATION

D. J. PARKER, CHIEF ENGINEER OF THE MINE SAFETY SERVICE,
UNITED STATES BUREAU OF MINES

[It was decided that this paper should be published as a safe practices pamphlet. It is, therefore, not printed in full here. It has been

issued by the National Safety Council as Safe Practices Pamphlet No. M. 2.]

Mr. Parker stated that successful mine rescue training and operation resolves itself into: 1. The selection of suitable apparatus. 2. Adoption of an adequate and thorough training course. 3. By proper understanding and use of the apparatus by persons suitably qualified.

In discussing the apparatus Mr. Parker told of the desirability of having apparatus tested by some one competent to pass upon the suitability of apparatus for mine use. The United States Bureau of Mines has attempted this work in testing mine rescue apparatus for permissibility. He explained in detail schedule 13, "Procedure for establishing a list of permissible self-contained mine rescue breathing apparatus," which is used by the Bureau of Mines.

Two types of self-contained oxygen breathing apparatus have been approved in accordance with this schedule. These apparatus are the "Gibbs," manufactured by the Mine Safety Appliance Company, and the "Paul," manufactured by the American Atmos Corporation.

Mr. Parker, in discussing the second heading, stated that for mine rescue work certain physical qualifications, good judgment, courage and knowledge of mining practices are necessary. Independent of these qualifications, a certain amount of knowledge of mine-rescue apparatus and skill in its use is necessary before one can take up rescue or recovery work. He then explained in detail the complete course of mine-rescue training that has been adopted by the United States Bureau of Mines.

This course ordinarily consumes a period of five one-half days, a total of twenty hours being given in wearing breathing apparatus in gases. Lectures and instruction is given regarding assembling, use and care of apparatus, and practice in assembling, taking apart and cleaning it.

In commenting on the third heading, the proper understanding and use of the apparatus by persons suitably qualified, Mr. Parker mentions that persons trained in mine-rescue work should undergo additional training from time to time in order to maintain their fitness; training once a month is none too often. He also mentioned that a man should be in splendid physical condition before attempting actual recovery operations.

After taking up the selection of apparatus and training of the personnel, Mr. Parker described, in detail, rescue operations. He mentioned that, following a mine explosion, the ends sought in rescue and recovery are as follows: 1. The recovery alive, if possible, of men entombed or missing, at the earliest moment compatible with reasonable safety of the rescue crew. 2. The discovery and extinguishing or sealing off of an incipient or active fire. 3. The restoration of normal ventilation. 4. The placing of the mine upon a normal working basis. Mr. Parker brought out the necessity of having a complete working organization, not only of well-trained apparatus men, but also of men to look after every detail incident to rescue and recovery operations.

DISCUSSION

In the discussion of Mr. Parker's paper Chairman Tillson asked why the activities of a rescue man were limited by Mr. Parker almost ex-

clusively to the horizontal plane. Mr. Parker stated that his experience has been that it is more trouble to keep the men who wear apparatus from going too far than from getting them to go far enough. He mentioned a case where three men wearing apparatus climbed a ladder 300 feet vertically for the purpose of opening a door in a mine. If one of those men had collapsed the others would not have been able to rescue him. If the man on top had fallen he would probably have knocked the other two men down with him. Mr. Parker stated that this was a hazardous undertaking and he did not recommend it except where a life was involved and it was necessary to go to such extremes to save it.

Mr. Boardman stated that he felt Mr. Parker was absolutely right in recommending that the men stay on the level; that it had been his experience that where men are trapped in a mine they will be found on the levels rather than in the stopes or raises. He thought that during exploratory work the rescue crew should not explore vertical workings, but should confine their activities to the levels until such time as ventilation is restored and the mine crews more thoroughly able to organize and be ready to go ahead on a permanent fire-fighting basis. Mr. Boardman also stated that the Anaconda Copper Mining Company had recently issued orders that all mine openings used for exits should be made of sufficient size to permit the passage of a man wearing oxygen breathing apparatus. These openings are made four feet wide and twenty inches deep from the ladder.

In answer to a question as to whether it was advisable for a mining company to limit itself to one make of oxygen breathing apparatus, Mr. Parker stated that he thought it was highly desirable that each mine should confine itself to one type of apparatus. It would then be possible for them to have a liberal supply of spare parts and the men could be thoroughly trained in the use of this one particular apparatus; they would not get mixed up in an emergency. If two kinds of apparatus are in use at the same mine it takes extra time to train men in the use of both types and it is double work keeping the apparatus ready for use.

HAZARDS DUE TO OXYGEN DEFICIENCY

In discussing the physical effort of breathing a deficiency of oxygen, Dr. Sayers stated that he had seen men drop and lose consciousness, due to breathing air deficient in oxygen; that a man sometimes knows an instant before he "goes down" that something is wrong, but he usually does not realize what is wrong, he just "drops." If the oxygen breathing apparatus is not working a man will "drop" before taking off his nose clip. With oxygen deficiency a person will breathe more rapidly, but his breathing will be shallow. The trembling of the muscles is due not to rapid breathing but to oxygen deficiency in the muscles and in the tissues. Dr. Sayers emphasized the importance of physical examination for men before allowing them to wear oxygen breathing apparatus. He mentioned the experience of the English during the late war, in which some of their aviators were lost; they would crash to the ground—there seemed to be no reason for it. Very few of these men were shot down in battle and upon investigation it was found that more than 90 per cent of acci-

dents due to airplanes in the early part of the war were due to a lack of physical fitness of the aviator. By adopting a more exacting physical requirement this loss was almost entirely eliminated. Dr. Sayers stated that at least 25 per cent of the men on record who had been killed while wearing oxygen breathing apparatus were known to have been sick or not physically fit before they went underground.

Mr. Seip asked Mr. Parker if he did not think it advisable to flush the air from the apparatus about every twenty minutes, in order to eliminate the accumulation of hydrogen or other impurities in the oxygen supply. Mr. Parker agreed that it was advisable because any impurities of nitrogen or hydrogen in the oxygen supply would otherwise gradually accumulate in the breathing bag. In the fixed feed apparatus, which affords more air than is required for ordinary breathing purposes, there would be no need to deflate the breathing bag because the leakage through the relief valve would take care of eliminating the impurities.

The Section then proceeded to consider Mr. Charlton's paper which was read by Mr. Seip.

THE USE OF TELEPHONES IN MINES

D. E. A. CHARLTON, ASSISTANT BUSINESS MANAGER, ENGINEERING AND MINING JOURNAL PRESS

To enumerate the several uses of the telephone in mines would be to repeat what has already appeared in technical publications, safety rule books, bulletins and other literature. Not a shift passes but the usefulness of this invention is made manifest and it hardly seems necessary, in these days of so-called civilization and enlightenment that it is needful to enact laws that make the use of the telephone in mines compulsory. To paraphrase the slogan of the peddler who deals in household appurtenances, "No well-regulated mine should be without one."

In June, 1921, the United States Bureau of Mines issued* a compilation, prepared by L. C. Ilsley and R. A. Kearns, of state safety regulations pertaining to the use of telephones at mines. This shows that sixteen states have rules or enactments relating to telephones. I understand† that there have been no new state regulations since then, although changes may take place at any time. It is of interest that the Federal Leasing Act of Feb. 25, 1920, has the following reference to mine telephones:

"The lessee shall provide and maintain, in each mine where more than 100 men are employed underground on any shift, a telephone system between the hoisting-engine room, the ground landing of the shaft or slope, the principal mine exit of drift mines, the fan building when same is located 1,000 feet or more from the power-house or main exit of the mine, and such other points on the surface as may be advisable for safety of the employees. The telephone system shall also extend into the mine and telephones be placed on each shaft or slope landing in use at the inside siding of each of the main haulage roads. The underground telephones shall be so placed that no twenty men shall be more than 1,000 feet from

*"Reports of Investigations," June 1921, Serial No. 2,255.

†Personal communication.

the nearest telephone station. Telephones shall also be placed in each refuge and first-aid chamber."

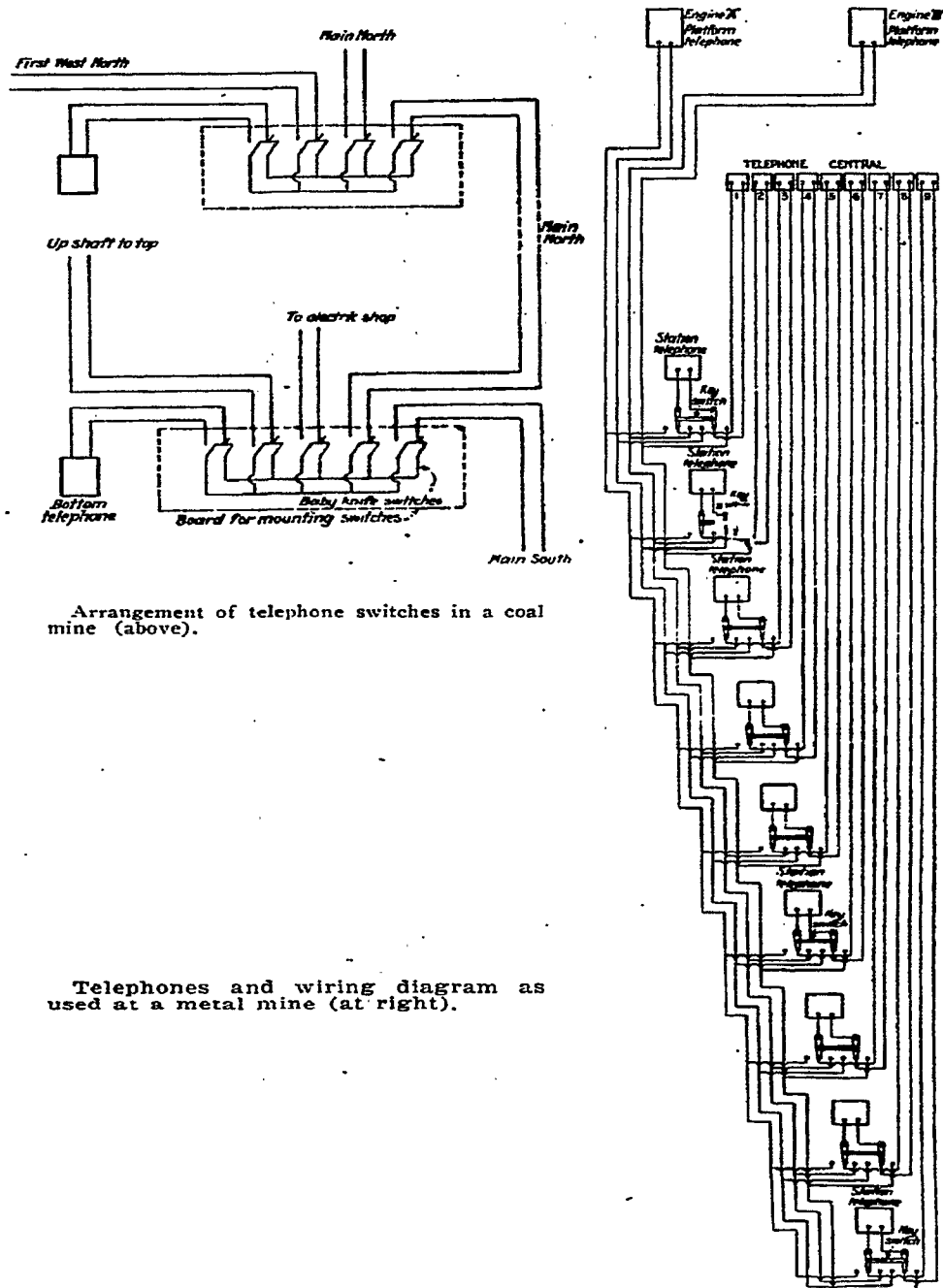
STATES HAVE DIFFERENT REGULATIONS

The following is a résumé of the various state regulations with regard to the use of telephones at mines: California rules provide that telephones be maintained in all mines over 500 feet in depth. Colorado specifies the maintenance of an adequate telephone system in all mines, from the surface extending to the bottom of the shaft. Illinois, that there shall be a system of party-line telephones that shall include one telephone at the bottom of the hoisting shaft or in slope or drift mines at the first cross entry, and one at each inside parting. Iowa, in all mines where the workings exceed 3,000 feet from the foot of the slope, shaft or the mouth of the drift there shall be installed a telephone system, and this shall be extended as the works of the mine progress 3,000 feet therefrom. Kentucky specifies that in any coal mine where more than fifty men are employed underground, one or more telephones shall be installed communicating with the surface. In Kansas it is unlawful to operate or permit to be operated any coal mine not equipped with a party-line telephone system. The New Mexico law apparently exempts metal mines, for it is stated that it shall be the duty of the operator to install and maintain a telephone system in every coal mine. North Dakota also relates to coal and specifies that in any coal mine where more than fifty men are employed underground, one or more telephones shall be installed. The Oklahoma laws provide that a telephone system shall be furnished in every coal mine where as many as fifteen men are working.

In the anthracite mines of Pennsylvania it is necessary to provide means of communication, by telegraph or telephone, between mines and collieries, and in the bituminous region of that state the law relates more specifically to communication between the surface and the bottom of the shaft or slope. Tennessee specifies the maintenance of a metal tube from top to bottom of shaft, or a telephone system. Texas also requires that a metal tube or telephone be maintained. The Utah laws provide that in all mines in which ten or more men are working more than 2,000 feet from the entrance, or in which there are ten or more working places more than 2,000 feet from the entrance, there shall be installed an underground telephone system. Washington specifies the maintenance of a telephone or metal tube from the top to the bottom of every shaft or slope and at each alternate working level. Wyoming specifies a system of party-line telephones in each coal mine in operation. In addition, several of the regulations of the various states contain clauses relating to the installation and maintenance of mine telephones.

SPECIAL CONSIDERATIONS GOVERN MINE TELEPHONE CONSTRUCTION

The severe conditions imposed on mine telephones make it necessary to supply a more rugged construction than that required for ordinary installation. Underground, the device frequently must be exposed to moisture, gases, acid water and mechanical sources of injury. Of these, the latter, which includes falls of ground, concussions of blasting and rough handling, is the most frequent; moisture is probably the next. Gas



Arrangement of telephone switches in a coal mine (above).

Telephones and wiring diagram as used at a metal mine (at right).

and acid-water conditions are somewhat restricted to coal and copper mines.

The generally accepted types of mine telephones are housed in a moisture and rust proof iron or steel case, of sufficient thickness to provide ample protection from injury. The edges of the case are well rounded, so that water and falling objects will easily slide off, and strong mounting supports are provided to insure rigidity when the telephone is installed. An outer door on the case, provided with a rubber gasket, serves, when closed, completely to protect the mechanism from any disturbing element. When this is opened only the transmitter, receiver, receiver cord and generator handle are exposed, as an inner door effectually conceals and protects all of the delicate mechanism. When considered necessary, locks or padlocks may be placed on the outer door and keys provided to the shift bosses or foremen. Binding posts for the line and ground wires are placed in a terminal box, which is either mounted on the underside of the case proper or included as a part of it. The bells, bell mounting and clapper rod assembly are housed in a dome-shaped casting on the top of the case.

The talking apparatus of the mine telephone consists of a standard long-distance transmitter and receiver, slightly modified for underground service. In the design of these the manufacturers have considered carefully the hard usage to which the mechanism will be subject and waterproof windings and special insulation are used throughout. The ordinary form of gravity-controlled hook switch is not sufficiently rugged for mine service and one manufacturer, at least, has devised a positive spring-controlled hook switch in which the force of gravity is not employed. The receiver, instead of being suspended from a lever terminating in a fork-shaped yoke, normally rests between the jaws of a special receiver holder. When the receiver is taken out of the jaws a trigger depresses a small plunger which passes through the door and actuates the contact spring of the hook switch.

ECONOMICAL IN CURRENT CONSUMPTION

Mine telephones are usually supplied with ringers of 1,600 or 2,500 ohms resistance and five-bar hand generators. Under average service two standard dry cells will furnish talking current for a year or more, as the transmitter has a fairly high resistance and therefore a low current consumption. Frequently it is desirable to supply extension bells which are loud-ringing, so that the telephone signals may be heard at some distance or above the noise in a particular place, such as the shaft station or pumphouse. In this event gongs of 6 to 8 inches diameter are supplied, the ringer coils usually having the same resistance as those used in the telephones.

It is customary to protect mine telephones against lightning discharge and accidental crossing with high-tension lighting or power circuits and for this purpose a protector, consisting of mountings equipped with fuses and carbon-block type open-space cut-outs, is used. Several kinds of conductors may be used for telephone lines in mines and a number of different types of brackets and insulators, which are in general use, are available.

No one type of installation can be recommended under all conditions. The following kinds of conductors are in general use for wiring mine telephone systems: *Surface*: Triple-braid weatherproof copper or iron wire (No. 12 gauge), bare copper or iron wire, bridle or drop wire for short runs. *Underground*: Considerable diversity of practice exists as to sizes and types of wire used underground. One manufacturer recommends armored cable, Ferrin cable or twisted pair drop wire (40 per cent Para insulation). From a questionnaire which I sent out the replies varied a good deal, but in general Nos. 12, 14, and 16 copper wire, rubber covered and armored, also No. 12 iron wire, tinned, were specified. In some instances, the wires down the shaft are included with the signaling wires, the entire installation consisting of a single cable with individual strands for the two functions. Where conduits were made use of one-half-inch metallic carriers were specified.

Concerning the maintenance of wiring for the mine telephones, not infrequently a great deal of trouble is experienced because of the breaking of the line by falls of roof and similar happenings. In the installation of wires, particularly in haulage drifts where trolley locomotives are used, it is essential that care be taken in the placing of wires so that there shall be no connection between the two circuits. Unless the telephone wire be well insulated, it is recommended that where it crosses over trolley wires a wooden or insulated conduit be provided.

VARIOUS METHODS OF ARRANGING CIRCUIT

The situation of mine telephones depends, of course, upon the extent of the operation. Not infrequently a group of mines will be connected from a central switchboard which will serve all important points above and below ground. In most installations, however, it is customary to maintain a single circuit at each mine, connecting the surface with the underground workings and signaling to the different stations by means of code rings. The following buildings will usually be included in such a circuit. For metal mines (surface): Office, engine-room, boiler-room, shops, change-house, first-aid room and top of shaft; (underground) shaft stations, pump stations, powder magazines, loading pockets and transmitting levels. For coal mines (surface): Office, engine-room, shops, tipple, top of shaft or slope and first-aid room; (underground) shaft or slope bottom, pump stations, main partings and first-aid rooms.

The following general requirements have been specified in a tentative draft* prepared by the United States Bureau of Mines for establishing a list of permissible telephones for use in gaseous mines: "The apparatus shall be so designed and constructed that under no circumstances can its normal operation cause ignition of surrounding explosive mine atmospheres. All parts of the apparatus shall be adequate for the service for which they are intended. The construction of permissible apparatus shall be especially durable. This requirement shall be applied consistently to all the details of the apparatus under test in order that with proper care

*Tentative Draft, Schedule 9A, Bureau of Mines. "Procedure for Establishing a List of Permissible Telephones for Use in Gaseous Mines; Character of Tests," etc.

and maintenance the permissible qualities of the apparatus will remain unimpaired under the severe conditions imposed by mining service.

"All terminals and contacts and all wiring shall be adequately protected and all leads shall pass through the casings of the apparatus by means of adequately insulated devices of approved design. All parts of the apparatus, such as the magneto, the hook switch, etc., which are capable during normal operation of igniting explosive gas and air mixtures shall be placed in permissible compartments.

"All openings in the casings of permissible compartments shall be tightly closed and it is desirable that such openings shall be as few as possible. All joints in the casings of a permissible compartment shall be metal-to-metal, so designed as to form a path not less than 1-inch long from the inside of the casing to the atmosphere. All boltholes in the casing shall be hottomed or so arranged that the accidental omission of a bolt will not give an opening through the casing. The compartment shall be provided with an adequate lock or seal to prevent tampering with the apparatus inside the casing. Battery cells shall be placed in a permissible, or in a locked or sealed adequate compartment, and their terminals and the connections thereto shall be arranged so as to preclude the possibility of anyone meddling or tampering or making electrical connection with them. The short-circuit current of the battery, measured as close as possible to the terminals, shall not exceed the following limits: For batteries giving 2.5 volts or less, 100 amperes; for batteries giving 2.5 but not more than 4 volts, 85 amperes; for batteries giving more than 5, but not more than 6 volts, 45 amperes.

"The manufacturer shall permanently attach to the case of the apparatus adequate instructions for the installation and connection of the telephone, so that the safety and efficiency of the apparatus and the system to which it is connected shall not be diminished by its installation. He shall also attach to the instrument an adequate wiring diagram of the apparatus."

Good transmission, which means correct wiring and proper installation and maintenance, combined with sensible usage, is essential to the success of any mine telephone system. In any consideration of the necessities in mine operation the telephone should occupy a high place, for without it today safety and efficiency would hardly be worthy of the name.

In the preparation of this paper I am indebted to L. C. Hsley, electrical engineer of the United States Bureau of Mines, the Stomberg-Carlson Telephone Manufacturing Company, the Western Electric Company, and to the several safety engineers and superintendents who have given me specific information concerning telephone installations at their mines.

DISCUSSION

Mr. Joseph W. Reed opened the discussion by stating that he had assisted in making experiments in using a telephone connected in a single metallic circuit, made through the mine rail or through the pipe line. This system embodies a coil of about 100 feet of wire with a condenser at one side of the telephone to make the circuit oscillate. An oscillating current results which passes through the telephone receiver and is trans-

mitted through the metallic circuit to the other telephone. This system is about the same as the Reincke 'phone, described in *Coal Age*. Experiments with the Reincke phone proved that it was possible, by tapping a mine rail, to talk easily to any other telephone also connected to the rail system. The mine foreman had a small pocket 'phone, weighing six or eight pounds. He could tap the rail at any place and call up the other stations. Mr. Reed stated that his experiments had not extended to the point of verifying the results mentioned above. He did not have wiring diagrams illustrating the system.

Mr. Parker stated that he was not in favor of the suggestion made in Mr. Charlton's paper, that underground 'phones be locked and be accessible only to a shift boss or other official who carried a key. Mr. Parker thought this was wrong and the telephone should be accessible to anyone in a case of emergency.

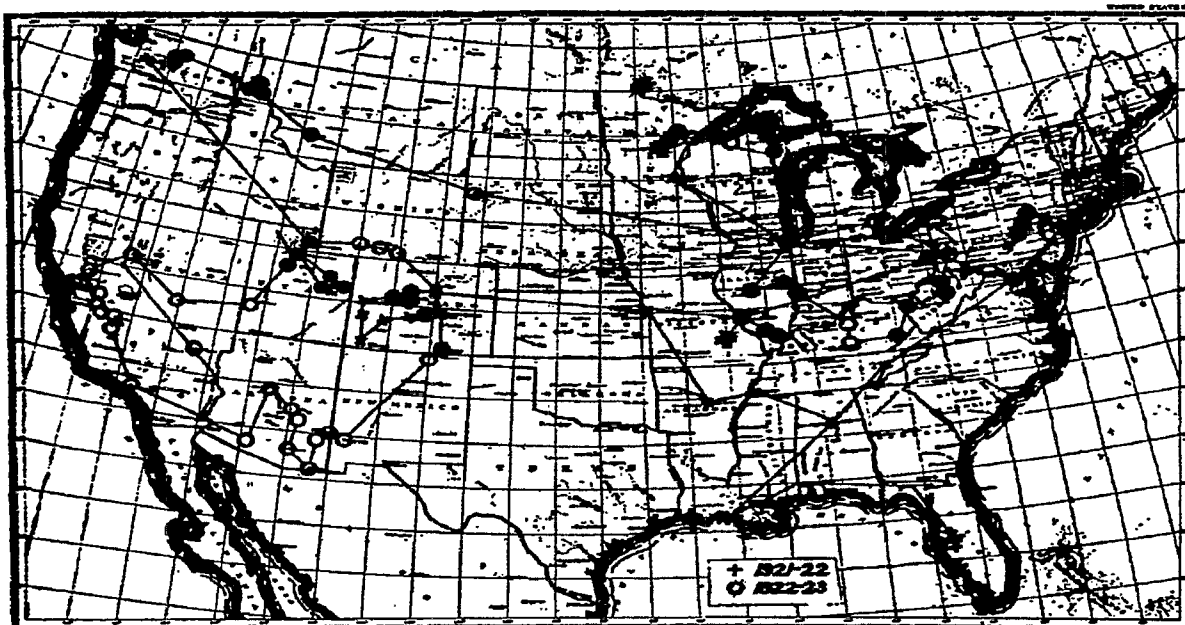
Mr. Colburn told of experiments being carried on by the Bureau of Mines in using the ordinary wireless set for sending signals underground. He stated that by using a Westinghouse receiving set the signals from the broadcasting station KDKA, eighteen miles distant, could be plainly heard under fifty feet of cover, but that the signals decreased in strength very rapidly as this cover was increased. In using a twenty-watt sending set it was found that signals could be heard very distinctly through fifty feet of earth, but that the signals decreased in strength very rapidly as this distance was increased. Mr. Reed thought it advisable for the Bureau of Mines to carry on experiments using metal conductors, such as rails or pipe, instead of confining the experiments to sending wireless waves through the ground.

SAFETY VISITS TO MINES OF THE UNITED STATES

Following this discussion Mr. Colburn presented his paper on "Safety Visits to the Mines of the United States." He showed a map of the United States on which was indicated the places visited during the past year, and also the places to be visited during the present year. It showed that Mr. Colburn's itinerary would include the Black Hills, Butte, Mont., and the Coeur d'Alene region, also mining districts in the States of Washington and Utah, before Christmas. Immediately after the holidays he would visit the Southwest, returning East about the first of April, taking in the lead-zinc belt at Joplin and the lead belt at Flat River, Mo. The spring and summer would be spent in visiting the coal mines of Illinois, Indiana, Kentucky, Ohio, Pennsylvania and West Virginia, and trips to these mines would probably continue well into the next year. Mr. Colburn gave instances of his visits to mines, how he was received by the operators, and what suggestions it was possible for him to make.

On account of the necessity of visiting such large sections each year it is impossible for him to make minute inspections. This is not considered desirable. His work was planned to be of a more general nature, with the object of collecting and spreading safety information. Mr. Joseph W. Reed, in discussing Mr. Colburn's remarks, stated that he felt

it desirable to publish the map showing the proposed itinerary of Mr. Colburn for the coming year, so that the mine officials could be prepared to take advantage of his presence.



THURSDAY MORNING SESSION

THE meeting was called to order by Chairman Tillson, who asked for the report of the Nominating Committee.

The chairman of the committee, Dr. Sayers, in making the report, outlined the splendid work that had been done by the past year's officers. He stated that the Nominating Committee felt that a very important program had been initiated by those officers and that it was advisable to retain those officers for another year in order that they might complete their program. The Nominating Committee, therefore, recommended that the present officers be renominated. Dr. Sayers' remarks were liberally applauded.

Chairman Tillson announced that the nominations made by the Nominating Committee did not take away the privilege of making nominations from the floor. He asked Dr. Sayers to act as chairman and to be kind enough to call for and consider other nominations. Dr. Sayers took the chair and by a unanimous vote of those present the officers who served during the past year were re-elected to serve during the coming year. Immediately after the election of officers the meeting proceeded with the consideration of the prepared papers.

PORTABLE VENTILATING EQUIPMENT FOR MINING OPERATIONS AND TUNNEL CONSTRUCTION

E. T. LEDNUM, MANAGER, E. I. DU PONT DE NEMOURS & COMPANY,
DENVER, COLO.

[This paper will refer to the subject of the development and the application of a product for use in the betterment of working conditions for mankind, irrespective of his mentality or his ability, as he toils underground in places where high temperatures, humidity and still air exist.

Intimate knowledge, from experience and observation in underground workings, induced the speaker to make a further study of conditions in mines, with the purpose of determining a satisfactorily treated fabric for use as a ventilation duct. The appearance on the market of "Ventube" was the result of this study. It is understood that remarks and references in the subject matter of this paper cover only portable air ducts and are not applicable to the permanent ventilation of large tunnels.]

STANDARDIZATION OF MINING METHODS

The finding of ore is, of course, the first thing for consideration in the development period of a metal mine, and natural ventilation is, to a great extent, utilized, until its possibilities are exhausted. Following that, small blowers or fans have been used.

Ventilation of coal mines and working conditions in coal mines have been pretty thoroughly covered and prescribed under existing State laws. For working conditions in metal mines, however, the subject of ventilation has been left largely to the discretion of the operating officials.

Charles A. Mitke, consulting engineer, in his book, entitled "Standardization of Mining Methods," says: "There are two methods by which the degree of ventilation may be determined. (a) According to the quantity of pure air per man, per minute, entering the mine. (b) By determining the amount of impurity present by making a chemical analysis of the air. The quantity standard is less expensive, more practicable and is the method most generally used. The quality standard is expensive and its application is necessary only in exceptional cases. It has only a remote bearing on the efficiency of the men, but occasionally it is found advisable to have accurate determinations made on several samples of mine air." In metal mines it has been necessary to make connections between levels where natural ventilation is relied upon for air current circulation.

Mines are being operated at low levels and these operations are being conducted at increasing depths yearly—the increase in depth is on the basis of about 100 feet per year. As we increase in depth the natural rock temperatures increase. A temperature of 100° Fahrenheit is quite common. In many mines the humidity causes them to seem hot. The temperatures may not be excessive at 80° Fahrenheit, but with a humidity of 99 per cent, the conditions for work are very distressing. Heat, humidity and stagnation of air is conducive to inactivity and immediate loss in efficiency, caused by the drop in the ability of men to work in such places. Many of us have been in such places and have experienced the depressing effect and this without very much physical effort being ex-

pended. Under such conditions the body film of air is not disturbed; this so-called body film is the result of air stagnation which forms around the body and causes heart fatigue to force blood to the skin to be cooled by sweating.

AIR WARM AND HUMID IN METALLIFEROUS MINES

Work in several metalliferous mines in this country is conducted in some places where the air is so warm and humid that continuous effort is impossible. Men are able to work for short periods only and come out as soon as they feel uncomfortable. Such work is very expensive, but the risk to safety and health is at a minimum.

The movement of air is of greatest importance, because for air to feel fresh it must have a cooling and evaporative power to keep the skin cool; to do this it must be in gentle motion.

Free silica dust has an injurious effect on health when breathed into the lungs. The high death rate among Cornish miners has been attributed largely to the inhalation of silica dust.

There have been many worthy contributions to the subject of the effect on the health of breathing dust in underground operations. This subject is a very large one and I will not attempt to do other than touch the high points; suffice to say that while some men are hypersensitive to dust, yet at the same time the breathing of non-poisonous, and what appears to be harmless, dust, such as gypsum, chalk and coal dusts, will ultimately produce chronic asthma. With lung affections and respiratory diseases, miners will naturally have low, or at least limited, resistance to other bodily illness and will succumb quickly to attack from pneumonia or lung infections.

Meritorious consideration to ventilation, and the maintenance of the equipment to deliver fresh air in our underground operations, will mean less sickness, greater producing power and more enjoyment for life by our employees and their families. A ventilation system adjusted to the severity of conditions will increase the efficiency of workers and show greater tonnage production, with increased earning power on the invested capital.

Mr. Daniel Harrington of the Bureau of Mines has contributed several notable papers on the subject of "Ventilation in Metal Mines" and the effects on life and the low efficiency caused by lack of ventilation. In the proceedings of the American Institute of Mining and Metallurgical Engineers he stated: "Failure to transmit fresh air currents to working faces is the most noticeable weakness of present-day metal mine ventilation and, unfortunately, this fault is only too frequent, even where there is an abundance of fresh air in the main courses." Science and experience have proven the wisdom of providing ventilation and delivering fresh air in gentle motion in the working places in our underground operations.

A generally accepted idea has been to the effect that an occasional blowing of the face by compressed air from the hose line and the exhaust from drills has been sufficient to afford adequate ventilation of stopes and drifts. Compressed air is an aid to ventilation, but it is expensive and

when applied only intermittently is not adequate to remove powder smoke from blasting. It also raises the dust. When dependence is made on exhaust from the drills the system is not desirable on account of minute particles of oil carried into the air.

SPECIAL BLOWERS AND THEIR USES

Considerable time and thought has been devoted to special blowers and many mines are using this type of equipment, which has proven by experience to be satisfactory and economical. Small self-contained electric fans blowing, say, from 1,000 to 4,000 feet of free air per minute through flexible lines, give instant relief from heat and humidity and remove fumes and powder smoke quickly; they also raise the efficiency and production of the miners.

Ventilation of coal mines is provided for almost entirely by surface equipment and the maintenance of established air courses. The Committee on Standardization Division of the American Mining Congress has given careful consideration to the installation of booster fans in coal mines and has proposed recommendations for installation of such fans for use in mines to properly ventilate remote sections; this can be done easily without greatly increasing the speed of the main fan.

The ventilation of metal mines is a very different problem from the ventilation of coal mines. Due to the very order of things in ore formations, and the character of workings, air in metal mines is pocketed and becomes stagnant. It becomes vitiated and the admixture of gases from organic decay and blasting increases the heat temperatures. The oxidation of sulphide ore bodies also develops heat and gases. Heat is also given off by electrical equipment. There is also a further development of heat from mine fires, which occur frequently in sulphide ore bodies, and the natural heat from increasing depth of workings.

The problem of properly ventilating metal mines is such that it demands the attention of engineers familiar with the conditions involved in individual operations. That which has been said about ventilation in mines, as to the effect on the health of men and efficiency, will apply directly in tunnel construction.

Quoting from "Modern Tunneling" by David W. Brunton and John A. Davis and from a chapter on "Railroad Tunneling," by J. Vipond Davies: "The ventilation of tunnels under construction is one of the most important things that can be considered by the engineer. Not only is a badly ventilated tunnel an act of inhumanity, but from the point of view of dollars and cents alone it is most shortsighted not to keep the air in the working space in a healthful condition for the workers. When the face of a rock tunnel is fired, the workings become filled with dense smoke, gas and dust, and until this clears so that men can see and breathe freely the work is at a standstill. The only way to cut down this loss of time is to exhaust the foul air or to blow in fresh, or both. Probably the most usual arrangement is to blow the air into the tunnel, through ducts laid for that purpose, and which terminate near the working face. * * * In very long tunnels, under construction, it may be necessary to introduce additional blowers (boosters) on the main line,

where the size of the ventilating pipe has been kept so small that the fan at the portal cannot force the air to the face. Intermediate blowers may also be required for subsidiary working points; for example, at places where lining work is in progress. It has lately been emphasized in industry that good ventilation and lighting are prime factors in increasing output; this is also true in tunnel work.

FLEXIBLE TUBING FOR AIR LINES

"The use of an auxiliary tunnel for access and ventilation, as at Rogers Pass or "Connaught" tunnel in Canada, is a solution of many difficulties in very long tunnels, but such a system must be studied on its own merits in relation to the particular job under consideration."

All of our mining and civil engineers are more or less familiar with the subject matter of data covering volume of air required under conditions where men are sitting still or exercising in the performance of labor in underground operations. The quantity of air per man per minute is not a governing factor, however, as ventilation is necessary to reduce high temperature and humidity, due mainly to natural causes.

Metal or rigid lines have been used as an air duct for ventilation purposes and have proven their merit. Metal lines are bulky and comparatively few feet of line can be taken down a shaft at a time. After they have been installed, falls of rock ruin them permanently. A metal line is also susceptible to the destructive action of mine waters. To develop a flexible tubing which will embody all of the factors of merit in metal lines as to frictional resistance, and overcome the deficiencies in a metal line, consideration had to be given to attacks from acid mine waters, fungus growth and humidity; also to producing a fabric which would prove its ability to meet these specifications to the point of economical installation and retain its flexibility. Flexible tubing must, at the same time, be of light weight and possess sufficient strength to insure durability.

A flexible duct for ventilation has many advantages. It is light in weight, occupies limited space during transportation and is easily installed. When not in use carrying air it will collapse and hang free. During blasting it hangs collapsed and free, as there is no air passing through same. It is, therefore, not affected by concussion. Immediately after blasting the fans are started, air pressure will expand the tube and the air will be carried close to the face. A fabric tube will also lend itself to absorption of shock from falling rock and, if punctured, can be quickly and easily repaired. A fabric tube also has the added advantage of being able to be carried and extended without the slightest difficulty over and around timbers, through stopes and numerous other places, where the fitting of a rigid line would be slow and expensive. Additional lengths can be added to the line with the air pressure on and miners can deliver the air to blow on them directly. With the air in circulation, miners will feel relief and comfort by removing the body film of stagnant air. This is of great value, especially in deep workings and high rock temperatures.

The frictional resistance to air offered by "Ventube" is no greater, as has been determined by careful tests, than friction in metal lines and the

loss of air is very much less than in metal lines, due to leaks in the metal lines.

SPECIFICATIONS FOR ADEQUATE VENTILATING SYSTEM

Robert Linton, president, North Butte Mining Company, in his paper entitled "Standardizing by North Butte Mining Company," in the proceedings of the A. I. M. E., says: "It is difficult to get satisfactory ventilation from an ordinary metal pipe 1,000 feet long, whereas excellent ventilation has been obtained from canvas tubing over 2,400 feet long. The size of the tubing and the corresponding size of the fan are determined by the size of the workings to be ventilated and the distance the air must be carried. Standards, based on clearing a working face within thirty-five minutes after blasting, are as below. The equipment can be used to ventilate at much greater distance by consuming correspondingly longer time. Tubing and blowers required to clear 6x8-foot heading in thirty-five minutes:

No. 2 Sirocco fan—10-inch diameter line, 600 feet. Delivering about 1,000 feet of air. A. C. Motor, 5 H.P., 1,735 R.P.M. D. C. Motor 5 H.P., 1,800 R.P.M.

No. 2½ Sirocco fan—12-inch diameter line, 1,000 feet. Delivering about 1,200 feet of air. A. C. Motor, 7½ H.P., 1,740 R.P.M. D. C. Motor 7½ H.P., 1,700 R.P.M.

No. 3 Sirocco fan—14-inch diameter line, 1,300 feet. Delivering about 1,500 feet of air. D. C. Motor, 10 H.P., 1,300 R.P.M.

No. 4 Sirocco fan—16-inch diameter line, 1,600 feet. Delivering about 1,800 feet of air. A. C. Motor, 20 H.P., 1,160 R.P.M.

"Both direct and alternating current motors are used for driving the fans: direct current is preferable, since the motors can be attached direct to trolley wires anywhere in a few minutes time. The best practice is to use a larger motor than the rating of the fan specifies, in order to allow a margin of safety for overheating where necessary to use it under temperature conditions above normal. Fans No. 2, 2½ and 3 are self-contained, being mounted on trucks complete, with starting apparatus ready to connect to the transmission line. The dimension mountings permit lowering the mounted fans on the cages without taking apart. The No. 4 Sirocco fan is too large to lower on a mine cage without taking apart hence it is not mounted on a truck, but where used is placed on a concrete foundation. Practically all the fans used are the smaller sizes, since most of the ventilating distances are comparatively short."

Since this paper was presented by Mr. Linton and read at the August (1920) meeting of the A. I. M. E., considerable work has been done by one of the large mining companies in co-operation with a fan manufacturer. It was found that instead of using stock fans that an equal quantity of air could be delivered by using one-half or two-thirds width fans and smaller motors; considerable saving in power resulted. During these tests many important facts were developed. I understand this information will be made public in the near future.

A. S. Richardson, ventilation engineer, Anaconda Copper Mining Company, in his paper "Ventilation of Butte Mines of Anaconda Copper Mining Company," presented at the New York meeting in February, 1922, A. I. M. E., says: "Improvement of ventilation conditions is not measured by reduction in temperature and humidity alone, but depends also

on other conditions. In fact, reference to relative humidity alone is misleading, because 100 per cent relative humidity is not oppressive at low temperatures, although it is decidedly oppressive at high temperatures. At wet-bulb temperatures below that of the body, say 98° Fahrenheit, an increase in velocity of air movement is the most effective means of reducing the bad effects of high temperatures. So long as the air is not saturated this increases the rate at which perspiration is evaporated on the skin, and as the latent heat of evaporation is high, the cooling effect due to it is generally greater than that caused in any other way. The present ventilation program provides for the circulation of practically double the volume of air formerly circulated through the mines, so that there will be a corresponding increase in the velocity of air movement and dilution of the CO₂ content."

COST OF VENTILATION WORK

In another section of his paper he has quoted cost of ventilation work done by the Anaconda Copper Mining Company from the year 1916 to 1920, inclusive. Under operating costs, which includes: All work on air shafts such as sinking, smooth surfacing and repairs; opening cross-cuts, drifts and raises required for use as air courses; excavation necessary for the installation of booster fans; cost of blowers and canvas pipe, and installation charges for this equipment: Year 1916, \$43,536.21; year 1917, \$459,295.45; year 1918, \$802,566.13; year 1919, \$531,308.18; year 1920, \$674,216.78. Total, \$2,900,922.75.

Under construction costs, which includes: Fans, motors, construction charges, covering new equipment for twenty-four air shafts; fans, motors and installation charges covering ten booster fans; cost of plant and equipment for making concrete slabs; no charge is counted for the mechanical equipment of seven air shafts for which new equipment was not needed or upon which it has not yet been installed: Year 1916, \$22,123.29; year 1917, \$54,430.93; year 1918, \$54,672.65; year 1919, \$223,983.30; year 1920, \$110,228.16. Total, \$465,498.33. A grand total of \$3,366,421.08.

There is no doubt as to the value of Safety First—good lighting and good ventilation—it pays. It pays from a humanitarian standpoint and it pays from a financial standpoint. It has been proven by mining companies and other organizations, including the institution which I represent, that is, the du Pont Company.

DISCUSSION

In reply to a question as to whether the canvas tubing could be used under suction, Mr. Lednum replied that canvas tubing did not lend itself to exhausting foul air through suction, that experiments had been tried with the use of a spiral on the inside of the tubing to keep it from collapsing, but that the spiral wire became deformed, which increased the frictional resistance and proved to be unsatisfactory.

Mr. Rowe, in commenting upon the paper, stated that the resistance of air through a flexible tube was found to be about the same as that through galvanized pipe, that the roughness of the joints in the galvanized pipe created more friction at the joints than the canvas pipe, and from actual tests it was found that the frictional resistance was about the

same; although theoretically the frictional resistance through the canvas tubing would be greater.

Following this discussion Mr. William Conibear read the paper prepared by Mr. Eaton, which is as follows:

UNDERGROUND TRANSPORT IN METAL MINES

LUCIEN EATON, SUPERINTENDENT OF ISHPEMING DISTRICT FOR
CLEVELAND-CLIFFS IRON COMPANY

Statistics show that of all accidents which happen in mines from 10 to 15 per cent occur in connection with transportation. Many devices have been tried and are used to keep men from getting hurt, but the largest classes of accidents that occur are those classed as trade risk or are caused by carelessness or negligence on the part of the injured man. Accidents of the latter kind seem more likely to occur where the safeguarding systems are most complete and are the hardest kind to prevent. Continual warning and teaching by example seems to be the only method by which the attention of the men can be kept aroused and carelessness avoided. Accidents of this kind are usually classed as trade risks and unpreventable. Although it does not seem right to classify accidents due to carelessness as unpreventable yet in any mine, over a long period of time, accidents of this kind always occur and it might be better to classify these accidents as inevitable rather than unpreventable. It is the object of this paper to point out the commoner kinds of accident occurring in connection with different methods of transportation and to give descriptions of the devices which are used to prevent their occurrence.

In the early days of metal mining only high-grade ores, comparatively close to the surface, were sought, and the quantities handled were relatively small, so that the cost of transportation in the mine was not high. The important thing was to find the ore. The ore once found, the profit was usually so large that little attention was paid to mining costs, but as the richer ores have gradually become exhausted attention has been turned more and more to those of lower grades which can be mined in large quantities at a low cost per ton. In mining the large tonnages of ore required for the successful operation of the great low-grade mines of this country, transportation of the material underground is the most vital factor. As one successful manager of a very large mine put it: "After the ore is broken, mining is a straight railroad proposition." By this statement he meant that the essential point was to move the ore from the breast of the stope to the collar of the shaft by the most direct route and in the shortest possible time.

UNDERGROUND TRANSPORTATION AND ITS SUBDIVISIONS

Transportation underground may be divided into three parts:

1. Shoveling the broken ore into cars and tramping it to chutes or to sidings (often called "loops").
2. Main-level haulage, which consists of loading cars at chutes or taking them from sidings and tramping them to the shaft.
3. Hoisting.

I am probably right in saying that the progress made in perfecting the methods of performing these different parts of the work has been greatest in the reverse of the order named. In other words, hoisting has reached the highest point of development, with main-level haulage next, while hand-tramming and shoveling has until very recently made little or no progress. Although hoisting is an essential part of the transportation problem it is not generally classified under that head and I shall not touch upon it in this paper.

In some mines the ore lies in large horizontal sheets and can be mined on main levels, so that all loading is done directly into main-level cars, sub-levels and chutes can be dispensed with. At other mines a system of radiating raises has been devised and the ore is undercut and broken by caving, so that it falls directly into chutes without shoveling. Recently also much progress has been made in the use of scrapers on sublevels, whereby the ore is dragged into the chutes without the use of shovels or cars. At most other mines the ore is shoveled into small cars, which are trammed by hand and dumped into chutes. This work is often done by the miners and the cost is not segregated, but is included in the item of "breaking ore."

The best results in shoveling and tramming by hand are obtained by individual contract, or piece work, a definite sum being paid each man for each car loaded. If the distance trammed is long an additional payment should be made for each 100 feet trammed, the prices in the mine being equalized in this way. Where men work in pairs results are good, but, in general, the larger the number of men in the contract the poorer the results.

Another successful method of payment, where trams are short and loading conditions uniform—as in the lead mines of Southeastern Missouri—is to consider a definite number of cars a day's work and, when that number has been loaded, to allow the men to go to the surface if they wish. A bonus is paid for any cars loaded in excess of the day's work.

The accidents which occur in this kind of transportation are rather frequent and hard to prevent, but are rarely serious. They consist mostly of strained backs, hernia, minor injuries to hands and arms and occasional injuries to head and feet. Strained backs and hernias cannot be prevented, but contributory causes can be decreased by using roller-bearing cars that are easily dumped. Injuries to hands and arms have various causes. When two men are shoveling into the same car one man sometimes strikes the other with his shovel or with a piece of ore. In loading coarse ore men often get their fingers jammed between a heavy chunk and the top of the car. Two of the commonest kinds of accidents to hands are getting the hand jammed between the side or top of the car and the timber in the drift in heavy ground, especially in going around a corner, or in catching the fingers between the car body and the truck after dumping.

Guards on top of the car are effective against contact with timbers or chutes above the cars, but no successful sideguards have, to my knowledge, been devised. Blocks properly placed on the truck four inches or more in front of the rear end of the car-body prevent pinching of fingers

after dumping. Men also occasionally bump their heads, or slip on the rail, or pull the car over their feet, but these accidents are due to carelessness and cannot be prevented.

HAND TRIMMING, ANIMAL AND MECHANICAL HAULAGE

Main-level haulage is the most important, though not always the most expensive, part of the underground transportation system. It may be classified as follows: 1. Hand-tramming, *i. e.*, by men. 2. Animal haulage, by mules or horses. 3. Mechanical haulage.

Hand-tramming is used in mines where the haul is short and the tonnage too small to warrant the first cost of animal or mechanical haulage, but many mines that formerly relied on hand tramming, because their product was distributed over a large number of levels in recent years, have found great economy in the use of storage-battery locomotives.

Accidents that occur in hand tramming are the same as those previously mentioned under the heading of tramming on sublevels, except that there are a larger number of injuries from collisions with chutes. This makes hand guards essential in drifts where there are chutes. Occasional accidents also occur, especially where large cars are used, from men being squeezed between cars or between a car and the side of the drift. These accidents are often serious and sometimes fatal and, being usually due to carelessness, are very difficult to prevent.

A very good description of animal haulage was given in the papers by Mr. C. L. Solomon and Mr. R. M. Magraw, published in the proceedings last year. Animal haulage is not as important in metal mining as in coal mining and is becoming less and less common as improvements in mechanical haulage are made. Aside from accidents due to the animals themselves, the accidents in animal haulage are about the same as those where hand tramming is used, because equipment is not very large and speeds are low. It is essential that roadways, where mules or horses are traveling, should be kept in good condition, not only for the efficient operation of the animals, but for the safety of the men who travel the same routes. Mules have a tendency to dig holes between the ties, which make the track an uneven and dangerous footway, and unless these holes are kept filled accidents from falls on the track are likely to occur.

GASOLINE AND COMPRESSED AIR LOCOMOTIVES

Mechanical haulage may be divided into two classes: (1) Rope haulage and (2) locomotive haulage. Rope haulage, except on inclines, is very uncommon at the present time and I know of no new installations of this character. Rope haulage on inclines is of the nature of hoisting and, for this reason, will not be treated in this paper.

Locomotives used for hauling cars underground are of various types. In the past there have been installations of steam-driven locomotives, but I trust there are none in existence at the present time. I remember a small locomotive which ran through a tunnel on the 600-foot level of the Hibernia mine in New Jersey twenty years ago, and the effect of the smoke and gases from this locomotive not only on the ventilation, but on the timbers in the mine, was very serious. Since my last visit to the

mine that portion where the locomotive used to run has caved in. I trust the locomotive was in the mine at the time the cave-in occurred.

The use of gasoline locomotives underground is open to the same objections as that of steam locomotives, but to a slightly lesser extent. Where ventilation is good and stopes are large the fumes from the engine do not vitiate the atmosphere to a serious extent. My experience with gasoline locomotives has led me to discard them, not so much from the sanitary standpoint as from difficulties in operation. Gasoline locomotives may be efficient in tunnels where they are brought to the surface at the end of every shift and can be inspected daily and frequently overhauled, but when used on a level in a shaft mine they are usually allowed to run until something breaks or the engine refuses to work. Delays are of continual occurrence, with consequent loss in efficiency.

Compressed-air locomotives have been very successful in many instances and have many advantages where operating conditions are difficult. This applies particularly to wet and dirty tracks and adverse grades. They are open to the same objections that apply to all reciprocating engines, which are relatively high maintenance and danger from exposed moving parts. On long hauls there are delays, due to frequent charging, and the original cost of installation is high. Air at 900 pounds pressure is used and the danger of explosion has often been dwelt upon, but such accidents are very rare.

ELECTRIC TROLLEY LOCOMOTIVES

The commonest form of locomotive used underground is an electric trolley locomotive. Locomotives of this type probably exceed in number all other locomotives in service. Recently, however, storage-battery locomotives have been gaining in favor and large installations have been made in mines where the tonnage to be hauled on each level is small, or where the ground is so heavy that constant changes in the timber are necessary. Trolley locomotives have been perfected to such an extent that they are now very dependable and efficient. I have had in use at one mine one locomotive which has trammed nearly a million and a half tons of ore in the last twelve years and the only repairs necessary have been replacement of bearings, contact points, trolley-wheels, etc., and re-winding one armature. There was no spare locomotive on this level and during the period mentioned there have been no delays through failure of the locomotive.

It is essential to the safe and efficient operation of trolley locomotives that the trolley wire be straight and firmly supported and that a good track be maintained. The standard trolley practice of the Cleveland-Cliffs Iron Company is to install the trolley wire at a height not less than six feet—preferably seven feet—above the rail. Supports are fastened to timbers in timbered drifts and in rock drifts, requiring no timber, to pipes wedged in holes drilled in the back. The alignment and elevation of the wire are kept as true as possible and the wire is supported at intervals sufficiently close to prevent sagging. At each branch, and in sections of 1,000 feet or more on straight hauls, knife-switches are installed, so that the current can be cut off from the wire when making repairs.

These switches are in padlocked boxes on the side of the drift, which are so constructed that the switch can be locked, when either open or shut. By this arrangement the electrician making repairs can feel sure that no one will turn on the current while he is on the line. Accidents from this cause occurred before this system was adopted. The current used is generated in the latest installations by a rotary convertor at 275 volts D.C. The convertor is located in the engine-house and the line loss is sufficient to cause a drop to 250 or 255 volts on the trolley wire when locomotives are running. This voltage has been found by experience to be comparatively safe and few accidents from contact with the trolley wire have occurred within recent years. At shaft stations, and where the wire passes in front of chutes, the wire is protected by inverted wooden troughs, so that contact with it is difficult.

All locomotive haulage drifts are lighted with lamps set at intervals of 100 to 200 feet and our recent practice has been to use lamps of 55 volts in series of five, taking their current from the trolley wire. Previously 250-volt lamps were used, but the filaments were so small that they were frequently broken and the charge for replacement was excessive, 110-volt lamps could not be used economically because that is the voltage used in the city houses.

STANDARD TRACK GAUGES

The standard track gauge for locomotive haulage in this company is thirty inches, and thirty and forty-pound rails are used. The rails used have angle bar splices and are bonded outside the splices. The track is laid on five-inch ties set not more than two feet apart, and is thoroughly ballasted with rock. Accidents and delays from derailment are infrequent. In hand tramming narrow-gauge and light rails are advantageous, as they permit short curves and reduce track friction, but with locomotive haulage the wider gauge and heavier rails are essential, in order to insure stability and locomotive traction. With a thirty-inch gauge, however, the degree of curvature is limited to turns of thirty-foot radius on main lines. Curves of larger radius are recommended, however, wherever possible at not too great expense.

The standard locomotive weighs six tons and is equipped with two motors, giving together seventy-five horse power, which is sufficient to spin the wheels when the train is stalled. This excess of power is very advantageous, as it prevents armatures from being burned out. The thirty-inch gauge was chosen because it is difficult to get a locomotive of this size and type on a narrower gauge without crowding the internal mechanism. A few larger locomotives are used on the same gauge of track, but their internal arrangement is not as satisfactory as with the smaller locomotives.

Storage-battery locomotives are more flexible in operation than trolley locomotives, but have not as great tractive power for their weight and require more care and attention to be kept in first-class condition. They possess, however, many advantages, because they require no trolley-wire or bonded track, and can be shifted from one level in the mine to another at slight expense. Where the tonnage to be handled is sufficient, trolley

locomotives should be installed, but where the timber is crushing badly, so that maintenance of the trolley wire is difficult and expensive, or where the tonnage on each level is relatively small the storage-battery locomotives is to be preferred.

Storage-battery locomotives possess a further advantage from the standpoint of safety through their low voltage, which makes accidents from electric shock less likely to occur. The batteries require constant and careful attention, however, and great care must be used in charging. Recently automatic charging devices have been developed, which prevent overcharging and are almost free from danger. At least one of these charging stations must be installed on each level where the storage-battery locomotive is used, but it can be easily moved to another level when the necessity occurs.

TENDENCY TO INCREASE SIZE OF MINE CARS

The cars used with locomotive haulage are usually larger than those employed when tramping by hand or with animals. Probably the largest cars used are those employed by the Granby Consolidated Mining, Smelting and Refining Company, which are of 130 cubic feet, or nine tons capacity. Four or five-ton cars are not unusual and as the output desired increases, larger and larger cars are being used, for it is by the use of larger equipment that the greatest economy can be effected. Cars are of all types: End-dump, side dump, gable-bottomed and without doors for use with rotary tipples. The standard car of the Cleveland-Cliffs Iron Company is made entirely of steel, is of sixty-five cubic feet capacity, and is of gable-bottom design, dumping on both sides at the same time. The car stands five feet high and is approximately eight feet between draw-heads. All cars are equipped with half-size Simplex automatic couplers of the model designed by the American Steel Foundries for the subway freight cars in Chicago. These couplers have been very satisfactory in service and are comparatively easy to repair. When repairs are needed the parts can usually be slightly bent or upset at the blacksmith shop forge or built up again with an oxy-acetylene or electric welding outfit.

The most common accidents which occur in connection with locomotive haulage are from men being struck by locomotives or cars, or from being caught between couplers or between cars. All locomotives are equipped with headlights and trains in which the cars are pushed ahead of the locomotive have a red light hung on the front end of the foremost car. Various kinds of lanterns have been used for this purpose, but the latest type tried, which is giving excellent satisfaction, is a large acetylene lamp without any lens but with a reflector painted red. This reflector is deep, so that the lamp is not extinguished by draft and the red color gives practically the same effect as having a red lens.

Various warning signals are used by different companies on their locomotives, some of which are automatic in action. One of these devices is a gong, which is rung continuously by a projection on the locomotive axle. Automobile horns are also used. It is doubtful, in my opinion, if these devices are of any particular value, because the train makes noise enough to be heard under normal conditions without their use and they

tend to make the men depend on their ears rather than their eyes for protection.

ACCIDENTS FROM COUPLINGS DUE TO CARELESSNESS

Accidents from coupling cars are unnecessary with automatic couplers, but they do occur, for men occasionally insist on holding the locking pin in their hand while the cars are coupled or try to open a coupler while the train is in motion. It is question of education; accidents of this kind can be eliminated. Accidents also occur from men being squeezed between the corners of two cars on the inside of a curve. Drawheads should be long enough to make accidents of this kind impossible on curves of moderate radius. They are, in fact, at all times unnecessary, because it is seldom, if ever, that a man has to stand on the inside of the curve when coupling or uncoupling.

A few serious and fatal accidents have also occurred from trains breaking in two, when men who were walking beside the track stepped between the rails after the first of the train had passed and were struck by the second part. This danger has been apparently eliminated by using extra deep jaws on the couplers which prevent the couplers from riding over each other, as sometimes occurs with standard sizes.

The chances of collisions are almost negligible on levels where one locomotive is employed. Where several locomotives are employed some sort of block-signal system should be used. Mr. R. T. Murell presented last year a most excellent paper on block signal and dispatch systems in metal mines. Nothing can be added to this description, to which any one interested in this subject is referred.

Accidents at both terminals of the haulage system are not infrequent. Probably the commonest form of accident is when men are struck by pieces of ore or by their bars when filling cars at chutes. With the ordinary type of chute coarse ore is both difficult and dangerous to handle and injuries to hands and arms are frequent. In hard ore this sort of accident can be almost entirely avoided by using "finger-chutes," like those designed for the Alaska-Treadwell mines. I have used this type of chute for over ten years at the Cliffs shaft mine at Ishpeming, Mich., with excellent results from the standpoint of both efficiency and safety.

So many accidents occurred to men barring at chutes at the mine of the New Jersey Zinc Company at Franklin, N. J., that a rule was put into effect there several years ago forbidding chute men from standing opposite the chute mouth when barring. They are required to stand at one side, out of the line of any flying chunks. This practice makes harder work for the chute men, but has effected a great reduction in the number of accidents.

AUTOMATIC SPRING SWITCHES RECOMMENDED

At shaft stations it is good practice to have, in the track, automatic spring switches which have to be held open by the brakeman whenever a train is run onto the track leading to the cage compartment. These are especially useful on tracks on which the grade is towards the shaft, as in tunnels through which timber is trammed to the shaft. The Cleveland-Cliffs Iron Company has had a number of serious accidents during the

past ten years from locomotives or cars running into the shaft and it is now one of the rules of the company that safety switches and derails be provided on all levels where the tracks lead directly to the shaft. Lights are required at all plats, also, at all times when men are in the mine.

Another source of accident, where locomotive haulage is used, is permitting men other than the regular train crew to ride on locomotives or cars. This practice should be forbidden unless mancars are provided. In fact, it is advisable to keep all others out of the train crew's work, especially in giving signals to the motorman. This is the brakeman's duty and only he should attend to it.

In closing I wish to touch upon one more point, namely, that efficiency and safety go hand in hand in transportation as much as in any other line of work. Many men still believe that precautions against accidents slow up production and decrease efficiency, but this is not the case; accidents cause delays and delays are expensive. There may be some basis for the contention, however, if, as is so often recommended, the precautionary measure to be taken mean simply not doing the work required, but there is seldom a case where a dangerous piece of work cannot be made reasonably safe without loss of speed if sufficient thought is given to choosing the proper method of performance.

DISCUSSION

Chairman Tillson announced that there were two other papers on the same subject and he thought it best to postpone discussion until all of the papers had been read.

UNDERGROUND TRANSPORT

H. L. REESE, ELECTRICAL ENGINEER, SUSQUEHANNA COLLIERIES COMPANY,
WILKES-BARRE, PA.

The subject of "Underground Transport" with reference, particularly, to electric haulage from a safety standpoint, has been considered by your Chairman as one worthy of discussion, inasmuch as there has probably been no phase of the mining industry which has received more time and attention than this problem. Of all the improvements made underground in recent years none can compare to the changes made to transportation systems, brought about by the general introduction of electricity as the motive power.

When we stop to consider that the first mine locomotive was put in operation in this country during the year 1887, in the mine of the Lykens Valley Coal Company at Lykens, Pa. (the mine being now owned by the Susquehanna Collieries Company), and think of the thousands of electric locomotives now in daily use, covering thousands of miles of track each day and handling tens of thousands of mine cars, we are amazed at the rapidity with which this branch has grown. The hazards attending the operation of this large and important part of the industry should rightfully be taken up at a meeting of this kind, in order that a discussion of the subject may bring out points which will help to eliminate the many accidents occurring in the movement of cars.

ACCIDENTS DIRECTLY RELATED TO UNDERGROUND TRANSPORTATION

In order that you will be acquainted with the various kinds of accidents directly related to underground transportation in the anthracite fields of Pennsylvania, we have made a careful analysis of all underground accidents which have occurred in the mines of the company which I have the honor to represent at this meeting. We find that during the five-year period (1917-1921) that 18.2 per cent were due to haulage, and as a matter of comparison other classes of accidents were: Falls, 28.2 per cent; moving material, 14.8; gas, 5.3; sprains, 3.8; falling material, 5.3; persons falling, 2.5; eye, 3.2; explosions, 1.5; electric, 0.2, and miscellaneous, 17 per cent.

A further analysis of haulage accidents during the same five-year period shows the percentage of these accidents to be as follows: Run over or struck by cars or locomotives, 16 per cent; caught between cars, 11; coupling cars, 17; caught between car and rib or obstruction, 11, and *jumping from or injured by derailed cars, 45 per cent.* It is seen from the figures given that the largest percentage of haulage accidents are due to jumping from or injured by derailed cars.

The electric transportation systems in most installations in the anthracite field were adapted from existing mule-haulage routes, equipped with comparatively light rails. These rails were laid on a roadbed which had been badly cut up by the mules, but the rails are now being replaced by heavier ones and improvements are being made to the roadbed as quickly as circumstances will permit. By an educational campaign among the foremen we have proven to them that it cannot be expected to operate a heavy locomotive at a high rate of speed over a track which served its purpose for animal transportation. There is a real necessity for good tracks, and our records show beyond any doubt that as the transportation systems are developed from year to year and heavier rails used for same that the number of accidents due directly to this cause will be reduced to a minimum.

HAULAGE ACCIDENTS LESS TODAY THAN FORMERLY

It will be seen from the statistics given that electricity as an agent does not contribute to any great extent to haulage accidents, and while no figures are available we are of the opinion that haulage accidents are considerably less today, with the wide use of electric locomotives, than what they were years ago when mule power was exclusively employed. At that time it was necessary, as many will remember, for a driver to jump off the trip and throw in a sprag or two when approaching a grade, a practice which would make us tremble with fear if we saw it done today. When one considers the number of cars a locomotive is able to pull per trip, in comparison to the number pulled by a team of mules, and the less number of employees that are now used for this class of service, accidents attributed to haulage should certainly be less today than in years gone by.

The anthracite mine law of Pennsylvania makes no provision for electric haulage, other than limiting the maximum speed of a locomotive to six miles per hour. From observations made in visits to the mines of the various companies in the anthracite field, we doubt very much if

legislation could improve the high character of workmanship in the installation of trolley and feeder circuits and, as has been noted above, the small percentage of accidents caused by electricity is due directly to the care exercised in keeping to a high standard the circuits after installation.

VOLTAGE USED FOR UNDERGROUND LOCOMOTIVES

It has been the general practice to use power for haulage at a voltage not exceeding 300 at the source of supply, and while our company operated the first and subsequent locomotives for many years from a third rail at 500 volts, we have no record of anyone being killed by coming in contact with same; yet we are of the opinion that the voltage of the trolley wire should not exceed 300. The length of the lines now are such as to make the installation of the systems expensive on account of the large amount of copper necessary because of the low voltage used.

The introduction of electricity has necessitated the use of safety features in connection with the transportation of the tremendous amount of explosives annually used—as a matter of information, during the year 1921 our company's total production amounted to 4,141,000 tons and the quantity of all classes of explosives used was 2,762,478 pounds.

While there are various methods of distributing the explosives, all of them make use of specially constructed wooden cars, the bodies of which are entirely insulated from the running gear and equipped with locked doors on the top.

Each general section of the mines has a powder car for its own use, and it is the usual practice to dispatch these cars to a central point in each section either before starting or at the end of each day's work; the cars being at convenient points for distribution to the miners early in the morning.

LIGHTING GREATLY IMPROVED IN LATE YEARS

Electric haulage, from a safety standpoint, has been a tremendous factor for good since its general introduction into the mines, on account of lighting conditions which can be obtained by use of incandescent lamps at all dangerous places, the illumination of danger signs, exits, etc. We are firm believers in providing good lighting wherever possible, especially where it is possible for a workman to lose his light and thus be in danger at places where ventilating currents are strong enough to put out an ordinary lamp.

The anthracite field is divided into three parts, known as the northern (Wilkes-Barre), middle (Hazleton), and the southern (Pottsville), districts. The transportation problems met with in the northern district are different from the middle and southern. In the northern district the measures are comparatively flat, the mine cars being taken to the point where the coal is blasted from the solid, while in the middle and southern districts the measures are on a pitch and the cars are loaded from a platform or chute on the gangway.

We have said that the northern field is flat, yet the measures pitch to such an extent that tracks leading from the gangways to the breasts may be on a pitch of 10 degrees or more and the transportation of cars

connected with the distribution and collection from these breasts probably constitute the greatest hazards to be met with in underground transportation.

USE OF FRICTION SHOES TO CONTROL LOADS

When mule haulage was employed to do the work in question, the car was pulled to the face of the breast and after being loaded was run down to the gangway by a man employed for that purpose, known as a runner. The speed with which the car would come out of the breast was dependent, to a certain extent, on the judgment of the runner, who would use the number of sprags he thought advisable, but owing to the condition of the rails the cars at times would attain a very high rate of speed, with disastrous results both to property and men as the runner usually rode the car on the rear bumper.

The introduction of gathering locomotives for this class of service has reduced haulage accidents materially and a word or two on our methods of bringing a car out of a breast having a steep pitch might not be amiss at this point. Each locomotive carries, as part of its equipment, a pair of cast steel friction shoes, one being right and the other left hand; when it is desired to take a car from the breast, the locomotive goes up the pitch for it and pulls the car onto a shoe; it is then brought down under the perfect control of the motorman. The right and left hand shoes have been found necessary in order that the shoe designed for the inside rail can be used in event the road down the breast is on a curve. Experience has proved that a shoe on the outside rail of a curve does not provide as much friction as on the inside rail.

There is one point which we would like to bring before the meeting—the switches used in the operation of reel motors. Up to this time locomotives, when received from the factory, are equipped with transfer switches, and from these our motormen have sometimes received serious burns. We have replaced the switches in question with a drum-type mechanism, which allows the motor line to be changed from the reel to a trolley, thus assuring an absolutely dead trolley when on the reel point of the switch, and disconnecting the reel from the circuit when in the trolley position; all parts of the switch are totally enclosed and carefully protected.

GANGWAYS, CURVES AND SAFE PRACTICES THEREON

Practically all gangways are driven on a grade of 6 to 9 inches in 100 feet, which is necessary for drainage, and as the gangways are driven in the vein, which changes in pitch, the haulage routes usually have a great many curves; on account of bad conditions of the roof some are of short radius and cannot be changed.

In coming out of a gangway with a loaded trip, when braking is done on the head end by the locomotive, the cars of the trip are usually located bumper to bumper, a condition which at times allows them to lock while going around a sharp curve and usually causes a derailment, with danger of injury to persons who may be passing. To eliminate this form of accident we are using the friction shoes on the last car of a trip, which

allows the motorman to slow up before reaching the curve. On releasing the brakes of the locomotive and turning the controller a notch or two the trips are again stretched the length of each coupling while going around the curve and in this position the locking of the bumpers is eliminated, thus giving us a much safer operating condition.

The slowing up of trips for the curves and other causes have, in some instances, allowed the couplings to drop from the hooks and as the motorman is unable to tell whether or not he has lost any of his trip—which may be run into either by himself on his return or by a locomotive which may be following—we have provided, as part of the locomotive equipment, a tag which can easily be attached to the last car and which is removed on reaching the end of the haul.

BRINGING OLD EQUIPMENT UP TO DATE

The first electric locomotive installed had side frames and bumpers of cast iron. On top of the bumpers a lug projected, which extended out over the bumpers of the mine car following. This was put on for the purpose of preventing the cars from jumping on top of the locomotive in case of derailment of the latter. The lug in question was dangerous in that it would get close to the body of the cars on curves and catch the leg at the ankle if one happened to have his foot on the bumper. The locomotives of today have bumpers of structural steel and are equipped with a small angle in the center of each bumper. We have cut off the lugs on all the old-type locomotives and substituted the same style of angles furnished with new equipment.

The installation of guards which extend below the trolley wire at all points where it is necessary for men to pass under has prevented many accidents and our men are keeping after the guards in order that they will be in the best state of repair at all times.

Accidents have happened due entirely to neglect in replacing worn parts of locomotives, especially the brakes, and in order to eliminate accidents from this cause we pay the motorman one hour extra each day that he may carefully inspect and replace necessary parts before leaving the mine. He is required to sign a report on the condition of his locomotive, thereby putting responsibility up to the operator.

Good motormen, like other operatives, can only be developed by time and on account of the large turnover of labor during the past few years we feel that when these men operate the locomotives month after month that haulage accidents, due to ignorance or carelessness, will be less than they have been in the past.

NO TIMBERING ALLOWED ALONG A LIVE TROLLEY

It is often desirable to operate small pumps, air compressors, fans, etc., from the feeder supplying the trolley wires and as it is necessary to keep power on these motors at all times we so sectionalize the trolley system that any part of it may be deadened, to enable men who are timbering to work in safety. While it may be possible to replace timber with the power on the trolley, we have made it a rule to prohibit men from doing any work of this character along a live trolley.

We do not think it desirable to put a set of printed rules into the hands of our men on what they are to do and what not to do. Several years ago we made up a list of "don'ts" which we felt covered the several conditions to be met with in daily use of electric locomotives:

"DON'TS" FOR ELECTRIC LOCOMOTIVE OPERATORS

Don't fail to report any defect in your equipment. Don't attempt to remedy any defects while the locomotive is in motion. Don't attempt to board moving trip from middle of the road. Don't have any unnecessary material on the locomotive. Don't run at excessive speed at any time. Don't make flying switches. Don't work about locomotive without blocking same. Don't fail to sound warnings at crossings, switches or branches. Don't neglect to report at once a bad spot in the roof or road. Don't depend on anyone to warn you of danger ahead. Keep on the alert. Don't hang out beyond frame of locomotive. Don't leave locomotive while in motion. Don't fail to have switches properly set at all times. Don't hold blocking and retrackers in place with hands or feet. Don't fail to examine brakes and sand supply before starting down a grade. Don't fail to use your trip alarm on front end of trip when pushing same. Don't allow others to ride on locomotives unless authorized by the foreman. Don't work on live apparatus when it is possible to cut off the current. Don't rely on the insulation of wires and cables for protection. Don't allow anyone playfully to give an electric shock. Don't run locomotives with trolley poles pointing in the wrong direction. Don't attempt to throw section switches while the locomotive is in motion. Don't fail to put a guard along the trolley wire where employees are compelled to pass under it. Don't carry iron tools on your shoulder when crossing under trolley wire. Don't in any case allow explosives to be carried on the locomotive and if carried on the trip place in last car. Don't fail to comply with the instructions for "Resuscitation from Electric Shock." These rules are posted about the colliery.

CO-OPERATION OF MANAGEMENT INSURES SUCCESS

The list of don'ts, as given above, were prepared for the guidance of employees with the sole object of preventing accidents and to obtain the best results the co-operation of each and every man connected with the operation was requested. While we have no data available as to what good the list of don'ts did for our employees, we are of the opinion that the results obtained were all that could be expected and that under normal conditions, by keeping after our men with the proper spirit, much can be accomplished along the lines of safety.

In bringing this paper to a close I would feel derelict in my duty if, from the standpoint of an engineer, I failed to take this opportunity of stating that in so far as expense is concerned the owners and managers of our property, and other anthracite properties, are in hearty accord with every improvement that can be made for the safety of employees. It has been possible, through their help and interest, to keep the subject of safety continuously before the minds of the operating men and to get results which reflect with honor and credit on the mining industry.

UNDERGROUND TRANSPORTATION FROM A SAFETY STANDPOINT

JOHN L. BOARDMAN, SAFETY ENGINEER, ANACONDA COPPER MINING COMPANY,
BUTTE, MONT.

I have been asked to present a paper on the subject of "Underground Transport," especially upon the new Edison storage-battery locomotives purchased recently by the Anaconda Copper Mining Company, and to explain the reasons for the specifications, from a safety standpoint, under which these machines were purchased.

Mr. C. D. Woodward, chief electrical engineer for the Anaconda Company, presented a paper to the February meeting of the American Institute of Mining Engineers, which was held jointly with this Section. This paper is so well written and covers the field so thoroughly that I could add very little and will, with your permission, read that part of it which refers to the storage battery locomotives:

As the trolley wire is a fire hazard and a potential danger to the workmen and as it limits the use of a trolley locomotive, particularly in the gathering operation, the storage-battery locomotive has been installed in a number of the Anaconda Copper Mining Company's mines. The first storage-battery locomotive was put into operation underground during the summer of 1919 and in a short time demonstrated that it was a marked success under all the haulage conditions. As a result, thirty additional machines were purchased, and most of them are in operation. The standard type of storage-battery locomotive adopted has a three and one-half-ton chassis, as this weight is consistent with good mechanical design. It is equipped with a compartment for 105 cells of Edison A5 batteries, held in fifteen trays, making the total weight of the locomotive five and one-half tons. It is rated at 1,500-pound drawbar pull at three and one-half miles per hour on level track, with a maximum drawbar pull of 2,500 pounds for starting and accelerating. The length of the locomotive is 139 inches over the bumpers. The width is thirty-six inches, and the height over the battery compartment at the outer edge is forty-seven inches. For the purpose of discouraging the carrying of drill steel and other supplies upon it the top of the battery compartment has been provided with a curved cover, raised three inches along the center line parallel with the wheels. This feature increases the total height to fifty inches above the rails.

SHORT-CIRCUIT HAZARD CORRECTED

Since this paper was written a difficulty developed in the fact that in adding water to the batteries the attendant sometimes slopped some of the water on the wooden box surrounding the batteries, causing a short circuit which charged the motor frame, and which would sometimes give a severe shock to persons coming in contact therewith. This difficulty has been overcome by placing porcelain insulators, spaced about six inches apart, all over the bottom and sides of the battery tray, so that the battery cases and the battery tray are now electrically separate.

Some trouble has been encountered by dirt getting under the cover and lodging on top of the cells, this has been overcome by providing a canvas sheet on the underside of the cover to seal the hinge and sides of the cover.

One of the safety features, worth a second mention, is the main contact between the controller and the batteries, which is so arranged that,

in order to connect the battery to the charging panel, the controller must first be disconnected, thus making it impossible to turn the current onto the motors while the battery is under charge.

There can be no doubt that, as a safety device, the storage-battery locomotive, for underground work, is one of the best of the latest improvements, but our study of accident causes shows that a very small part of the total are due to the kind of machinery used. I have prepared a table to show the relative importance of accidents from ore cars and trains, compared with our total accidents for the first seven months of the year:

Total Accidents, Butte Mines—						Accidents Caused by Ore Cars and Trains.					
Month.	F.	Ser.	Sigt.	L. N. Time.	Rate.	Fa.	Ser.	Sigt.	L. N. Time.	Rate.	
Jan.	1	13	39	46	10.17	0	2	4	4	1.15	
Feb.	2	19	101	110	16.73	0	5	13	13	2.44	
Mar.	3	34	122	116	16.03	0	7	17	10	2.17	
Apr.	2	35	97	161	16.66	0	4	15	11	2.04	
May	2	31	132	182	18.06	0	3	19	18	2.28	
June	1	33	102	116	14.73	0	5	13	13	2.00	
July	5	28	82	112	8.25	0	7	9	6	1.62	
7 mo.	16	193	675	843	17.29	0	33	90	78	2.01	

ACCIDENTS DUE TO ORE CARS AND TRAINS

Since from one-seventh to one-eighth of our total accidents are due to ore cars and trains the following table is compiled to place the responsibility for such accidents:

1922 Month.	Injured themselves by coupling, pushing, lift- ing, etc., on cars.	Injured in course of employment by handling cars by motors or animals.	Riding on cars or motors. For- bidden prac- tice.	Injured by cars, mo- tors or ani- mals handled by others.
January	6	0	0	0
February	22	5	1	2
March	21	5	3	1
April	26	4	2	1
May	29	8	1	3
June	19	5	2	5
July	18	1	3	3
Totals	141	28	12	15

Table No. 2 shows that in the first seven months of 1922 we had 196 accidents due to underground transportation. Of these 141, or about 72 per cent, were cases where the injured—through carelessness, awkwardness or incompetence—injured themselves; 28, or 14 per cent were due to handling cars or motors where the employee injured himself; 12, or 6 per cent, were injured by riding on motors or cars, a forbidden practice; while 15, or 8 per cent, were injured by cars, animals or motors handled by others and had no responsibility in the accident except, in some cases, they might have avoided the injury by moving quicker.

MEN ATE LUNCH SITTING ON TRACK

We have had two accidents this year, both slight, due to trolley wires. In one case a man was carrying steel on his shoulder, contrary to orders, and received a shock, while the other was reversing a trolley pole when he struck his head against the trolley wire. The storage-battery locomotives would, by eliminating the trolley wire, prevent such accidents as these. We had one very serious accident, due to carelessness,

which will illustrate another danger the battery locomotive will eliminate. The power had been shut off the level for the purpose of tramming powder by hand from the shaft to the powder magazine. A motorman left his motor standing where it stopped, with the controller on. Three men sat down to eat lunch in front of the motor. When the power was switched back on the motor ran away, injuring the three men, one of them very seriously.

DISCUSSION

Chairman Tillson opened the discussion and questioned whether automatic warning bells, ringing continuously, were efficient. The difficulty is that when a trip is coasting the bell would not ring and, when there is switching to be done, there are times when the trip is at rest when it is desirable to warn men to get out of the way before the trip is started. Under such conditions the bell would not ring. Another objection is the physiological result of having the bell ringing almost continuously. After a while the men become so used to hearing the bell that they are not conscious of its noise. Mr. Reese, in answer to a question as to whether a bell on the rear of the trip had been satisfactory, stated that he thought it bad practice to push cars into places where they can be pulled, that his company had put in turnouts so that it was very seldom necessary for them to push a trip. The locomotive being on the front of the trip and pulling the cars, does away with the necessity of using bells on the rear of the trip.

The question was then brought up as to the danger of using 500 volts on the trolley system. The consensus of opinion seemed to be that from 200 to 250 was a better voltage.

Mr. Boardman mentioned that he felt that the Mining Section ought to recommend that all future installations of electric haulage in mines be storage battery locomotives, instead of trolley locomotives, because they certainly contribute to safety. Although this suggestion was not acted upon, it seemed to be the consensus of opinion of those present that storage battery locomotives were safer to use in mines and that their installation should be encouraged.

The question was then brought up as to whether the crew should ride on the trip. It was stated that the manufacturers of locomotives do not provide adequate space on the locomotive to take care of the brakeman. The suggestion was made that a caboose be provided. Chairman Tillson stated that the New Jersey Zinc Company has adopted a special car that is attached to the locomotive for the crew to ride in. No one rides on the locomotive except the motorman, the rest of the crew ride in the caboose.

Another source of accidents mentioned was men striking against chutes while riding on the train. A properly constructed caboose would protect a man against such injury.

MAINTAINING SAFETY INTEREST AT MINES

G. M. GILLETTE, GENERAL MANAGER, MARYLAND DIVISION, THE CONSOLIDATED COAL COMPANY, FROSTBURG, MD., AND E. H. DENNY, ASSISTANT SECRETARY, THE JOSEPH A. HOLMES SAFETY ASSOCIATION.

The maintenance of safety interest among the personnel of a mining organization has oftentimes proven a difficult and vexatious problem to mine managements. Hard and sincere effort by company officials toward accident prevention has sometimes seemed to give inadequate results. The problem of increased safety in mining has been approached in various ways by the mining companies of this and other countries; it seemed, therefore, desirable that a pamphlet on maintaining safety interest at mines should only be prepared after the more representative mining companies had been consulted as to safety means and methods in vogue at their operations.

The senior author of this paper, therefore, some nine months ago addressed a letter of inquiry regarding safety practice to a large number of the mine operators of this and other countries; a gratifying number of responses were received, many of which embodied a large number of constructive suggestions for safety work. Included in these were fifty-two coal companies, eight copper mining companies, five iron mining companies, four zinc mining companies, three gold mining companies, two lead, two nickel and two unclassified producers of metal products. Among these seventy-eight companies who furnished data regarding their safety work were represented twenty-one states and foreign countries as follows: South Africa, Canada and British Columbia, Peru, Chile and Mexico. Effort has been made herein to compile and present the data and suggestions furnished by these companies.

MAINTAINING SAFETY INTEREST AT MINES

Means of maintaining safety interest at mines, as submitted by these mining companies, fall under certain definite heads which we have classified, perhaps, rather arbitrarily. Before giving these classifications and discussing them in some detail, however, we wish to emphasize the absolute necessity, if safety work is to give even moderately successful results, of whole-hearted and enthusiastic interest in safety on the part of the mine management and mine officials from general manager down. Such safety interest by officials can be manifested to the employee through some or all of the measures about to be discussed, but the adoption of safety means and measures, no matter how well fitted to the case in hand, will not bring favorable results if apathy is manifest by a considerable portion of the company officials whether of high or minor rank.

Safety results will depend largely upon the foreman and his interest or lack of interest will seriously affect the success of any safety measures. He maintains daily contact with the men under him; if through him the company can convey the impression to their men that the matter of safeguarding an employee is as important as production, and that safety means more with the management than dollars and cents, a foundation for safety interest and safety results will be indeed well laid. The fore-

man's interest in safety usually reflects, or can be made to reflect, in large measure the interest of the higher company officials in safety, so much of the safety effort of the management must be directed toward the mine foreman, assistant foreman and similar mine officials.

Means of maintaining safety interest at mines falls under the following more or less arbitrary heads. 1. Safety and accident publicity. 2. Mine inspection, accident prevention and investigation. 3. Safety committees. 4. First aid and mine rescue training and equipment. 5. Welfare and educational safety work for miners. 6. Bonus and penalty systems. 7. Miscellaneous means of arousing miners' interest in safety. 8. Miners' meetings and organization toward safety.

SAFETY AND ACCIDENT PUBLICITY

Under this general head are grouped safety bulletins, posters bearing safety rules, guidance and danger signs in and about the mines, accident record bulletins, company magazines and miscellaneous company safety literature, safety rules and regulations for general distribution, and the distribution of first-aid textbooks.

Half of the mining companies responding gave special testimonials to the use and value of safety bulletins, many of them making use of the bulletins of the National Safety Council in this connection. Safety bulletins should be placed in a conspicuous place, where they necessarily attract the attention of the miner on his way to and from work; they should be made as attractive as possible and changed at least weekly. Usually, they should not be mixed with miscellaneous signs. A description of some or all fatal or serious accidents may be written up in bulletin form with, sometimes, a photograph or drawing showing how the accident occurred and how to prevent it; this when posted on a bulletin board will attract general interest.

One mining company testifies that their men watch eagerly for new bulletins and that as a result of the facts thus driven home to the miner, in their opinion, both injuries and loss of life have been prevented. Bulletins may be useful at points in the mine where the men congregate as well as at the surface. Posters giving the company safety rules are of value, particularly for new men, and, as with other bulletins, may be printed in two or more languages if desirable. Monthly posting of accident records oftentimes stimulate foremen with high accident rates to work toward avoiding the repetition of same.

Safety committee recommendations oftentimes furnish good subject matter for a bulletin board. In and about the mines a limited number of signs reflecting the company's attitude toward safety or guiding the miner to an exitway may be used with profit. Such signs will be a constant reminder that danger exists and, hence, tend toward accident prevention if judiciously used. Danger signs are in many States restricted to a special purpose, that of denoting positive danger rather than mere warning and should be only so used. Warning signs may often be illustrated to good purpose, arrangements being made so that the phrasing thereon may be readily changed.

Many of the larger mining companies have found that printing of leaflets and even a monthly or quarterly magazine, devoted largely to safety and welfare and for general distribution to employees, has assisted very materially both in keeping up safety interest and in maintaining among employees a certain satisfaction and pride in the very fact of their belonging to the company organization. A general distribution of safety rules and regulations, printed in various languages, if necessary, is of value, particularly in any attempt to enforce disciplinary measures.

One large foreign mining company has given general distribution among employees of a first aid and safety handbook, gotten out by the company management. In the United States the United States Bureau of Mines "Manual of First-Aid Instruction for Miners" is issued by the Federal government to all persons trained in first-aid under the bureau's auspices and can also be obtained by mining companies for distribution to their employees by submitting the names and addresses of persons to whom the handbooks are to be given.

MINE INSPECTION, ACCIDENT PREVENTION AND INVESTIGATION

Under this general head come the employment of a head safety inspector or safety engineer and assistants, mine inspection by company inspectors and insurance company inspectors and the complete investigation, study, and report on all accidents. These measures affect or may be made to affect the foremen and indirectly the miner himself, insofar as his interest in safety is concerned.

It is, in general, only the companies having one or more large mining operations who can maintain a safety inspector or safety engineer. Such safety man can sometimes combine other duties, particularly along welfare lines, but he should not be so encumbered with other work that, as a result, he neglects the safety end. One duty of the safety engineer is to keep the idea of safety before the foremen and superintendents in every job from construction to operation. He must supplement inspections by foremen with his own inspections, usually in company with the foreman concerned, calling the attention of the foremen to unsafe practices and, when necessary, bringing unsafe conditions to the attention of someone in responsibility in the mine management, oftentimes the general superintendent or general manager or president. The safety engineer must be able to secure the friendship and interest of the foremen and of the miner; if the safety engineer antagonizes the foremen generally or lacks the backing of the company heads his work will lose much of its effectiveness.

One company reports that it utilized the services of an outside safety engineer, called in for a time, without appreciable results in accident prevention; they, however, expect better results with their own safety man, now employed. Another company has one of its staff engineers make safety inspections and recommendations at regular intervals in the course of other work; such safety inspection has been found satisfactory in the case cited. A third company states that since a certain insurance company has been carrying their compensation risk and furnishing regular mine inspection service that the officials at the various

mines have been much more active in detecting risks and remedying unsafe conditions. Doubtless the mine inspection work of the insurance companies has been similarly useful to other mining companies in maintaining safety.

An important part of the duties of the safety inspector or safety engineer is the investigation, study, tabulation and report on all accidents or at least all major accidents. A summary of such accident reports may be made monthly and will be of value: (1) To the management in showing progress or lack of progress along safety lines, (2) to the foremen in stimulating them to accident-prevention efforts and (3) to the men, in showing the company interest in safety work. Of course, such summary may take different forms for the three purposes indicated. The report to the management may include numerous details, such as cost per ton or \$100 of payroll of all accidents, comparative mine ratings, days lost, detailed nature of injuries, etc.

SAFETY COMMITTEES

Safety committees composed of mine officials, or miners, or mine officials and miners, are favored by numerous companies as a means of lessening accidents and maintaining safety interest. One gold mining company has two committees, one of department heads and one of workmen, which have functioned satisfactorily over a several-year period. Members of the workmen's committee are elected by their fellow-employees with the exception of the chairman, who is the company safety engineer. The workman's committee makes an inspection of all company operations at one of its monthly meetings; the next month it meets with the central safety committee, consisting of the superintendent, as chairman, and the department heads as the other members; the two committees jointly consider matters pertaining to safety. Should unsafe conditions be found during the inspection such conditions are reported immediately to the safety engineer without awaiting joint committee action. Elections for membership on the workmen's committee are keenly contested.

Another company utilizes a safety committee composed of two members, and it makes monthly inspections, reports and recommendations. One of these committee members, who, it is assumed, are foremen or other mine officials, is always a member of the former committee. This shifting membership gives individual responsibility to as many men as possible.

A large coal company has a general safety committee meeting once a month, composed of two assistant general superintendents, the manager of accident relief, the company mine inspectors, division engineers, mechanical engineer, electrical engineer and company secretary. Committee meetings discuss all accidents, make recommendations for the prevention of similar accidents and discuss general safety matters. Details of accidents are sent out in writing to the mine or plant concerned. These accidents are then taken up at plant safety meetings and the information and recommendations of the general safety committee given to the foremen in order that they may disseminate same among the workmen.

One large company, with iron and coal interests, finds that a seeming multiplicity of committees consisting of a central safety committee, a works safety committee, and a departmental safety committee works satisfactorily. On the other hand a coal company, with large operations concentrated in one locality, has a single committee of about fifty members, meeting monthly; the committee chairman is the general manager of the company and the remaining membership comprises the entire operating force down to and including fire bosses and machine bosses. The success of this committee's work, it is reported by the company safety engineer, is due to the fact that the general manager deemed the work important enough to require his presence at all committee meetings.

MEETINGS SUPERVISED BY SAFETY ENGINEER

An iron mining company has a worker's safety committee consisting of a workman from the mine, another from the concentrating plant, another from the mechanical department and another from the electrical department, the meetings being supervised by the company safety engineer. The committee members are paid extra for the time and attention devoted to the work.

A coal mining company also has a workman's safety committee consisting of three miners, who examine every working place in the mine once each month and make a report on such examination; they are paid at a timberman's rate for the time taken in mine inspection and are also paid for attending a monthly safety meeting of mine officials. Another coal mining company advises that the maintenance of workmen's safety committees without pay has been very unsatisfactory, little interest on the part of committee members being manifest.

At many mining operations regular meetings of foremen and assistant foremen, presided over by the superintendent or other official, take the place of special safety committee meetings. Accidents occurring under each foreman are discussed, their cause brought out and methods of prevention suggested.

The success of safety committees as a means of maintaining safety interest depend very largely upon the interest the mine management takes in them. They can unquestionably be made a very important factor in accident prevention work.

FIRST-AID AND MINE RESCUE TRAINING AND EQUIPMENT

Under this head are grouped first-aid training of employees, installation of first-aid equipment, mine rescue training, mine rescue equipment, first-aid contests, regular first-aid and mine rescue practice by trained teams with or without financial compensation, fee or reward systems for each case of successful first-aid treatment.

First-aid training to miners has received the active backing of the Federal government, the United States Bureau of Mines having trained over 70,000 persons connected with the mining industry in its first-aid or mine rescue course during the past twelve years. Such training is without cost to the mine management, except for the wages of such of its employees as are trained on company time. Many company safety engineers, company physicians and insurance company inspectors have

also given first-aid courses to mining employees, so the total number of miners trained in first-aid methods probably is over 100,000. The fact that many miners are injured in their daily work at points so situated that it is impossible to bring them under a physician's care for two or more hours makes first-aid of particular importance to the mining industry. The first-aid man renders prompt and effective relief to an injured person in the absence of a doctor; he makes the patient comfortable, renders infection unlikely and later places the patient in the doctor's hands in as good a condition as possible. The trained first-aid man not only renders prompt and effective treatment to the injured, he also, through his first-aid work, learns to think safety and to work daily toward accident prevention.

One large coal mining company states that they consider it highly important that every official have a knowledge of first aid and that each of their mine officials holds a Bureau of Mines first-aid certificate. The interest of the officials in first aid has spread to the other company employees. At the present time 71 per cent of all employees have taken a complete course in first aid. It is stated that a first-aid man makes a decidedly better employee and that company statistics show that much interest has been secured and held for the safety movement through this propaganda, and that material accident reduction has resulted. Each employee of this company trained in first aid receives a small pocket first-aid packet, which he is requested to carry. These packets are asked for and inspected by the safety engineer on his inspections. This small article in an employee's possession will, according to the company general manager, invariably bring to his mind a certain inclination toward safety; this has been demonstrated many times. The men also take an interest in the safety movement by being ever on the alert to help a fellow workman who has been injured and thereby have the opportunity to fill out the injury cards enclosed in each packet, in order that their names may go on the record as having been helpful in the movement.

FIRST-AID TRAINING MAINTAINS INTEREST

First-aid training, as a means of maintaining safety interest, is emphasized by one-third of the companies reporting and undoubtedly is an important factor in alleviating and lessening accidents. The more capable and enthusiastic first-aid men can be organized into first-aid teams, with arrangements for additional practice at monthly intervals.

First-aid contests, whether within the company, district contests, state contests, or national contests, arouse interest in first-aid and safety to a high pitch for a time. Endeavor should be made to interest as large a number of first-aid men as possible in the practice and tryouts preliminary to any contest; too great concentration of first-aid effort upon one or two picked first-aid teams in a large mining operation or group of operations may defeat the larger purpose of first-aid work—that of having in and about the mine as many competent first-aid men as possible. Several companies have some system of fee or reward for actual cases of successful first-aid treatment. These companies pay approximately one dollar to each man who administers first-aid treatment to an injured

workman, providing the mine physician approves the treatment given and the bandaging of the injured person. Such plan has been found reasonably successful in maintaining first-aid interest.

First-aid work involves the installation in or about the mine of a certain amount of equipment, the quantity varying with the size of the operation or operations concerned. Numerous safety appliance companies put out first-aid material in durable containers which will be found satisfactory. In installing first-aid equipment, points to be considered are accessibility with regard to injured workers and storage in a place where it will be unaffected by moisture, dust, etc.

Mine-rescue training or training of the miner in the use of self-contained oxygen breathing apparatus has received the backing of the Federal government and the United States Bureau of Mines has approved two types of such apparatus for use following mine explosions and in fighting mine fires—cases where irrespirable and poisonous atmospheres are likely to be encountered. Mine rescue teams of employees trained in the use of such apparatus will prove very helpful in the event of mine disaster. Such teams should receive practice in the use of rescue apparatus at regular intervals and the apparatus itself should be inspected regularly and kept in the best of condition in order that apparatus work may be of value when needed. Usually compensation of rescue teams for training work is necessary. The general subject of mine rescue work was treated fully in another paper of the National Safety Council.

WELFARE AND EDUCATIONAL SAFETY WORK FOR MINERS

Under this rather general head are grouped indirect and more remote factors bearing upon the maintenance of safety interest at mines; work conducted by the mining company which makes toward the employees' welfare and safety and indirectly for his own interest therein. Under this head come the various means of protecting workmen from injury, such as guarding underground lighting and power circuits, the guarding of manways and chutes by guard railing and grizzly, furnishing of goggles to workmen in mechanical departments when needed; also adequate mine lighting, good mine ventilation, good drinking water made readily accessible underground, installation of sanitary toilets, establishment of modern company clubhouses, hotels and plant hospitals. All these factors directly influence the attitude of the miner toward the company and hence toward the company safety work; well-directed effort by the company along some of the lines indicated indirectly affect the maintaining of safety work.

BONUS AND PENALTY SYSTEMS

There is considerable difference of opinion as to the value of a bonus system as a means of maintaining safety interest and securing greater safety; whether or not a bonus system is desirable will depend largely on local circumstances.

One company states that a bonus to shift bosses, based upon the number of accidents, resulted in the shift boss discouraging a man with a slight injury from going to a doctor in order that the accident would

not be held against him; however, they consider that it was not the principle of the bonus but rather the application thereof which was at fault and are basing their bonus now upon the number of serious accidents only.

A large metal mining company has had a system of rewards in operation for five years as follows: To the foreman of the mine showing the best record in the matter of accidents per 1,000 shifts worked for a period of one year the sum of \$300.00.

In each mine, to the shift boss having the best record in the matter of accidents per 1,000 shifts worked for a period of one year, the sum of \$200.00. In each mine, to each shift boss having a record of 1,000 shifts worked under him without accident, the sum of \$10.00.

In computing accidents for awarding prizes only such accidents are considered as cause a loss of time to the injured man of not less than six days. This system of prize awards is considered very effective toward safety.

BONUSES FOR ACCIDENT PREVENTION WORK

An Eastern metal mining company gives accident-prevention rewards to its shift bosses based on the following schedule: Five dollars monthly to each shift boss having no lost-time accidents in his gang for that month; \$20.00 semi-annually to each shift boss whose lost-time accident rate is less than 0.5 per 1,000 shifts of eight hours, or one lost-time accident per each 16,000 hours of labor worked by his gang for the *half year*; \$20.00 annually to each shift boss whose lost-time accident rate is less than 0.5 per 1,000 shifts of eight hours, or one lost-time accident per each 16,000 hours of labor worked by his gang for the *year*; \$20.00 annually to each shift boss provided the amount of time lost by his gang, due to injuries, is less than 0.4 per cent of the total number of shifts worked by his gang during the year.

The semi-annual and annual bonuses are arranged in this way to compensate for several months during which a boss may have been unfortunate in having accidents and, thus, be excluded from participation in any reward for conscientious accident prevention work. The "annual-time" bonus compensates for a number of lost-time accidents sufficiently large to exclude the shift boss from participation in any of the other rewards but in which the amount of time lost was small.

Another large metal mining company states that they do not employ any bonus system, as their investigation of such systems has indicated that minor accidents are decreased thereby but the severity rate increased.

A large coal company uses a quarterly bonus system, based on a record of all accidents and man-days lost as compared with the man-days actually worked. Company regulations provide that every accident, no matter how trivial, must be reported to the foreman of the district in which it occurs and that the foreman must in turn report it to the safety department in the main office. Failure on the part of the foreman to report an accident of which he has knowledge means a penalty of twenty-five man-days charged as being lost in said foreman's district. This bonus system has been very successful in stimulating interest

among both the foremen and the men under them. In case of minor injuries the tendency is for a man to be treated at the emergency hospital and return at once to work whereas, previous to the bonus being in effect, he was inclined to lose two or three days as a result of such injury.

Another coal company states that no bonus system is used for the reason that the first duty for which a foreman receives his salary requires that safe working conditions be maintained.

FOR AND AGAINST REWARD SYSTEMS

A western metal mining company discontinued the bonus for the reason that it appeared that certain bosses failed to receive a bonus, not because of any lack of care and effort on their part, but rather because of the greater natural hazard in the sections of the mine over which they had charge. A Canadian coal company has found the scheme to work satisfactorily of paying all foremen and firebosses \$5.00 extra per month when the time lost on any accident does not exceed three days.

Bonus of merchandise or the equivalent of such bonus has been used successfully by several companies. One company discusses accidents at a monthly meeting of shift bosses and gives a box of cigars to the shift boss with the best accident record for distribution in turn to his men. A safety flag awarded on the basis of the best monthly accident record and floating for a month over the particular mine office or department building having such record has been found to arouse keen rivalry among a group of mines or departments.

One company states that they have found that they can accomplish more in the way of safety by ironclad rules and discipline than by appealing to their men in an endeavor to maintain safety interest. Another company, similarly, when labor was plentiful, adopted a system of penalties for both men and shift bosses consisting of seven to fourteen days' suspension for violation of safety rules and during this period observed a remarkable decrease in the accident rate. This system was abandoned eventually, however, due to labor shortage and the fact that some of the shift bosses used the system to punish men for personal reasons.

MISCELLANEOUS MEANS OF AROUSING MINERS' INTEREST IN SAFETY

Under this head are grouped such means as suggestion boxes, safety cards and slogans on company literature.

The suggestion box is fastened in some convenient place to receive suggestions from the miners relative to safety. Oftentimes the award of a monthly prize for the best safety suggestion received will stimulate interest. Several mining companies report that their suggestion boxes have been very useful in bringing out unobserved careless practices as well as suggestions of safeguards.

One company uses a so-called safety card. When an official or workman is known or observed to disregard the usual safety rules, such card, calling attention to the particular error, is placed in his pay envelope and attracts a great deal of attention on the part of the person receiving same. When accidents at any one mine run particularly high for a certain period an attractive heavy card about 4x7½ inches, with a large

Safety First hand in green upon it pointing to an appropriate safety saying, is hung on each mine car and motor in the mine. This is kept up for a month and very satisfactory results have followed.

Another company prints safety slogans on the back of all due bills; in these slogans are cited local accident cases and how they might have been prevented.

MINERS' MEETINGS AND ORGANIZATION TOWARD SAFETY

Under this head are included mining schools, club meetings of workmen, safety campaigns and rallies, miners' sports and entertainments and miners' safety societies. Mining schools in a community work toward safety, either directly or indirectly. Such class work as English to foreigners, general Americanization propaganda, classes for firebosses, assistant foremen and foremen all help the maintenance of safety interest. Club meetings of workmen, when matters of both general and safety interest can be discussed, also work in a similar manner. For miners safety meetings to be successful entertainment features and stunts should form a large part of the program.

Safety rallies and campaigns find a somewhat qualified favor with the mining companies making reports on same. One company states that "safety weeks" and "no-accident months" have been tried and have a very favorable effect during the period of intensive effort, but that, like all stimulants, they leave a period of reaction which more than balances their beneficial tendency.

Another company conducted an intensive safety campaign during a month period. As a result, during the period of the safety drive, the accident rate was cut more than half. No reaction from the drive is reported, but some objection arose on account of misinterpretation by certain of the state press of certain accident figures used in the necessary local publicity.

Community safety rallies in which the entire community are interested in safety are reported by one company to be very successful in their safety results. The United States Bureau of Mines, in co-operation with State and local authorities, has conducted statewide safety campaigns in the mining communities of Utah and Idaho with, it is believed, excellent results from a safety standpoint.

The encouragement of the miners' interest in safety by sports and entertainments has produced excellent results for many companies. The annual miners' field day at Butte, witnessed by 20,000 or more interested spectators, is one of the most striking company efforts along this line. Usually such field days include a first-aid meet as well as appropriate athletic events.

MINERS' SAFETY SOCIETIES

The miners' safety society, composed principally of actual miners, has met with varying success. As long as such societies continue to function actively they are of decided assistance in maintaining safety interest. Some miners' safety societies have continued their active work for a period of years and entered largely into the community life and welfare. Examples of such cases are the Butte (Montana) Safety and First-

Aid Association, the Safety Bear Club at Grass Valley, Cal., and the Newcastle Safety Society at Newcastle, Ala. A miners' safety organization, to succeed, usually has to have some support, moral or otherwise, from the mining company and a group of officers, who may in part be minor officials in the mining company itself, who are enthusiastic safety workers. One British Columbia mining company reports that an association of their men, termed the "Mine Rescue and Ambulance Association," was formed in 1917, the association members running the association entirely, but furnished by the company with meeting quarters, first-aid material and prizes for the yearly first-aid contest of the association. Women were later admitted as members. During the winter bi-weekly dances and socials are held. Lectures are arranged and papers read which deal with the various phases of mine safety work. At the present time this association has a membership of over 300 and is an important factor in the community safety work. The majority of such miners' first-aid societies utilize first-aid training and re-training and practice as an important or main feature of their safety endeavor.

The United States Bureau of Mines considers such safety societies as an important means of maintaining and continuing its safety work and is co-operating with the Joseph A. Holmes Safety Association in establishing safety societies as local chapters of the Joseph A. Holmes Safety Association in mining communities. The purpose of these chapters is the promotion of safety in the mining, metallurgical and allied industries and their field of work as defined by the constitution of the chapters is:

(a) The prevention of accidents and the improvement of health conditions in the mining, metallurgical and allied industries.

(b) The providing of opportunities and facilities for the training of its members in mine rescue, first aid and other safety methods, and for keeping in practice those of its members already trained in such methods.

(c) The promotion among its members of educational, social and recreational activities, including co-operation with Federal, State and local agencies in vocational education in mining and metallurgical work.

SOCIETY NAMED IN HONOR OF FIRST DIRECTOR OF BUREAU

First aid and, when possible, mine rescue training and re-training are made an important part of the chapters' work and the accomplishment of such training work recognized by special insignia. Each chapter has officers consisting of a president, vice president, secretary-treasurer, safety director and educational director; chapters have use of the Bureau of Mines films, lantern slides and publications. Contact between and with chapters is maintained by an assistant secretary of the association, paid by the Bureau of Mines and with headquarters at Pittsburgh, Pa. Contact is also made with chapters by the various field employees of the division of mine safety service of the Bureau of Mines, who organize chapters when the mining company officials and mining employees of a community are favorably disposed toward such safety chapter organization. Nominal dues, amounting to about 40 cents per member per year, are paid into the parent Joseph A. Holmes Safety Association to take care of printing, postage, and similar expenses. Since the adoption of the

local safety chapter plan on March 5, 1922, eighteen chapters of the association, located in seven States, have been formed. The chapters already have a mimeograph publication, issued twice monthly through the assistant secretary. The Joseph A. Holmes Safety Association itself was organized by twenty-four national societies, organizations and government bureaus, six years ago as a memorial to and for perpetuating the work of the late Dr. Joseph Austin Holmes, first director of the Bureau of Mines. The director of the Bureau of Mines is ex-officio president of the Association.

DISCUSSION

In opening the discussion on this paper Chairman Tillson mentioned the value of using *The National Safety News* to keep up the interest of men in safety work. He recommended that a subscription to the *News* be given by the company to those men who had done effective accident-prevention work. The advantages and disadvantages of a bonus system as a means of helping to promote interest in safety were discussed and the opinion seemed to be that the bonus was advisable in some cases.

FRIDAY MORNING SESSION

SAFE PRACTICES IN MINE HOISTING EQUIPMENT

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Statistics show that approximately 3¾ per cent of fatalities which occurred in coal mines and 25 per cent in metal mines, during a period varying in the several states from four to forty-four years for which such statistics are available, occurred in shaft and slope accidents. Aside from this often needless loss of life such accidents cause considerable material damage and loss of tonnage, because the mine is rendered inoperative until the damage is repaired. The purpose of this pamphlet is to call attention to proper installation and operation of hoisting equipment in order that such accidents may be overcome.

HOISTS—INSTALLATION, BRAKES, DRUMS AND OPERATION

Hoists used on slopes and shafts are so much alike in general character that from the safety standpoint they may be treated in one class. As a general rule, hoists manufactured by a reputable builder are so well designed that there is little need of discussing the features of the hoist itself, but rather its selection, installation and operation, and its auxiliary equipment, such as brakes, indicators, overwind device, etc. The selection of the hoist, its type, size and speed, and whether steam or electric, is dependent entirely on contingent conditions, such as capacity of mine, depth of shaft or available fuel supply. Its power should be ample to easily handle the ordinary load with diminished steam pres-

sure or low voltage, but not so great as to cause excessive power losses by operating at too low an efficiency.

The hoist should be installed in such a position with relation to the shaft that the rope will coil properly on the drum and will not chafe or rub against the grooves of the sheave or drum or against itself. With ordinary proportions of rope and drum this may be avoided by keeping the angle of fleet (the angle between lines drawn from the sheave to the center and to the ends of the drum) within $1\frac{1}{2}$ degrees. Brakes should be sufficiently powerful to enable the engineer to keep the load at all times under control. In the case of steam hoists the brakes need be only sufficient to hold the maximum load at any point on the shaft or slope, since retardation can be accomplished by use of the reverse, but in the case of electric hoists the brakes must be sufficient to stop the maximum load within a moderate space and hold it at any point, since the current may fail without warning. Hoists should be equipped with brakes which may be at all times operated either mechanically or manually. The mechanically operated brake should be positive; that is, it must be applied by a dead weight, unless held off by power. It is not ordinarily considered good practice to use brakes to lower unbalanced loads on long hoists, but where this is done it would be well to provide two separate brakes which may be used alternately.

The diameter of the drums should be sufficiently large to avoid dangerous bending strains in the rope. The minimum should be that recommended by the rope manufacturer and, if possible, a large diameter drum should be used. It is desirable that the drum be of sufficient capacity to take the required length of rope in one layer. Where it is necessary to wind the rope in more than one layer the last groove on the end of the drum should be made a spiral to raise the rope up on the next layer.

The height of flanges on the ends of the drums is in most states specified by law. It should not be less than four inches high, measured from the last layer of rope. "Horns" in place of continuous flanges are dangerous, as the rope may fall between two "horns" and be wrapped on the shaft. The hole through which the dead end of the rope is passed should be rounded to as large a radius as possible, so as to prevent kinking the rope.

On hoists having tight and loose drums the clutch mechanism and brakes should be so interlocked that it is impossible to release the clutch unless the brake is applied, or vice versa. Friction clutches, if power operated, should, like power-operated brakes, be positive in action.

Every hoist with which men are handled should be equipped with an efficient overwind device. Such a device should embody slow-down features protecting each end of the hoist and overspeed governors to limit the maximum speeds when hoisting men and when hoisting materials. Where men are hoisted to a point below that to which materials are hoisted an additional feature should be provided to prevent hoisting beyond that point when hoisting men. An automatic device interlocked with the overwind device should be provided at each landing to indicate

that the speed and hoisting limit mechanism for handling men has been made operative by the engineer.

The hoist indicator should accurately indicate the positions of both cages at all times. Marks on the rope or drum ("mouse marks") should be used only to land the cage. It is recommended that the hoist indicator and overwind device be embodied in the same mechanism. Though a hoist recorder is not necessary it will be found of great service in preventing reckless driving of the hoist, in placing the responsibility for delays in hoisting and in case of accident.

SAFEGUARDING HOISTS

All the rules ordinarily observed in safeguarding moving machinery should be observed in the hoist room. All easily accessible gears should be inclosed. Railings 42-inches high should be used where moving parts are beyond arms' reach and guards 6 feet high where within arms' reach.

Only reliable men of more than average ability and physically fit should be employed as hoisting engineers. The operation of a large hoist, whether men are handled or not, should not be considered a "pensioner's" job. Where hoists are operated continuously at high speed it is advisable to have two engineers, who relieve each other at frequent intervals. A commendable practice followed at many mines is to have an extra man, competent to operate the hoist, stand by while the shifts are being hoisted or lowered.

Hoists should be oiled and adjustments made only when the hoist is not in motion. They should be carefully inspected and brakes and overwinds tested at the beginning of each shift. Before men are hoisted and lowered the cage should be hoisted from the bottom to the top of the shaft. The hoisting engineer's attention must be entirely on his duties while operating the hoist. When handling men he must be careful not to exceed the maximum speed specified by the state law. Where no such limit is set, and it is necessary to hoist or lower men rapidly, a good practice is to bring the hoist almost to rest one revolution from the end of the hoist and allow it to "coast" the remainder of the distance.

The diameter of sheaves must never be less than the minimum diameter recommended by rope manufacturers and should be as much larger, within reason, as conditions will warrant. Increased diameter of sheave decreases the bending stresses and prolongs the life of the rope. When the arc of contact is small, pressure and length of contact exerted by the rope on the sheave do not generate sufficient friction to overcome the inertia of a large heavy sheave. Sheaves should be made as light as possible, well balanced and run absolutely true. The throat should be properly shaped to accommodate the rope used, smooth and either chilled or lined with hard steel or some soft packing. The method of attaching linings to sheaves should avoid, as far as possible, the use of bolts and nuts, wedge pins, etc., which may be worked loose by the vibration of the sheave.

When ropes are changed the sheaves should be carefully inspected for roughness, corrugations and shape of groove. If found defective the groove should be ground or turned to the proper profile, or a new sheave

or lining installed. A tight or corrugated sheave throat reduces the life of a rope more than much actual service. Sheaves, to prevent undue wear on the rope, must be set exactly in the plane of the rope as it enters and leaves the sheave. The bearings must be well fitted and kept properly lubricated.

The diameter of head sheaves on slopes should be proportionate to the vertical angle through which the rope is deflected. Large sheaves are not necessary where the deflection angle is small and are undesirable because the friction developed by the small arc of contact is not sufficient to overcome the inertia of a large sheave. Along the slope and on changes of grade or alignment, rollers and turnsheaves should be so spaced as to prevent the rope from rubbing against the bottom, top or sides of the hoistway. Bearings should be easy running but not so frictionless as to continue running long after the rope has been lifted from the rollers.

The hoisting rope must be fitted for the work which it must do and for the equipment with which it is to be used. It must be amply strong to carry the load with the proper factor of safety, of the proper construction for the service for which it is intended and of the proper material for the conditions under which it is to be used.

FACTOR OF SAFETY

In most states the required factor of safety is established by law. The Bureau of Mines* recommends a factor of safety varying with the depth of shaft, as given in the following table:

Feet—	Minimum Safety factor for new rope	Minimum safety factor when rope must be discarded	Percentage reduction
500 or less.....	8	6.4	20
500 to 1,000.....	7	5.8	17
1,000 to 2,000.....	6	5.0	16½
2,000 to 3,000.....	5	4.3	14
3,000 and over.....	4	3.6	10

This factor of safety is computed by dividing the breaking strength of the rope by the total load, plus the weight of the rope when fully extended, and is based on an actual factor of safety of four when the stresses due to bending and acceleration are considered.

In general, 6-strand, 19-wire rope, or its equivalent in special construction rope, should be used on vertical shafts, and 6-strand, 7-wire rope should be used on inclined shafts and slopes—the ropes composed of large wires are better able to withstand wear from friction, while the small wires are stronger and can better withstand bending. Langlay rope is preferable where its tendency to untwist may be resisted, as on shafts or slopes where the rope is permanently connected with its load, but regular-lay rope must be used where it is frequently disconnected from its load or untwisting cannot be prevented.

Softer grades of steel withstand repeated bending and resist the action of acid waters better than the harder grades and should be used

*Bulletin No. 75. "Rules and Regulations for Metal Mines," by W. R. Ingalls, James Douglas, J. R. Finlay, J. Parke Channing and John Hays Hammond.

wherever conditions permit. Hard-drawn steel and plow-steel ropes should be used only where maximum strength for a given size or weight of rope is required because of small sheaves or drums or depth of shafts.

FASTENINGS FOR ROPES

Considerable difference of opinion exists as to the proper method of attaching the rope to the load. The two methods employed in this country are by a cast socket and by clamping the end of the rope on itself around an eye or thimble. The former method, if properly executed, develops the maximum strength while the latter yields better results when applied by less skilled operatives. When socketing is employed the "straight wire-spelter"* should be used rather than the "bent wire-babbit" method.

When clamps are used, the proper number of clamps, properly spaced and applied, should be used.†

Diameter of Rope Inches	Number of clips	Length of wrench to tighten bolts Inches	Efficiency Per cent
$\frac{3}{4}$	5	18	77.39
$\frac{7}{8}$	5	18	79.13
1	5	24	77.89
$1\frac{1}{4}$	5	24	80.00
$1\frac{1}{2}$	6	24	82.15

Where distance below the head sheave of shafts or slopes permits it is well to use bridle chains attached to a clamp bolted to the hoisting rope a short distance above the rope fastening. These chains should be adjusted so as not to ordinarily carry the weight of the cage but not to allow a large drop should that fastening fail.

Since failure from broken wires is most marked directly above the fastenings, and from friction where the rope comes to rest on the sheave, a length of rope equal to about one-half the circumference of the sheave

*The method of making the socket joint is as follows: The rope should be securely seized or bound at the end with soft iron wire before the end of the rope is cut square. An additional seizing should be placed on the rope a distance equal to the length of the socket from the end. After the rope is trimmed off, the seizing on the end of the rope should be taken off, the rope opened down to the second seizing, the hemp center cut out and the wires broomed out—that is, they should all be untwisted but not straightened. Then the wires should be thoroughly cleaned in benzine, naphtha or gasoline as far as they are to be inserted in the socket, and then dipped in commercial muriatic acid for thirty to sixty seconds until the acid has cleaned each wire. Next, the rope end should be dipped in boiling water, to which a small amount of soda has been added to clean off and neutralize the acid. Then the rope end is inserted in the socket and warmed, if the temperature is below 65 degrees Fahrenheit to prevent cooling the zinc too rapidly. The socket is placed with its axis vertical and coinciding with the axis of the rope, the bottom is sealed with clay or putty and molten zinc or spelter, heated to a temperature that will just char wood, is poured into the socket until it is full. The socket should preferably be forged from one piece of soft iron, without welds. Bureau of Mines Bulletin 75, "Rules and Regulations for Metal Mines."

†The clamped attachment is made as follows: The rope is bent back over a thimble of the proper size and the loose end clamped against the long end of the rope with the proper number of clips. The Crosby type of U-bolt-and-drop-forging clip has proved most satisfactory. The clips should be spaced a distance equal to six times the diameter of the rope apart, the drop forging being against the long end and the U-bolt against the loose end of the rope. The number of clips required to develop approximately 80 per cent efficiency of the rope and the proper length of wrench to tighten the bolts are given in the table.

The clips must be carefully inspected each day and tightened if they show any signs of loosening through the stretching of the rope. Bureau of Mines Technical Paper 237, "Safe Practice in Using Wire Ropes in Mines."

should be cut off at regular intervals, and the fastenings renewed. The proper length of intervals is dependent on the ordinary life of the rope."

The Bureau of Mines recommends that ropes be cut off and fastenings renewed at the following intervals:

Average Length of Service— Months	Maximum time be- tween re- socketings Months	Average Length of Service— Months	Maximum time be- tween re- socketings Months
6	1	21	3½
8	1½	24	4
10	2	27	4
12	2	30	4
15	2	36	4
18	3		

Since the wear of ropes used on slopes is more severe on the ends attached to the skip, many companies prolong the life of the rope by turning it end for end after the one end becomes worn.

TESTING ROPES, LUBRICATION AND INSPECTION

After a new rope has been installed, or an old rope resocketed, and before men are hoisted or lowered, it should be tested by hoisting the heaviest load which will at any time be carried on the cage and then carefully examined for slipping of the attachment and for broken wires.

Hoisting ropes should be lubricated with an oil or grease which can penetrate to the core of the rope rather than with a "shield," which simply forms a hard shell around the rope. The lubricant should be applied frequently enough to keep the core of the rope saturated. From time to time the accumulation of hardened rope dressing should be cleaned off with wire brushes, steam jets or by scraping. An efficient steam jet arrangement used by the New Jersey Zinc Company for cleaning ropes is described by Mr. B. F. Tillson in the "Transactions of the American Institute of Mining Engineers," vol. 57, page 743.

Hoisting ropes should be inspected daily by a reliable man for broken wires and undue wear. At regular intervals, say once a month, a more minute inspection, calipering the rope at intervals and cleaning the rope to allow inspection at the valleys of the strands for corrosion, should be made. When ropes are cut off for resocketing the piece cut off should be unlaidd and carefully inspected for broken wires, corrosion and "nicking."

CAGES, GATES AND SAFETY CATCHES

In the construction of cages and skips the requirements of prime importance are strength, rigidity and lightness. Every design must, of course, be a compromise between these factors, dependent on the conditions of cost, loads and depth of shaft. Though wood has its good points and was formerly largely used in the construction of cages it has so many disadvantages as compared with steel that it has been largely superseded by it. Only mild structural steel and boiler plate should be used for the principal members of cages and skips, as they will bend or stretch rather than snap when subjected to excessive shocks. Wherever possible connections should be made by riveting rather than by bolting,

*Bureau of Mines Bulletin 75, "Rules and Regulations for Metal Mines."

so as to make the joints more rigid. A crosshead (top cross member) built up of structural steel is preferable to one cast in one piece because it is less liable to have hidden flaws. The drawhead should be as simple as possible, without welds, and should be well cushioned with springs to eliminate, as far as possible, shocks caused by hoisting with a slack rope. If bridle chains are used in place of a drawhead they also should be connected either to the rope or cage through springs.

Cages used for hoisting or lowering men should have side plates at least six feet high and should have hinged sheet steel covers so arranged as to protect the entire floor area of the cage on which men stand while being hoisted.

Though the practice of fitting gates to cages used for handling men is at present confined almost exclusively to metal mining practice it is recommended that this practice be followed in coal mining as well. The use of gates on cages and at all shaft landings alone can prevent over half of the shaft accidents. Cars should be blocked or locked to the cage with some automatic device. The operating mechanism should be, as far as possible, below the floor of the cage, so as to offer as few obstacles as possible to men entering and leaving the cage.

All cages should be fitted with safety catches. They should be designed to give the greatest braking power possible but not to dig into the guides so deeply as to bring the cage to a sudden stop. The size and shape of the teeth of cams will be governed by the condition of the shaft and guides. The catches should be able to act equally well on a full-sized or a worn guide and to take equal hold on both guides, regardless of the amount they are worn. In the case of eccentric cams they must be prevented from turning entirely around. The operating mechanism should be simple and contain only such wearing joints or links as are absolutely necessary. Some arrangement should be used to prevent the safety catches, after having been engaged, from being withdrawn except by lifting the cage. The operating springs should be adjustable and set under just sufficient tension to hold the safety catches off when the car is being lowered at the maximum allowable speed.

The dumping arrangement of self-dumping cages and skips should carry them as far as possible from the shaft before dumping begins, to prevent pieces of material from falling back into the shaft. Some positive locking arrangement must be provided on all selfdumping cages used for hoisting men to prevent the body from overturning in the shaft. Automatic locks are, of course, preferable.

Man cars for use on slopes and inclines should be so constructed as to protect the men riding from objects falling down the slope, from falling off of the car, and from coming in contact with timbers, projections, etc., in the slope. An effort should be made to develop safety catches for all conditions of pitch, roadbed and capacities. The operation of such a catch should depend on the speed of the car rather than on the tension of the rope on the drawbar, because of the resistance caused by a long rope dragging along the slope. The attachment of the rope to the car requires special attention. A good practice followed by some companies

is to carry the rope entirely around the car, clamping it to the car at various points and clamping the loose end to the rope. Other companies use bridle chains and clamps similar to the ones used on cages. Where men ride on slopes in a trip of cars, the ordinary car couplings should not be solely relied upon but additional "side hitchings" or a rope or chain connecting the entire trip should be used in addition.

GUIDES AND TRACKS, LANDINGS, GATES AND FENCES

It is of prime importance that guides and tracks be set to a true line, free from kinks or sags, and be absolutely true to gauge. If this precaution be taken, hoisting may be quite rapid with comparative safety. Wooden guides should be of the best grade of timber obtainable and of full size section rather than built up of small pieces spiked together or faced with planks. The former are much more rigid and eliminate the danger of parts coming loose or spikes working out.

Though metal guides have been found, in some respects, more satisfactory than wood, their high initial cost and the lack of a simple safety catch suitable for use on them has prevented their wide adoption. Guides should be renewed as soon as they become worn to such an extent that the safety catch cannot properly engage. This depends on the depth of the guide and type of safety catch, but as a rule should not be much in excess of half an inch in the width of the guide.

All landings should be protected so as to make it impossible for men or cars to pass into the shaft unless the cage is at that landing. To prevent more men crowding on the car than allowed by law, some arrangement should be made whereby the proper number can be counted off before they enter the cage.

All landings must be inclosed or fenced on sides where access is not necessary and such sides provided with gates which open and close automatically. Gates should be vertical, approximately six feet high, of open construction, so as to make the shaft at all times visible, and substantially built. If made so heavy that one man cannot lift them there is no need of an interlock. They should open vertically, be equipped with guides, but arranged to be swung aside when long material is being handled into or out of the shaft. Under ordinary conditions the latches allowing the gates to be swung aside must be locked. Keys to the locks should be available only to authorized men.

Where landing chairs or fans are used they should be provided with means for locking them back in the "clear" position. Connections between the chairs and their operating lever should be in duplicate. The hazards incurred by projecting chairs may be greatly reduced by an electrical device which indicates to the engineer that the chairs have been withdrawn and the shaft is clear.

It is recommended that automatic caging devices be installed at all landings where cages are loaded. Not only do such devices tend to increase the speed of hoisting, but they act as a safety device by keeping the men away from the zone of danger near the shaft. All shaft landings the men away from the zone of danger near the shaft. All shaft landings not fitted with caging devices should be provided with car blocks which will protect the shaft from runaway cars, unless held in the "off" position.

Loading chutes should be made to deliver the material well over the side of the skip in order to keep to a minimum the amount of material falling down the slope or shaft. Wherever possible, loading chutes should automatically be swung into the shaft and withdrawn by action of the skip. Openings to loading chutes or pockets should be protected with "grizzlies."

It is a wise precaution to have the landing in the immediate vicinity of the shaft floored over so as to reduce the hazard of slipping or stumbling. Shaft landings must be kept as dry as possible, free of all oily or slippery places and of loose objects over which men may fall or which might get knocked into the shaft.

SIGNAL SYSTEMS

To be effective a signal system must be reliable, must give distinct signals and should be easy to operate. The old-fashioned bellrope and "rapper" fulfilled none of these requirements and has almost entirely been superseded by either pneumatic or electric signal systems. Of these two the pneumatic system is more rugged and answers the purpose of a speaking tube as well, while the electric system is far easier to operate and, if kept in condition, gives more distinct signals. If a hoist recorder is provided, signals should be recorded on the hoisting record.

The practice, followed by some companies both in coal and metal mines, of having signals given from the various landings to the head tender, who alone transmits them to the engineer, is less liable to cause confusion of signals leading to accidents than to have both head and foot tender signal to the engineer.

It would be highly desirable to have a uniform signal code embracing all signals ordinarily used. At present different codes are used in different states or mining districts and in coal and metal mines. This leads to considerable confusion because of miners going from one district to another where different codes are used. Signal codes printed in large, legible type on placards capable of being easily cleaned should be posted at all landings and in the hoist room in sight of the operating levers.

SAFETY RULES

Keep the hoist clean and properly lubricated. Inspect the entire hoist at the beginning of each shift and report any defects to the man responsible for the maintenance of the hoist. If serious defects are found do not operate the hoist until repairs have been made. See that brakes, indicators and overwind devices are properly adjusted and that the ropes are taken up as they stretch. Always keep the hoist fully under control and do not let anything attract your attention from your duties while operating the hoist. Observe the legal limits of speed when hoisting men. After the engine has been idle, hoist the empty cage from bottom to top of shaft to be sure everything is clear before hoisting or lowering men. If you are in the least confused as to signals wait until the signals are repeated before moving the cage.

Carefully inspect the cage, its fastenings, safety catches and car blocks or latches once a day. See that all moving parts are lubricated and can

move easily but are not badly worn. Anneal the drawhead, links and chains at intervals of three to six months to prevent crystallization. Keep the floor of the cage clean and in good condition to prevent men slipping or stumbling.

Do not allow more than the number of men permitted by law to ride on the cage at one time. Do not allow men to ride on the cage when material is being hoisted or lowered on the same cage or in another shaft compartment. Do not allow men to carry explosives or tools on the cage with them. Close the gate of the cage or put up the bar or chain before giving the final signal to hoist and do not allow anyone to get on or off of the cage after the signal has been given. Wait until the cage has come to rest before opening the gate.

Do not load the cage beyond the capacity of the rope. Overloading causes injurious strains which later may result in the rope breaking under ordinary loads. Do not allow any part of the load to project beyond the floor of the cage. If too long, stand it on end or hang it below the cage. In the latter case attach each piece separately; do not hang pipe, rail or timber below the cage in bundles.

Keep shaft timbering and guides accurately in line and replace any timbers which become crushed, rotted or worn. Keep the shaft clear of accumulations of ice. From time to time remove any materials which may have accumulated on the timbers. Before working in the shaft inform the hoisting engineer as to what you are about to do, so that he may be governed accordingly in responding to signals. Do not try to save time or labor when building a scaffold or working platform in the shaft. You can work to better advantage and with less hazard on a properly built scaffold. When cleaning out the sump, block the cage in some manner so that it cannot be lowered and crush you.

DISCUSSION

The Chairman postponed discussion of this paper until other papers dealing with hoisting equipment had been considered.

EUROPEAN VS. AMERICAN HOISTING PRACTICE— HOISTING ROPES

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During the World War the coal mines of Northern France and Belgium were in most cases totally destroyed and in the reconstruction an excellent opportunity was given to adopt new types of equipment and in many cases new methods of procedure which would not have been so much the case if the plants had only been partially destroyed.

In order to economize as much as possible in the reconstruction work it was decided to standardize as much as possible in the new construction. For this purpose a group of operators and engineers in Northern France formed a committee to make definite recommendation in regard to the hoisting plants in the devastated area. Mr. J. F. Perry, an Eng-

lish engineer with the Metropolitan Vickers Company, on account of his wide experience in the application of electric power to hoists, was requested to become a member of this committee. Mr. Perry has written a very interesting series of articles appearing in the *Metropolitan Vickers Gazette* of January, February, March and April, 1922, covering "The Reconstruction of the Devastated French Winding Equipments."

The recommendations of the committee have, no doubt, taken into account the safety of operation which plays a very important part in the economy of operation.

Compared with America the natural resources of Europe are less plentiful and in many cases more difficult of recovery. The cost and availability of skilled labor in Europe is much more favorable than in America and also during normal times the market conditions are much more stable. The above-mentioned conditions mean that equipment and practices which are best for European conditions would not, in many cases, be at all suited to American conditions. This is particularly true in regard to the more complicated apparatus, requiring a considerable degree of skill for operation and maintenance. The coal mining areas in America are not, as a rule, located at industrial centers, so that it is very difficult to obtain skilled labor. For this reason, apparatus and equipment which would give the best satisfaction under European conditions will prove a failure under American conditions.

The committee made a very careful study of hoisting conditions and equipment in France, Germany and England, in order to ascertain the best and most economical type of equipment to meet French conditions.

This paper will be confined to the discussion of the first part of Mr. Perry's articles, covering winding ropes. The recommendations of the committee were largely based upon the practice in England.

DISCONTINUING USE OF FLAT ROPES

The flat rope used so much in continental Europe before the war was not considered by the committee and scarcely mentioned by Mr. Perry. This type of rope has been used to a considerable extent in the metal mines of America, but is gradually being superseded by the round rope. The flat rope is not used to any extent for coal mining hoists in America, to the writer's knowledge.

The round rope, known as regular lay, made from crucible cast steel or plough steel, with hemp center, is the popular rope used for hoisting in America today. The Lang's lay type of rope is used to some extent and may become more popular when its advantages are recognized.

In England it seems that they have passed from the use of the regular lay rope to the Lang lay and from the Lang lay to the locked or semi-locked rope. The individual wires used are of high-grade plough steel, having a breaking strain of about 250,000 pounds per square inch. Fig. 1 illustrates a typical example of a locked-coil rope, which is composed of a central core of round wires surrounded by a series of layers of round and special shaped wires. The various strands are locked in position and the cable has a smooth surface on the outside, which pre-

vents, to some extent, the entrance of mine water and at the same time prevents the anti-corrosive lubricant from escaping.

About 50 per cent of the collieries in England are using the locked-coil type of rope. This type of rope is not as flexible as a type using a hemp center and the committee recommends that when this type of rope is used that the minimum diameter of the hoisting drum be not less than eighty times the diameter of the rope.

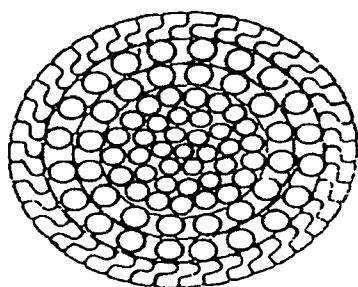


Fig. 1. Locked coil rope with two layers of semi-locked strands and one layer of locked strands.

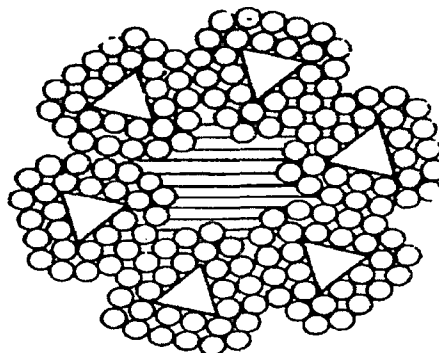


Fig. 2. Flattened strand rope type "A."

Next to the locked-coil type is the flattened-strand, as illustrated in Fig. 2. This type of rope is becoming quite common in England and is used to advantage in replacing Lang's lay, especially in Wales. Mr. Perry estimates that about 30 per cent of the hoisting ropes in England are of this type. It is built up of six strands of cable, assembled about a hemp core. Each strand consists of a group of round wires wound on a triangular core. The committee recommends a ratio of seventy-two for this type of rope.

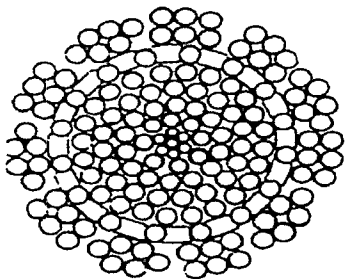


Fig. 3. Flattened rope, type "B," with semi-locked core.

A third type of rope, of the flattened-strand construction, is illustrated in Fig. 3. The center core is of round steel wire surrounded by a semi-locked layer, over which is wound a layer of flattened strands. This is a newer type of cable and as yet has only been used at eight collieries in England.

The Lang lay cable seems to be going out in favor of the locked and semi-locked cables. The recommended ratio for Lang lay cable is sixty-eight. About 20 per cent of the collieries in England still use this type of cable.

CABLE BUILT OF TWO CONCENTRIC GROUPS

The "Nuflex" rope is constructed on the Lang lay principle. In general, this type of cable is built up of two concentric groups of relatively

fine wires, built up on a hemp center, thus rendering them light and flexible. The inside group is wound in the opposite direction from the outside group which makes the rope non-spinning. These ropes are especially recommended for tail ropes and replace with advantage the flat ropes commonly employed in France. The following shows the three principle types of rope used in England, the apparent density of each, the recommended ratio of cable to minimum drum diameter and the diameter of rope for same effective breaking strain:

	Fig.	Density	Ratio	Dia. for same strain	Drum dia.
Locked coil	1	7.21	80	1.75	140
Flattened strand	2	5.38	72	1.97	142
Lang lay	..	5.01	68	2.1	143

The general conclusions arrived at by the committee were that (1) Lang lay cable is by far the heaviest and largest of the three types being considered. (2) For the same space occupied on the drum the density and effective breaking stress of the Lang lay rope is considerably less than that of the other types. (3) With equal weight per foot the Lang lay rope is found to be inferior to the other two types, from the point of view of space occupied on the drum and its effective breaking stress is less. Besides being heavier per unit length for the same service, the Lang lay rope increases the overall width of the drum, resulting in more angling and an increase in the inertia of the drum.

The committee feels that the diameter of the cable selected has an important influence upon the first cost of the hoisting equipment, the overall efficiency and the operating costs.

RESULT OF STUDIES BY COMMITTEE

A study was made of the standard Ward Leonard equipment recommended by the committee with the following results: Diameter of locked cable is 20.4 per cent less than Lang lay and its weight 8 per cent less. The cost of equipment with locked cable is 10 per cent less than with Lang's lay. The cost of the lock coil cable is 3.34 per cent greater than Lang lay. The overall efficiency with locked coil cable is 1 per cent higher and consequently the energy consumption 4.6 per cent less than with Lang's lay. Further observations deal with the exterior surfaces, flexibility, elongation and losses due to construction.

The comparative rough surface of the Lang-lay rope will, in the opinion of the committee, greatly increase the friction losses when compared with the smooth surface of the locked rope. The less flexibility of the locked rope is compensated by its smaller diameter. The elongation of the locked cable is very small and most of it takes place with the first few days of service. The elongation of the Lang lay rope is more than ten times as much as the locked rope and this elongation lasts over a period of several months. The locked cable loses approximately 12 per cent of its strength in manufacture while the Lang lay loses approximately 9 per cent.

Some of the statements made above seem fairly reasonable, while others seem to be startling. The first question that comes to mind is in regard to obtaining locked or flattened-strand cable in the United States.

Are the manufacturers prepared to furnish these types of cable and are they willing to concede the advantages claimed by the committee across the water?

We can, no doubt, agree to the figures regarding rope sizes, ratios of diameter of cable to drum diameter, apparent densities, surfaces, flexibility and elongation, but I doubt very much if actual practice would bear out the figure regarding cost, efficiency and saving in power.

RECOMMENDS USE OF PLOUGH STEEL CABLES

It seems that the committee recommends only the use of high-grade plough steel. In many of the coal mines in this country the shafts are comparatively shallow—150 to 200 feet—in which case the cost of cable is a small item and frequently an ordinary cast steel rope is used. Where the mines are deep, and the cost of cable a large item, then it is more important to consider the use of high-grade steel.

The less flexibility of the locked cable does not give it any advantage in regard to driven diameter, but would help in reducing the length, weight and inertia of the drum. I doubt very much if the cost of the hoisting equipment in this country would be anything like 10 per cent less with a locked cable than with a Lang lay cable. It is also probable that the cost of the locked cable would be more than 3.34 per cent greater than Lang's lay.

The effect on the overall efficiency when using locked cable, as compared with Lang lay, is not only difficult to estimate, but very difficult to determine by test. It is doubtful if the theoretical value of 1 per cent increase in efficiency would have much weight in this country in determining the type of cable to use.

It is my opinion that conditions at the various coal and metal mines in this country vary so widely that no single recommendation in regard to cables for hoisting could be given and that for each particular set of conditions the best practice could be determined by the co-operation of the mine operation and cable manufacturers. We cannot expect to accept and follow blindly the practice of our European neighbors, but we can certainly take to heart some of their experiences which may prove a valuable aid in assisting us toward making better, safer and more economical practice in the selection of hoisting ropes.

PRACTICAL HINTS FOR SAFE USE OF WIRE ROPE

E. O. KEATOR, CIVIL ENGINEER, DAYTON, OHIO

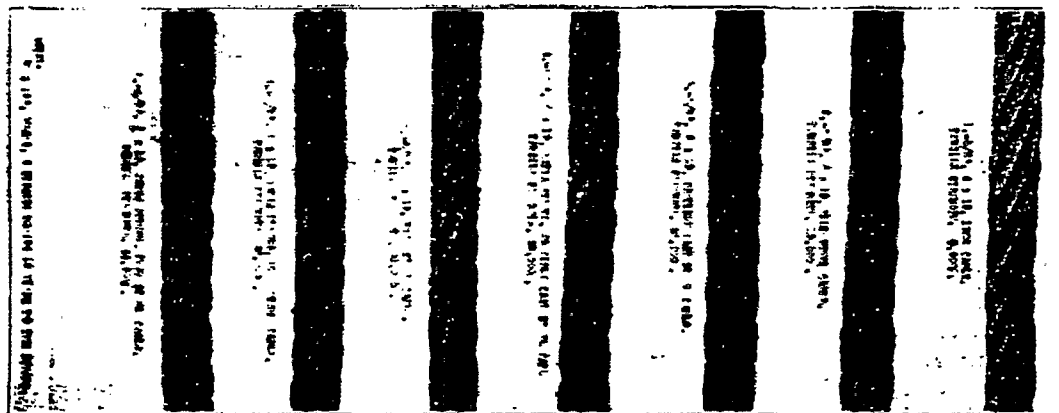
All problems pertaining to industry have their theoretical and practical sides and a proper solution of these problems demands co-operation. Failure to co-operate sometimes means loss of life and destruction of property, both of which are common enough in connection with the use of wire rope. Wire rope is in itself the most reliable of all structural materials, but it is also a complex material and cannot be used to advantage in the rough and ready manner that other structural materials are used. It is necessary to follow certain definite rules to obtain satisfactory results and, when those rules are ignorantly or otherwise disregarded, disaster often follows.

The purpose of this paper is to point out a few details where better co-operation between the manufacturers and users of wire rope will result in the elimination of certain classes of accidents, and to promote a better understanding between the two parties. A brief survey of the history of wire rope will aid us in getting started on the right track.

There is no authentic record showing that iron or steel rope was used prior to the advent of the steam engine, in the early part of the last century; in any event, the steam engine created the demand for strong hoisting lines capable of lifting the heavy loads that man was enabled to handle with this new and powerful agency. Wire hoisting rope was first used in mines, but its great strength, comparative lightness and adaptability led to its gradual extension to all fields of human endeavor where the lifting of heavy loads was a part thereof. We have today the mine hoist, the elevator, the conveyor, the derrick, the pile-driver, the electric hoist, the well drill, the oil pump, the steam shovel, the log carrier, the crane, the dredge, the ditcher and many other types of load-handling machinery, all operated with wire rope. Being a complex material, yet widely used and almost as dangerous as dynamite when not used intelligently, it would be quite appropriate for the National Safety Council to take steps to insure intelligent use of this excellent material in the many fields it has invaded.

SUPERIORITY OF STEEL ROPES

For more than fifty years, or until the advent of the openhearth and Bessemer processes of manufacturing steel cheaply, which was just before.



Here are seven pieces of wire rope that have the same appearance in every respect, but vary in strength about 500 per cent. All are of one size, viz., five-eighths inch diameters. There are 20 other commercial sizes, from one-fourth inch diameter up to two and three-fourths inches diameter, each size made in several grades of steel—with a few exceptions. The importance of marking each cable, as a matter of safety and economy, with its rated tensile strength, working capacity, minimum safe drum diameter, and manufacturer's name and address is obvious.

Civil War times, all cables were made of iron having a tensile strength of from 50,000 to 60,000 pounds per square inch, and it should be borne in mind that the ordinary types of wire rope fastenings in use today, viz.,

the clip, the three-bolt clamp and the leaded-in-socket, were evolved in those early days for use with those low-strength iron cables.

As men began to learn the superiority of steel ropes over iron ropes, the former came into the more general use, but it never has entirely superseded the iron rope and there are many men, even today, in responsible charge of hoisting machinery, who believe that Swedish iron rope is the strongest and best grade of rope made. This belief is erroneous, of course, but it exists to a considerable degree and shows a fundamental ignorance on the part of many users, which, taken with other conditions in a like state, points to the need for better co-operation between the manufacturer and user. There are six commercial grades of wire rope, of which iron, having a tensile strength of approximately 60,000 pounds per square inch, is the weakest; next comes mild steel at 85,000; crucible cast steel at 160,000 to 200,000; extra strong crucible cast steel at 190,000 to 220,000; plow steel at 200,000 to 260,000; and improved plow steel at 220,000 to 280,000 pounds per square inch.

DIFFICULT FOR ORDINARY USERS TO TELL DIFFERENCE

With this fine array of material one would suppose it to be a simple matter for anyone knowing of the existence of the several grades to select that which was best suited to his purpose. Such, however, is not the case because all the grades look exactly alike and there is no way for the ordinary user to tell the difference between them; he might need a plow steel cable but be furnished at the supply-house with an iron cable with but one-fifth the working capacity of the plow steel cable.

Let us consider a hypothetical case of this kind: Suppose a steel-frame building is under erection in the downtown section of one of our big cities. High above the street, over the heads of hundreds of people passing to and fro, is a derrick, hoisting from a truck in the street the steel beams, girders and columns that compose the frame of the building. A state inspector comes along and in the course of his duties examines the hoisting rope being used to place the steel members just mentioned. He decides, correctly, too, that the rope already has worn beyond the safe stage and that no more hoisting may be done with it. Work stops. The superintendent hurries to the telephone and issues a rush order for a new hoisting rope.

The old rope is removed and the new one put in as quickly as possible, but an hour has been lost where every second is valuable. The instant all is ready the superintendent orders the hoisting engineer to "tear in," which he proceeds to do. He picks up the load, opens the throttle wide and away sails the load. A hundred feet from the ground and there is a cry aloft from the signalman, "Look out below!" The new cable has parted and dropped the load upon a group of passers-by. The coroner makes his investigation and reports that "Deaths were unavoidable, due to faulty hoisting cable. Cable, although new, weaker than old one." But the coroner was wrong in his finding; the cable was not faulty; the trouble was that a new iron cable had been substituted for a plow steel cable, and, neither being marked in any way to identify them or ascertain their relative strengths, the hoisting engineer naturally thought the new one was at least as strong as the old one.

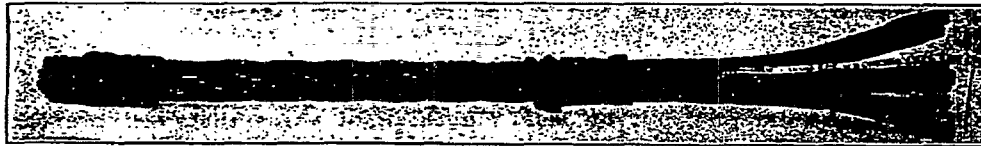
Accidents of this kind, but fortunately without serious results as a rule, are common on construction work, as every experienced construction man knows. An examination of the broken cable proves nothing to the man on the job. All he knows is that the new cable was not as strong as the old one, but he learns nothing of value that will prevent a repetition of the disaster. He might go to another supply-house to buy the cable, but it is just as likely to be iron cable as it was before. This situation confronts every hoisting engineer on construction jobs, in industrial plants and in mines, although in the latter many safeguards are required that are not found elsewhere.

To eliminate all guesswork in connection with the choosing of wire rope to perform certain work, the wire rope manufacturers should be required to mark all cables, or at least all hoisting cables, at the time of their manufacture; giving the name and address of the manufacturer, the grade of steel of which the cable is made, its rated tensile strength (new), the working load and minimum diameter of drum on which it can be safely used. This could be easily, cheaply and very efficiently done by printing the information on a narrow tape, at close intervals throughout the entire length of the tape, and weaving this tape into the manilla ropes to be used as wire rope cores. Then when it becomes necessary to renew a hoisting cable the engineer need only to look at the printed tape in both the old and new cables to ascertain if they are identical. Printed tape of the kind exactly suited to this purpose is used by many concerns all over the country for tying packages and costs probably not more than one-tenth cent per foot. No change in ropemaking machinery would be necessary to use it.

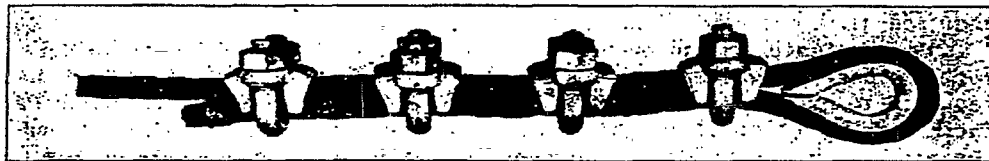
VALUE OF MARKED CABLES

The plan of marking cables has a number of advantages: 1. It is an important safety measure. 2. It eliminates chances for fraud and insures the customer that he gets what he pays for. 3. By no means the least important, it furnishes the hoisting engineer and other interested parties a firm foundation upon which to build a knowledge of wire rope. A long step is made in this knowledge by anyone who secures certified samples of the various grades, all in one size, and, by bending back and forth with the fingers, compares the stiffness of wires of the various grades, remembering that "the stiffer the wire the stronger the cable." Practice in this, along with frequent reference to the printed tape, giving the actual strength of the cables, would soon make the hoisting engineer something of an expert who, by applying the "finger-bend-test," would not miss the grade of cable much, even though it were unmarked. Knowledge breeds confidence and when all parties concerned have the confidence in wire rope that it deserves, its use will spread and accidents will be fewer. We have pure-food laws, full-weight laws, and full-measure laws. Why not, through the influence of the National Safety Council, state industrial boards, insurance companies and the engineering societies, a law providing for the marking of all cables, or at least hoisting cables?

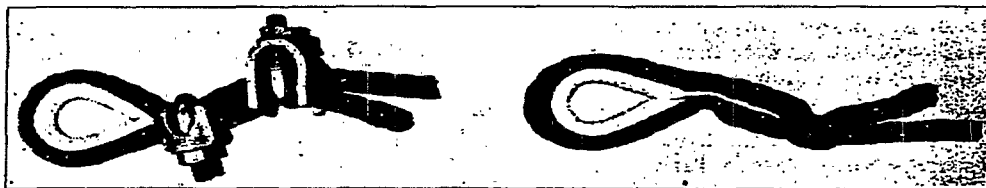
After a cable has been intelligently selected the next step is to attach it safely and securely, so that it will perform the work expected of



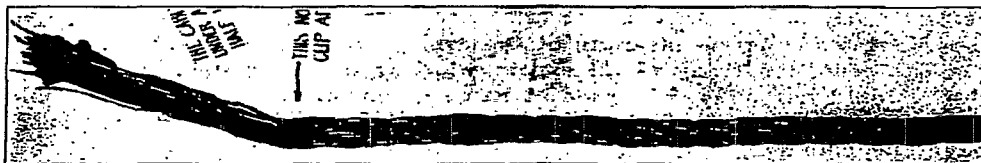
Identification tape woven into wire rope, showing ultimate strength and safe working load.



Here is shown the correct position and the correct number of forged-steel clips of a well and favorably known pattern, for fastening five-eighths inch plow steel cable, viz., four clips, spaced apart a distance equal to six diameters of the cable, with U-bolts all in contact with the short end. If applied properly—neither loose nor too tight, and kept that way by daily inspection, tightening from time to time as the cable shrinks in diameter and loosens them as cables do when loaded—they give an efficiency of from 75 per cent to 80 per cent, or approximately 20 per cent per clip. Large cables require more clips than this; smaller cables, fewer.



Here are shown a common malleable clip along with a pressed steel clip in place, and the same cable after the clips have been removed. The destructive action of the U-bolt of the malleable clip and of both U-bolt and base of the pressed steel clip are clearly shown. It is not difficult to damage a cable in this manner with clips three-quarters inch and under; the cable is weakened, thereby, sometimes as much as 40 per cent to 50 per cent by a single clip.



This seven-eighths inch cable was a part of one of the guy lines of a large steel derrick used by the Miami Conservancy, Dayton, O. As the mast, raised with this line, reached an angle of approximately 30 degrees with the ground, this line parted under one of the clips and dropped the mast, wrecking it. The cable was new and had been figured by the engineers to be more than sufficiently strong to take the load of raising the mast. The riggers, however, wishing to make sure that there would be no slipping, over-tightened the clips with disastrous results. The break plainly shows the flattened and cone-shaped ends of the wires giving indisputable evidence of the cause.

it without danger of coming loose. To do this properly is one of the most difficult feats to perform in the entire construction field and it is safe to say that, with methods in common use, no one can do it who has not had abundant laboratory-testing experience or works under the supervision of someone that has had. In no other way will the pitfalls that beset the workman be recognized and avoided. For instance: Instructions by the wire rope manufacturers in the matter of applying clips call for wrenches of various lengths to be used with clips of specified sizes, and a specified maximum pull on the wrench when tightening the nuts on the U-bolts. The pull on the wrench handle in pounds, multiplied by the length of the wrench from the center of pull to the center of the bolt, is called the *torc*. When the *torc* exceeds a certain amount specified for any particular manufacturer's clip, which is usually far below the figure necessary to strip the threads or rupture the bolt, the U-bolt has cut into the cable and damaged it, thus weakening it. On the other hand, if a smaller *torc* is used the efficiency and effectiveness of the clip is impaired, thus the close relation between theory and practice is demonstrated.

Wire ropes today are rarely fastened by experts or by persons who have made laboratory tests, and the frequency with which we hear of fastenings failing under ordinary working loads testifies to an abundance of fastenings having efficiencies around 25 per cent and lower. Indeed, the United States Bureau of Standards found in its tests, described in Technologic Paper No. 121, that babbitted sockets, prepared in the most approved manner, failed under loads as low as 25 per cent of the strength of the cable. Inspection, by the writer, of a large number of fastenings in use that had not failed, as compared with similar test specimens, duplicating them as near as possible, forced the startling conclusion that the average efficiency of cable fastenings made on construction work and in the industrial plant is well under 50 per cent, and that the reason there are not even more accidents than now occur is due to the fact that working loads have been exceeded very little, if any. This certainly is not safe practice in the use of wire rope.

MINIMUM ALLOWABLE EFFICIENCY

The minimum allowable efficiency of wire rope fastenings, compared with the tensile strength of the cable, new, depends upon the nature of the work performed. Ropes that take static loads only, such as suspension bridges, should have 100 per cent fastenings. Hoisting ropes wear out where they run over drums and sheaves. The efficiency of hoisting-rope-fastenings then, need be no greater when the ropes are new than the ratio of the tensile strength of the worn section to the tensile strength of the cable when new. Thus, hoisting cables are used until worn to 65 per cent of their original strength and then discarded. Fastenings, therefore, having an efficiency of 65 per cent or over have, for all practical purposes, 100 per cent efficiency, as the fastenings are as strong or stronger than the cable itself during the latter part of the period that the cable is in use.

Some authorities hold that it would be a safety provision on some classes of excavating machinery to provide fastenings that fail when the load passes the elastic limit of the cable, or at 50 to 60 per cent of

its ultimate strength. Their reason for this is that cables worked over sheaves and drums beyond the elastic limit are rapidly destroyed, especially on undersize drums and sheaves with which excavating machines are usually provided. A failure at the fastening would then show that the cable was being worked beyond its elastic limit and the loss of a few inches of cable would be as nothing compared to the saving of the remainder of the cable, accomplished through failure of the fastening under those circumstances. Such a failure in the fastening might also prevent overturning of a machine if it were in an unfavorable position and the intensity of the load was unknown. Thus, while 100 per cent fastenings are desirable, as a rule they are not needed, and sometimes are not wanted, which is very fortunate in view of their scarcity or impossibility of attainment.

The so-called "lead" or "babbitted" socket was evolved in the early days of wire rope, when all such ropes were made of iron wire of low-tensile strength. Commercial sockets in use today are practically the same size, weight and strength as the original sockets, while being used with cables ordinarily 50 to 500 per cent stronger than the first iron cables. The basket section of the sockets was originally designed to cover a sufficient length of the cable with the bonding metal—lead or babbitt metal—to develop a total bond sufficient to pull the cable in two. Of course, then, if the same bond is provided for cables five times as strong, they will pull out just as they did in Bureau of Standards tests, where the baskets were even longer than those in commercial sockets. "Lead" and "babbitted" sockets have been used for a hundred years and in all likelihood will continue to be used, but for the sake of safety all commercial sockets should be provided with baskets sufficiently deep to provide a bond with lead or babbitt equal to the ultimate strength of the strongest commercial grade of cable when new.

RECOMMENDED METHOD FOR ATTACHING SOCKETS

The theorist will consider this a useless expense and say substantially this: "Use our sockets; follow our directions for attaching them and we guarantee you 100 per cent fastenings: 1. Cut off the end of the cable squarely. 2. Serve it tightly with a dozen turns of serving wire, beginning at a distance back from the end equal to the depth of the socket basket. 3. Open up the strands, cut out the hemp core down to the serving, wipe carefully each individual wire to remove grease and all other foreign matter and straighten each wire. 4. Fix up a half-and-half mixture of muriatic acid and water and hold the frayed end of the cable in this mixture for one minute. 5. Wipe the wires dry, squeeze the ends together and thrust them thus into the end of the socket. 6. Align the cable with the central axis of the socket and clamp in this position. 7. Plaster fire clay around the bottom of the socket, sealing all openings between it and the cable. 8. Pour in the melted bonding metal, which must not be lead or babbitt metal, but pure zinc."

To this the practical man is going to reply: "We are glad to know how to make 100 per cent fastenings with wire rope, but the process you describe requires a chemist, a metallurgist and some laboratory equipment, none of which are available to the ordinary wire rope user. You

need the chemist to first clean the cable with acid and then to remove the acid, because the chemist, knowing the corroding action of acid on iron, would spend an entire day if necessary in removing the acid that was taken up between the wires by capillary attraction into the cable at the serving, there to augment the so-called 'failure from crystallization by bending, due to the vibrations of the cable,' to which ordinary sockets are subject. You need the metallurgist to watch the temperature of the melted zinc. Even under the most careful factory conditions, wire in galvanizing is reduced approximately 10 per cent in tensile strength; how much more is it likely to be reduced in strength when the zinc is heated red hot to make it run through the wires easily, as would likely be done? Machinists, millwrights, riggers, hoisting engineers, carpenters and the casual workman are the type of men who ordinarily fasten cables. They read little, but learn their work by watching their predecessors. Zinc, lead and babbitt metal are all one and the same to these men and used interchangeably. What, from their standpoint, would be more natural or reasonable than to use babbitt metal with a 'babbitted' socket or lead with a 'leaded' socket. Zinc? Never. No, it is far safer to use a mechanical fastening with a reasonable efficiency than the socket with its hoped-for 100 per cent efficiency, but more probable 25 to 50 per cent efficiency."

A mechanical fastening may be reasonably efficient when properly applied but, like the socket, too complicated to use under ordinary working conditions. Mechanical fastenings may be very simple in construction and appearance, too; yet too complicated in operation for safe use under ordinary working conditions. Any device worthy of use as a cable fastening must be dependable under ordinary working conditions and, to merit the name of being a safety device or to merit consideration as a standard fastening, it must guarantee the security and safety of all cables on which it is used.

Since the efficiencies of the vast majority of wire rope fastenings are unknown and the frequency of failures indicate the average efficiency to be dangerously low in spite of the various methods and devices employed, let us examine into the nature of wire rope and ascertain what there is about it to cause this situation. In hoisting ropes, the most important class, we have a material smooth of surface and heavily greased, flexible, highly compressible, and with the dangerous property of shrinking in diameter under load. Furthermore, it is weakened when deformed under load by clamps, weakened by acid and lye when these are used for cleaning and not removed, and weakened by heating beyond a certain point. With these complications must be considered the fact that, although the various grades of any one size have exactly the same appearance which causes them often to be used interchangeably and indiscriminately, they vary in strength as much as 500 per cent. From a safety standpoint, therefore, the inevitable conclusion reached from a consideration of these points is for a one-clamp or single-unit device, applicable to all grades of cable with equal safety.

To solve the problem of fastening wire rope mechanically, there have been designed various types of friction clamps, distortion clamps, clamps

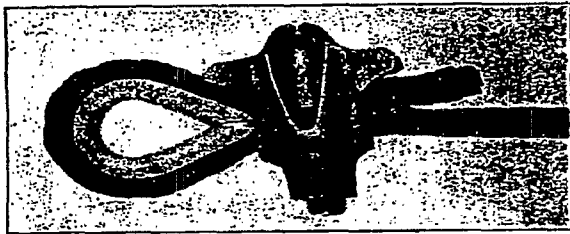
that derive their holding power from lateral contact of ridges and grooves with the strands in the manner that screw threads operate, and clamps that contain combinations of these principles; bolts, wedges and cams being the means of operating them. All are more or less adversely affected by the peculiar properties of wire rope, but particularly by its compressibility in conjunction with its greasy surface. Catalogues and technical articles pertaining to the use of wire rope mention as a matter of course that clips and clamps to be safe must be correctly applied as to position on the cable, correct as to number, and correct as to degree of tightness. Furthermore, even then they are expected to slip and must be regularly inspected and retightened from time to time.

When fastening failures occur, as they often do by clips virtually cutting the cable in two from overtightening, the fault is laid to a poor cable; when failure occurs by the slipping of the cable through the clamps because of insufficient tightening or an insufficient number, the operator is blamed. With ordinary clips and clamps there are any number of positions in which they may be applied; there are various weights of clips and clamps of the same pattern for the same size cable; there are an infinite number of degrees of tightness from which to guess at the correct degree, and as for the regular inspection of fastenings and retightening them, it is impractical although admittedly necessary. No wonder, with this intricate set of conditions and the clips and clamps that demand their performance, wire rope fastenings must be coddled and, lacking that, fail. Since at least ninety-nine out of every one hundred cables are fastened by men who have hardly the remotest conception of the scientific principles involved in the various cable-fastening devices, there can never be even a moderate degree of safety guaranteed until devices are provided that insure safety, regardless of their position on the cable, regardless of their degree of tightness, regardless of the number used, and regardless of the strength of the cable.

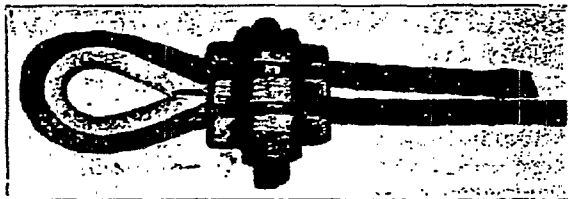
WEDGE SOCKETS FOR CABLES

Such a device is the wedge-socket. It consists of a tapered, hollow metal shell, open at both ends, with a metal wedge having the same taper. The wedge is grooved to fit the rope and the inside of the shell is likewise rounded on two sides to receive the cable. The wedge is placed in the bite of the rope and the cable inserted, ends first, into the large end of the shell. A pull on either end of the cable draws the whole down into the shell, wedging the cable into the rounded sides, where it resists the heaviest strains put upon it. In practice, of course, the unloaded end of the cable need be no longer than to project out of the socket.

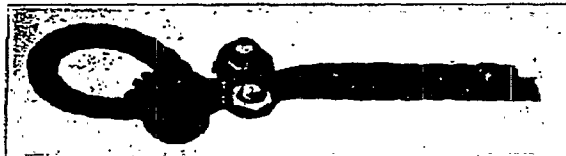
The wedge-socket was in use, in modified form, on elevator work more than twenty years ago, but was abandoned, presumably because it is not a "100 per cent" fastening, like the so-called babbitted socket when attached with zinc spelter by experts. However, it is becoming largely used now on heavy-duty excavating machines where clips, clamps and babbitted sockets of the common types have proved inadequate with the high-strength steel cables and the severe service demanded of them. As at present constructed, these wedge-sockets never fail by slipping, but can always be depended upon to pull the cable in two if tested to failure,



The cam-clip shown here is, like the wedge-socket, a self-tightening clamp. After being applied with a moderate initial tightening, it takes care of itself and the load without further attention. The gripping surfaces are grooved to fit the strands of the cable and after settling into them, the cable is obstructed from further movement. The shrinking of the cable under load, which causes ordinary clips and clamps to become loose, is counteracted by the cam, which takes up the shrinkage and increases its grip as the load increases. One cam clip in the various sizes assures an efficiency over 70 per cent, and two, up to 85 per cent or more.



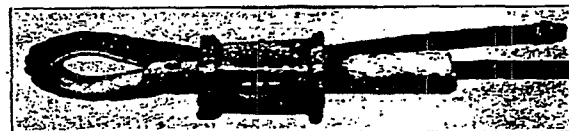
The U-bolt-operated friction clamp, shown here, is like all friction clamps. While less destructive to the cable than clips, they are less likely to take hold of the cable with sufficient effectiveness to support even a moderate working load. Wire-rope users for that reason have learned to distrust friction clamps and favor clips, because of their tendency to bite into the cable and take a positive grip on it. This single clamp would hold twice as much with the central and top pieces removed, making it a common clip. Several per fastening must be used and those carefully watched.



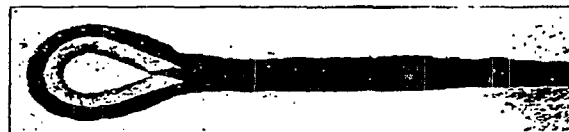
This fastening might well be termed the "Contractors' Stand-by." It has a double guarantee:—it guarantees an efficiency of about 50 per cent and it guarantees that the cable will break in the half-hitch under an appreciable greater load. The lesson taught here is that those who use this method of fastening cables, have learned from experience that it is more dependable than any other method of fastening cables; also, that they are willing to sacrifice any hoped for efficiency over 50 per cent in other ways by using this method which assures them a 50 per cent efficiency.



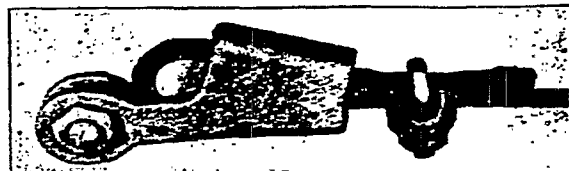
This "three-bolt clamp," as this is commonly known, derives its holding power entirely through the frictional resistance induced between the surcasses of the clamp and the cable by reason of the U-bolt pressure when the cable is under load. What is not generally understood in connection with its use is the enormous U-bolt pressure necessary to make it effective. The gripping surfaces of the clamp are smooth and the surface of the cable is not only smooth, but liberally smeared with grease making a co-efficient of friction between the two, of around one-tenth. To develop a breaking pull in the cable, therefore, means a U-bolt pressure ten times as great; this is all the more reason why the clamp must be watched and be retightened from time to time as it grows loose from the shrinkage of the cable with use and age. From two to six clamps per fastening are necessary to develop this strength.



This type of wedge clamp is used to a considerable extent on electrical line work. Its holding power depends entirely upon the thoroughness with which the wedge is driven home.



Spliced-in thimbles have an efficiency of around 90 per cent. This is five-eighths inch mild-steel cable and it required an expert at McCook Flying Field two and one-quarter hours to do this job of fastening. It is out of the question for anyone but an expert to undertake a job of splicing.



This is the wedge socket, assembled and ready for instant attaching. This clip is only lightly attached, to prevent the wedge from dropping out before the initial pull on the cable. It is practically infallible and foolproof.

giving an efficiency of from 70 to 80 per cent with a new cable. Doubtless, by increasing the length of the wedge and the shell, which would distribute the pressure on the cable over a larger area, higher efficiencies could be obtained, if desired, but as before mentioned, since hoisting cables are ordinarily used until worn to 65 per cent of their original strength, efficiencies of from 70 to 80 per cent in the fastenings are ample.

Effect of the lack of a standard cable fastening of any kind for the past one hundred years naturally has resulted in the appearance on the market of a large variety of clamps and, as could be expected with any commercialized article, price has largely controlled their use. The strength, reliability and efficiency of a clamp has today very little control over its use; price, in fact, has been everything. Consider the common clip. Its holding power depends largely upon the strength of its U-bolt; the average size in use is the $\frac{5}{8}$ -inch clip, *i. e.*, more of them are used than any other size. Today there are on the market $\frac{5}{8}$ -inch clips with $\frac{3}{8}$ -inch U-bolts, $\frac{5}{8}$ -inch clips with $\frac{3}{8}$ -inch U-bolts, $\frac{5}{8}$ -inch clips with $\frac{7}{8}$ -inch U-bolts, $\frac{5}{8}$ -inch clips with $\frac{1}{2}$ -inch U-bolts, $\frac{5}{8}$ -inch clips with $\frac{3}{4}$ -inch U-bolts and $\frac{5}{8}$ -inch clips with $\frac{5}{8}$ -inch U-bolts! And a $\frac{5}{8}$ -inch clip with a $\frac{3}{8}$ -inch U-bolt, applied by an expert, is likely to hold more than a $\frac{5}{8}$ -inch clip with a $\frac{5}{8}$ -inch bolt when applied by the ordinary wire rope user! With the wedge-socket the case is different, for it holds the same no matter how applied. However, if ever decided upon as a standard fastening, the design, dimensions and material of which it is to be made would have to be specified, otherwise commercial competition would cause its early relegation to the low scale of the common clip.

SUGGESTED MANUFACTURE OF CLIPS IN MULTIPLE

In many installations of wire rope it is impossible to use sockets advantageously, so clips of one kind or another will always be in demand. However, for the sake of safety, the common type of clip should be made much more uniform in size than is the case at the present time. For instance, the heaviest pattern of $\frac{1}{2}$ -inch clip now on the market has a $\frac{1}{2}$ -inch U-bolt and three of these are recommended by the manufacturer for use with plow-steel cable. Presumably that manufacturer has made tests and ascertained thereby that three of his clips, properly applied, give a reasonable efficiency in this case. He also recommends that no less than two of his clips should ever be used on any grade of cable. Now to prevent the ordinary, inexperienced wire rope user from not guessing the correct number, it would be a simple matter to manufacture three bases in one piece. This same manufacturer instead of using U-bolts $1\frac{1}{2}$ -inch in diameter with his $1\frac{1}{2}$ -inch clip and requiring three clips to the fastening as with his $\frac{1}{2}$ -inch clip, thus maintaining a consistent ratio, uses U-bolts of only $\frac{3}{4}$ -inch diameter with his $1\frac{1}{2}$ -inch clip and requires six to the fastening instead of three. There is absolutely no reason for this that outweighs in importance from an adverse standpoint the confusion it causes, yet all the manufacturers do it.

Clips on the market today are designated as "forged-steel clips" and "malleable-iron clips." "Forged-steel clips" have forged steel bases only, the U-bolts being made from mild steel rolled rods. "Malleable clips"

have bases made of malleable iron and U-bolts also made from mild steel rolled rods. For wire-rope clips, malleable iron is a more satisfactory material than forged steel, because, being softer, the wires imbed themselves in it without being damaged to the extent they are with forged steel bases. This feature, in conjunction with the more scientifically shaped gripping surface of the "malleable" clip, obtainable by the molding process and impossible to obtain by the forging process, makes the "malleable" clip the more efficient of the two, when of the same weight.

NECESSITY FOR STANDARDIZATION

Some manufacturers of forged steel clips refer to the "malleable" clips as "cast" clips for the purpose of creating the impression that "malleable" clips are made of cast iron. As a matter of fact malleable iron is as far from being cast iron as forged steel is. Cast iron is a commercial product used for making window weights and other cheap products of iron that get little strain of any kind. It is made out of old scrap that is worthless for any other use and after being cast receives no further treatment to change its structure internally. Steel, as everyone knows, is cast into ingots when it comes in a melted state from the furnace, but no one thinks of calling it "cast iron" although it would be, in the sense that malleable iron is "cast iron." Malleable iron is a prepared mixture with definite amounts of various elements, just as steel is; furthermore, after being cast into the desired shape it is put through a long, expensive annealing process that requires a minimum of six to seven days and sometimes as much as fourteen days to complete it. After the annealing process the iron has a different internal structure throughout, having about the same tensile strength as rivet steel, 50,000 to 60,000 pounds per square inch, and able to withstand severe hammering and bending without rupture. It is then known commercially as malleable iron.

Of course, any manufacturer can make poor malleable iron if he wishes, just as any wire rope manufacturer can make inferior wire rope, by trying to make it too cheaply. Forged steel is not necessarily a reliable material, for it, too, must receive a heat treatment before articles so made are ready for the market. Forged steel ordinarily is an extremely hard and brittle material immediately after the forging process is completed, unfit in this condition for use for wire rope clips.

It is obvious to the engineer that no matter what material clips are made of the stresses imposed by the U-bolts are relatively the same, and that therefore, for each clip to have equal strength, it is only necessary to proportion the material in the body to conform to the relative strength of the materials used—providing that the U-bolts are of the same size. The ratio of the tensile strength of malleable iron to that of heat-treated forged steel is closely 1:1.25. Also, the degree of hardness closely approximates their relative tensile strength, and hardness is not a desirable quality. Here again we see the necessity for standardization to establish safe designs, but to make sure conformity to standard dimensions every clip should be marked with the manufacturer's name.

Some wire rope users require galvanized clips, and often specify that they be "hot-galvanized." Their acceptance of "hot-galvanized" or electro-

plated clips without question, however, indicates that they do not know the difference. Hot-galvanizing means that the article is dipped into molten zinc to receive its rustproof coating. It is an easy matter to so coat wire rope clips but the threads of the bolts and nuts become so clogged with the metal that it is impossible to use them without rethreading which, of course, removes all the zinc; therefore there is no advantage to be gained by hot-galvanizing.

In the cold-galvanizing process, the zinc is deposited by hanging the article in a battery solution and depositing the zinc by electric current. All clip U-bolts that are galvanized are galvanized in this manner. There is another process of depositing zinc, in a gaseous state, called Sherardizing, after the name of the man who evolved it, but although very effective it is too expensive for commercial use with wire rope clips. Some manufacturers plate the U-bolts and hot-galvanize the bases, but there is no advantage in that; in fact, it is a decided disadvantage with malleable clips, as the heating incident to hot-galvanizing is quite likely to nullify the effect of the previous annealing and render the material brittle once more. Cold-galvanizing or electro-plating has no deleterious effect on malleable iron.

WEDGES OF DOUBTFUL VALUE

Among the various types of clips and clamps, there have appeared on the market several operated with wedges instead of bolts. These have the advantage of speed in application but little, if anything, more can be said of them, although it is claimed of some that they have a self-tightening action that makes them more reliable than common clips. Tests do not bear out these claims except where the wedges are made sharply saw-toothed on the side next to the cable, thus increasing the co-efficient of friction between the wedge and the cable over that between the back of the wedge and the shell of the clamp. Ordinary, unserrated wedges have a lower co-efficient on the side next to the cable because of the cable's natural smoothness and compressibility, which is further accentuated by the presence of grease on the cable. Telephone and telegraph linesmen use clamps with both smooth and serrated wedges and, in addition, three-bolt friction clamps and ordinary clips.

A few years ago there came out a patented cam-operated clamp which appears to meet all requirements as a safety device and be worthy of consideration as a standard clip. In appearance it is substantially like the common clip except that a cam has been added and is attached to the U-bolt, where it serves both as a self-tightening device and a pressure distributor for the U-bolt, thereby eliminating the danger of cutting the cable incident to overtightening the U-bolt. Its action is positive and effective, whether applied loosely or tightly.

Tests show the efficiency of this cam-clip to be between 70 and 80 per cent, used with the various grades of cable, including improved plow steel, and it appears to make no difference whether the cam is attached to the running (short) end or the standing end of the cable. These efficiencies were obtained by using but one clamp; higher efficiencies, up to 90 per cent, were obtained with two, the cable in every instance breaking inside the clamp, as is usual with all arrangements of clips and

clamps that will take a breaking test without slipping. The U-bolts of this clamp throughout the various sizes are in all instances the same in diameter as the cable and the other parts also proportionally made, thus insuring the same efficiency in all sizes. It is absolutely necessary, from a safety standpoint, that all proportions be maintained in this clamp. Designed for a 1-inch plow steel cable it has a U-bolt made of 1-inch stock. A U-bolt made of $\frac{1}{2}$ -inch stock would doubtless hold a 1-inch iron cable, but would certainly pull in two with a plow steel cable. This shows the necessity for making rules to prevent cutting weights, which is the inevitable result of commercial competition.

There are many other types of clamps, some of which are illustrated herewith, but it is not worth while to go further into an analysis of them here, the purpose of this paper being merely to aid the reader and particularly the wire rope user in recognizing the difference between dangerous and safe conditions in connection with the use of wire rope. There are still one or two details along the line of cable fastenings that are worth bringing to notice, one of which is the slovenly manner in which cables are attached to drums. Most building codes recognize this condition by stating that there shall never be less than three turns of cable on the drum. This will do all right for elevators, where the travel of the car is between fixed limits and where inspections are regularly made, but it is not sufficient for derricks, hoists and cranes where the full length of cable available is often needed to move loads out of ordinary reach. Many a load has been dropped and many a boom smashed by trying to use all the cable on the drum, and it isn't because of a sudden jerk either, but because the end of the cable inside the drum is not fastened at all. To be sure, clips are used, sometimes to fasten a loop around the spindle inside the drum and sometimes merely to act as a knob to prevent the end of the cable slipping through the hole in the drum-shell, but are not effective.

CLIPS INSIDE HOISTING DRUM

So far in dealing with ordinary cable fastenings it has always been admitted that there is a chance, at least, for a safe fastening, but here are two conditions that do not permit of safe fastenings. 1. It is a physical impossibility for a man to reach inside an ordinary hoisting drum and obtain a purchase with a wrench on the clips there and tighten them sufficiently for the cable to take anything like a working load. 2. There is no clip on the market of the ordinary type that can be effectively tightened against a single cable to serve as a "knob," either inside or outside of a drum, because usually the legs of the U-bolt are not threaded the full way and the space between the curve of the U-bolt and the concavity of the clip-base, therefore, cannot be taken up sufficiently to obtain a good grip on the cable.

The practice of using hexagonal nuts, usual with ordinary clips, is one that promotes danger and for that reason might well be discontinued. Here lies the trouble: With ordinary wrenches the corners of hexagonal nuts are easily abraded, often making it impossible to get a good purchase on the nut, and this is particularly true with worn wrenches. However, no wrench that is usable at all will fail to allow a

purchase on a square nut. The fact that the legs of the U-bolts of most clips are too close together to permit the use of square nuts argues nothing. As a matter of fact, competition and lack of standard specifications has resulted in bringing the common clip down to a mere shell in which even hexagonal nuts are with difficulty tightened, because of the lack of space for the wrench to work in. The correction of such details as these is what puts the real meaning into "Watch your step," "Safety First," and "Don't get hurt."

After an intelligent selection of wire rope has been made and it has been safely fastened, it lies with the hoisting engineer to see that it is intelligently used and thereby accomplish his hoisting work with safety and economy. If the printed tape has accomplished a part of its intended purpose, the engineer not only knows the type of rope to use but, by an inspection of the dimensions of the drums on the machine he uses, will be able to ascertain whether he is really going to work the rope or simply abuse it. Competition in the commercial handling of machinery that employs hoisting ropes is keen, and the most fertile means of reducing the cost of it is in reducing the diameter of the drums. Smaller drums mean smaller engines, smaller boilers, lighter weights and less cost, but it also means a more rapid deterioration of the cable and that sometimes amounts to downright abuse. Where cables fail to give satisfactory service, almost invariably the cause will not be found in the cables but in the manner in which they are used. The machinery salesman is not going to explain the trouble if it lies in his machine. The ordinary hoisting engineer is today not in position to locate it with precision and it is always convenient to point to a broken cable as a faulty one. Safety, therefore, demands a better co-operation between the office and the field, the theoretical man and the practical man.

AERIAL TRAMWAYS AND SAFETY

F. C. CARSTARPHEN (MEM. AM. SOC. C. E.), TRAMWAY ENGINEER,
TRENTON WORKS, AMERICAN STEEL AND WIRE COMPANY

Are aerial tramways safe? They are safer than you think they are!

In speaking of aerial tramways, I have in mind the particular system where the material to be transported is placed in receptacles suspended from stationary cables which are supported at various elevations above the ground. The carriers are spaced at definite time intervals, the distance depending upon the speed of the traction rope, weight of the unit load, and quantity of material to be transported per hour. The size of the track cable depends upon the weight of the carrier plus a portion of the traction rope. Different diameters of track cables are used to support the loaded and empty carriers. Wire rope, usually of Lang lay construction, is used to impart motion to the carriers which are attached to it by means of grips. The proper position of cables and traction rope is maintained by different types of supports, among which we may designate towers, curved rail stations, bent supports, double anchor, anchor tension, and double tension stations, also angle and intermediate control stations.

Such an aerial tramway can be built over any topography and operate with high efficiency and economical transportation of practically all kinds of commodities. Aerial tramways are occasionally built for the transport of passengers, but such lines are not included in this discussion.

During ten years of intimate contact with the design, erection, and operation of aerial tramways, I have not known of a single fatality. Not more than one-half dozen injuries among tramway operators have come to my attention; there may be more, but I have not heard of them. I am always on the alert for information of this sort.

It therefore appears that mortality statistics indicate the operation of aerial tramways to be one of the safest occupations. Intuition intimates that this record is favorably influenced by the operators being always on the alert. In other words, the unwillingness of the tramway operators to take a chance is evidence of the ever present feeling of danger, which is a natural trait of the race. The lack of fatalities in aerial tramway operation is further proof of the well known safety saying that "A careful workman is the best safety device."

Such few tramway mishaps as occur, are due to the following causes:

- (1) Tramway carriers becoming detached from the traction rope and running freely along the track cable.
- (2) Parting of the track cable, which drops the carriers upon the traction rope or to the ground.
- (3) Inability of the terminal mechanism to control the velocity of the tramway.
- (4) The possibility of material being shaken from the carriers and falling upon individuals or property along the tramway right of line.

In listing these specific sources of danger, it is to be understood that the design of the tramway shall be made with due regard to the protection of the crew, by calling for adequate guards for gears and counterweights, enclosing of belts and shafts with wood, metal, or rail guards, the use of safety set screws, the elimination of hazardous projections on revolving shafts, and proper means for opening the power connection. Railings should be used for all walks, and toe boards for those that are inclined. Railings should be provided for man holes or other openings in floors or platforms, and for stairways. The steps of the stairways should be equipped with safety treads. Buildings of the several tramway structures should be properly lighted. A careful code of warning signals to be used in case of emergency should be developed. The operator should be carefully instructed as to his duties and taught the principles of tramway operation. In so far as these safety requirements are common to practically all industrial enterprises, it is not necessary to discuss them further. Our attention will be directed to the hazards mentioned above as being characteristic of aerial tramways.

The system of aerial tramways which we have indicated in this discussion is very meritorious because the carriers possess great freedom of motion in the terminals. To attain this independence it is necessary to arrange the tramway mechanism so that the carriers may be attached or detached from the traction rope. Formerly, this operation was done

by hand. In the modern tramway, these operations are taken care of by automatic devices called "attachers" and "detachers," respectively. Frequently, one of the tramway terminals is built on the crest of a precipitous slope, so that the track cables leaving the station are inclined. It is therefore easy to see that if the automatic attacher failed to function properly and the carrier had sufficient momentum to cause it to leave the station, it would run unrestrained down the track cables. If the spacing was sufficiently great, this free running carrier might attain a velocity which would cause it to leave the track cable at the first saddle encountered, instead of striking the forward carrier. There is no hard and fast rule with respect to the behavior of free running carriers. If the distance between the carriers is moderate, the free running one will collide with its neighbor. As a result, both carriers may run wild, and one or both be thrown from the track cable.

It should be understood, however, that faulty operation of aerial tramways varies inversely with the skill of the operator. All tramway equipment is so simple and positive that if it fails to function, it is due entirely to the inability of the working force to make the necessary adjustments to keep the machinery in running order.

To return to our free running carrier. It is evident that if the attacher be so placed as to permit inserting a length of rail curved upward in the vertical plane so as to overcome the velocity of the carrier, in passing through the attacher, any carrier which is not attached to the traction rope will come to rest before leaving the station. This is a proper safeguard, and its use is justified where the outgoing cables have a down slope. The curved rail is not positive, because sometimes the drag due to the traction rope resting in or on the grip is sufficient to move the carrier over the rail crest.

If by chance the line rider was on one of the carriers struck by a runaway, his position would be precarious. It is very desirable to leave the bucket in the event of a collision. To this end, all tramway line riders should be provided with safety belts, similar to those worn by firemen. It will be recalled that this type of belt is equipped with a large snap hook which can be thrown instantly over the track cable, or preferably the traction rope, and when equipped with twenty inches of $\frac{1}{4}$ -inch chain will permit the wearer to leave the bucket on which he might be riding, and to control any slipping on the track cables or traction rope by a turn or two of the chain about the cable or rope. Although I have never seen a line rider imperiled in this way, yet I have often speculated on the subject, and heartily endorse the foregoing suggestion.

In order properly to guard the public, it is evident that all highways, railroads, wires, or other structures along the tramway right of way should be protected from falling carriers or material. Some bucket loaders become careless and permit the carriers to leave the terminal with a surcharge of material, which may be shaken off.

The most satisfactory and economical system of protection is by means of suspended guard screens. Such screens, because of their elastic prop-

erties, are ideal for the distribution of shocks, which would destroy rigid structures. While it is true that the operation of aerial tramways can be conducted in such a safe and orderly way as to preclude the probability of broken track cables or free running carriers, or falling bodies, yet the possibility cannot be eliminated. It is therefore always best as a safety measure to install guard screens above public places.

Electric motors are very satisfactory for the propulsion or control of aerial tramways. The induction machine when operating as a generator serves as an excellent dynamic brake, and is therefore in general use for this purpose, because alternating current is prevalent. Inherent characteristics differentiate it from the direct current motor in that an impressed frequency from an outside source of power is required to prevent it from dropping its load. Since power circuits are often interrupted or broken by lightning or other causes, the control of the tramway may be lost. Should the motor fail as a brake, those tramways which are built upon sufficient gradients to develop power will begin to accelerate. Usually this increase in speed takes place so quietly that it is not detected until too late to prevent the carriers being thrown from the track cables or derailed in the stations.

If the tramway should require power for its operation, then, when the motor fails, the tramway will reverse its direction of travel. Aerial tramway lines have been furnished in the past with manually applied brakes for their control should this emergency arise. It is much better to add auxiliary mechanical devices which in turn may be supplemented by hand brakes.

The first of these devices is a no-current relay which automatically releases the clutch connecting the motor to the tramway drive, and connects a brake so constructed as to take over the control of the tramway and permit its continuous operation until the power circuit is restored. Then the no-current relay again connects the motor to the tramway drive.

A solenoid brake if properly adjusted may be used to bring the tramway to an orderly stop, should the power circuit fail. The best type of control for tramways operating by gravity is a modified type of fan, called a sentinel brake, which is fitted with hinged arms supporting cones. These cones rest just alongside of the vertical shaft of the machine, thus offering a minimum of resistance in starting. As the shaft begins to move these cones are thrown outward by centrifugal force and offer a maximum amount of resistance to rotation. Like all pneumatic machines their power absorption varies as the cube of the velocity. Because of this, great variation in horsepower may take place, with slight changes in traction rope velocity.

On tramways requiring power, and which are driven by electric motors, it is evident that there cannot be continued operation if the current fails, and it is therefore necessary to prevent the reversal of the direction of motion. This is best accomplished by equipping the drive with a "reverse preventer." It is essentially a pawl and ratchet. The pawl is under the control of a centrifugal governor, which forces it into position as soon as the tramway stops. The governor control of the pawl

eliminates the distasteful noise which is produced if the pawl is allowed to remain in running contact with the ratchet.

It is well also to equip the tramway with a speed indicating alarm, which will call the attention of the operators to any change in the velocity of the traction rope equal to five or ten per cent of the normal operating speed. This instrument is similar to the well known speedometer except that it is fitted with adjustable contact points of an electric circuit containing a signal gong. When the bell rings, the crew may apply the hand brakes in time to bring the velocity to normal.

Having thus disposed of runaway carriers, a word or two may be said about grips. These devices should have a tractive power of twice the load which will come upon them. This hauling power should be independent of the slope of the tramway. It should also be practically constant at all points along the traction rope. This is mentioned, because the diameters of traction ropes vary throughout their length. The grip should rotate in the carrier frame, and should be placed so that traction rope guide sheaves can be used both above and below it, and thus prevent derailments due to excessive traction rope uplift or downward pressure.

A grip which meets nearly all of the specifications for safety must permit a difference of $\frac{1}{8}$ -inch in the traction rope diameter without loss of holding power. Such a grip may be used equally well in the top or bottom opening position.

The devices described reduce to a minimum the chance of accidents in the operation of aerial tramways. I am fully conscious that the merits of these safety devices, and others, cannot be fully presented in so brief a communication. It will have served a useful purpose if the safety features of aerial tramways are better understood.

DISCUSSION

Following the reading of the papers the meeting was thrown open for discussion. Mr. Hosler brought up the question of whether it was best to use rope clips or sockets in attaching the hoisting rope to the cage. In the discussion that followed it was brought out that the use of spelter sockets makes a neat and efficient form of attachment which is generally recommended by the manufacturers of wire rope. In practice, many engineers object to the use of sockets on account of their inability to get a first-class job done in attaching the socket unless the spelter makes a bond with the steel in the wire rope. A weakness in the socket is hard to detect; therefore, some of the operators prefer the use of rope clips.

In discussing the use of landing chairs or keeps, Mr. Kudlich explained that where hoisting was being done from several levels it is common practice to install a series of electric lights, so arranged that they will give warning to the hoistman when the chairs are in the shaft. The chairs are usually connected with a counter-weight that keeps them back in the clear and it is necessary for the cagetender to throw a lever in order to seat the cage on the chairs.

In discussing overwind and overspeed devices, it seemed to be the consensus of opinion that these safety devices should be installed not only for man-hoisting but for all hoisting equipment. In discussing the

speed of hoisting, attention was called to the fact that the laws in some States required that men shall be hoisted at a comparatively slow rate of speed, that in deep mines, in the sections of the country where the winters are severe, the men are exposed to extreme weather conditions if the speed is made too slow. These deep mines are usually quite warm in the lower levels and if it should take five or six minutes to hoist men to the surface they would become severely chilled, which would be injurious to their health. It was brought out that in the deeper mines, where modern hoisting equipment is installed, hoisting can be done with greater safety at a higher speed than it can be done in a shallow shaft less modernly equipped at a slower speed. It seemed to be the consensus of opinion that the character and condition of equipment should control the speed of hoisting, rather than the setting of maximum limits that work a hardship for the best-equipped shafts.

In discussing the overwind device and clearance at the top of head-frame or tippie, a criticism was made that in many places there was not enough clearance between the top of the cage and the sheave wheel, when the cage or skip was raised to the position of dumping, sometimes only two or three feet of clearance being allowed. It was the consensus of opinion that the minimum overwind distance should be never less than ten feet and where the hoisting is done at maximum speed there should be about twenty feet of clearance.

The suggestion brought out by Mr. Keator, that hoisting rope should be identified in some manner, was favorably received. The printing of the identification and strength of a rope on a ribbon which would be interwoven throughout the entire length of the rope seemed to be the most feasible suggestion, although there would be considerable difficulty in getting a ribbon that could be read because the ropes are usually lubricated with heavy oils that are likely to obliterate the markings, but the idea of permanently marking the rope in some manner so that the user could learn its strength and character without having to refer to a printed catalog or to a textbook seemed to meet the approval of those present.

The Chairman thanked those who took part in the program and told of the co-operative meeting that would be held at the annual meeting of the American Institute of Mining and Metallurgical Engineers in New York in February. Two sessions of this meeting will consider the questions of safety in mining and are to be held under the joint auspices of the Mining Section of the National Safety Council and the American Institute of Mining and Metallurgical Engineers.

The Section then adjourned.

Packers' and Tanners' Section

J. M. EATON, Chairman

Safety Department, Libby, McNeill & Libby, Chicago, Illinois.

W. L. McCLELLAN, Secretary

Armour & Company, Chicago, Illinois.

CHAIRMAN EATON called the meeting to order. The Secretary's report was read and accepted. In Mr. Drummond's absence the following paper was read by Mr. W. L. McClellan, who acted as temporary Secretary.

SAFETY DRIVES WITH NO-ACCIDENT WEEKS

A. B. DRUMMOND, MUTUAL SERVICE DEPARTMENT, WILSON & Co.

When it first became recognized that accidents were not a necessary by-product of industry, but rather an evil that could be controlled, the first step taken was the safeguarding of machinery and other physical equipment. While the results were well worth the expense and effort incurred, it soon became apparent that still better results could be obtained through the study of methods of operation—and the installation of better and safer methods showed splendid results in the decrease of accidents. It was not, however, until the important discovery of the third "M" in the trinity of accident production and accident prevention that the germ was finally recognized and "isolated" and the positive remedy realized.

I do not remember who coined the phrase "Every accident means there is something wrong with machinery, methods or men,"—but it is the acceptance of this truth and the sincere and persistent effort to "make everything right in machinery, methods and men, so there will be no accidents," that is placing safety more and more in the public limelight as an outstanding virtue and economic necessity.

Safety drives—whether they be days, weeks, months or years—have been generally considered as the spur that lifts the lagging horse to further effort, but it is more than that. Safety, it is generally conceded, is an educational movement and, following out this thought I like to think of the year-around accident campaign as a grade school with the various degrees of safety intelligence classified into classrooms running from the kindergarten to the graduating class. Through the printed page and the spoken word by precept and example, the teachers (superintendents, foremen and supervisors), with patience and courage, instill into the minds of their fellow workers the golden rules of safety first, last and always.

Safety drives, as I see it, should be likened to the old-fashioned spell-down or trial examinations which are held periodically in the schools. Under the close scrutiny and careful ear of the principal and teaching staff the pupils go through their paces, standing on their own merits, each one eager and anxious to make the best showing possible. If the spell-down or trial examination is held in competition with other schools how much harder the effort to be the victors! These spell-downs or trial examinations, too, disclose to the teaching staff the weaknesses and faults of the contestants and steps are taken to overcome these faults and weaknesses against the future. The best time to note what they can do is when standing on their own feet, really trying under competition. Then they should be at their best.

GOOD SUCCESS THROUGH SAFETY DRIVES

Wilson & Co., Inc., have been using the safety-drive method for a number of years with good success and we feel that the future will bring still better results. As I remember it, one of the first no-accident weeks held showed that all plants and branches but two completed the week with a perfect record! As time went on and more co-ordination and greater interest was shown, Wilson & Co., Inc., began holding no-accident months four times a year, on the first month of each quarter—namely, January, April, July and October—competing one plant against another and giving a trophy to the plant or plants with the most perfect record. During the July, 1922, no-accident Derby, we had two plants cross the finishing line with a perfect 100 per cent record, with a number of others crowding close on the winners' heels.

Safety drives are the means of furnishing a mutual topic for discussion among employees and engenders a departmental or plant loyalty which, under proper direction, can be enhanced and made to run in other channels to mutual advantage. Safety drives mean enlisting the active and sympathetic interest of everyone on the payroll, from the lowest-paid employee to the president of the company, and what but good results can be expected when all are playing the same game and thinking along lines in unison?

Standing on the sideline, watching a game being played which you do not understand, does not make a favorable impression on you, but when you have had the rudiments and objects of the game explained to you, and the "gang" invites you in and lets you take an active part, it grows to be a delight. Safety drives are successful because, like the Irishman says, "This is not a private fight, anyone can get in and welcome."

As to the length of safety drives, there seems to be considerable disagreement, but that can best be judged by local conditions. While you could not expect a five-furlong-dash horse to make much of a showing over the Derby route, neither should you expect a Marathon runner to show much interest in a 100-yard dash.

FATAL TO THINK SAFETY ONLY ONCE IN WHILE

Safety drives necessarily mean some additional expense, but through the concentration of effort the decrease in compensation and medical expense makes this a negative factor. And the confidence engendered in

the men from putting it over means much to the success of the safety movement, in the days between safety drives, in helping to overcome the tendency to slow up. Safety drives must be followed up by persistent effort continuously, for it is not intended, in any manner, to convey the impression that occasional or scheduled "spurts" will be sufficient to make the wheels go around. On the contrary, it is decidedly fatal to the entire safety movement to think safety just once in a while or when this spirit moves.

As the grade school is the basis of our national educational system, so should our safety work be systematized under sympathetic, patient, yet courageous teachers (superintendents, foremen and supervisors), whose experience and knowledge fit them to carry out the work in an efficient and continuous manner.

But let's also have the safety drives judiciously planned and carefully carried on after the fashion of the spell-downs, or trial examinations, so that on special occasions we will have the opportunity to stand in the limelight on our own merits—win and wear our justly earned honors bravely and proudly or courageously set about to learn how to do better next time.

DISCUSSION

MR. McCLELLAN: We have had quite a success with safety drives. I know we have decreased accidents in our plants 50 per cent. I favor a week's drive. We find the foremen are all keyed up by these drives and they keep on their toes for months afterwards. Our tractor department had no accidents and won the individual banner. The interest was such in that particular department that they kept going just as long as they could. Our butterine department had no accidents during the drive and at its conclusion continued in the same way for some time; I think it was a month and a half before the butterine department had even a slight injury.

MR. O. F. W. CROMWELL (Central Leather Company, New York): Sometimes if you do have an accident, either before the drive or afterwards, in a way it is the best thing that could happen. It is not important whether it be a serious accident or a minor one, except that it shows where they are falling down. It helps a great deal in instilling a sense of care—the plant may go for six months afterward and not have an accident.

MR. McCLELLAN: There is one thing about accident drives that we have to watch—you must not permit the spirit of the fight for the record to keep a man from going to the doctor if he has a slight injury, because serious infection may result. We watch that closely; if it is only a scratch he goes to the doctor's office.

MR. CROMWELL: Another thing you have to watch is that sometimes, in a drive, a man will get a scratch and not report it.

MR. McCLELLAN: We have had as many as twenty-five infection cases and have lost more by keeping the men from the doctor's office than if we had sent the men there in the beginning.

MR. V. D. SUTTON (Postum Cereal Company, Battle Creek, Mich.): Isn't it well, in a no-accident drive or contest of any nature, to count only

the lost-time injuries, not including the slight ones? In that way you would not discourage the men going to a physician for slight injuries which might afterward result in an infection.

MR. McCLELLAN: We count everything as an accident, slight or serious.

DRIVES CUT DOWN LOST-TIME ACCIDENTS

CHAIRMAN EATON: I think the object of the drive is to cut down lost-time and serious accidents, trivial accidents—scratches or cuts, that do not take a man away from his work for more than a half-hour or so—have never been counted as of sufficient importance to include in the report when making up the percentage as a result of the drives.

MR. McCLELLAN: That is very true. Still, in a drive, lots of plants would rather classify that kind of an accident as a trivial one.

CHAIRMAN EATON: Another question comes up in that connection: In starting a drive we imbue the foremen and the help with the idea of avoiding accidents. What is the result as to reduction? Is there any let up in speed? In my paper I touch on the subject of labor turnover but I do not go into the question of safety drives. I would like to know from those who have had extensive experience if there is a decreased production due to safety drives.

MR. McCLELLAN: I believe you gain in production, because the elimination of accidents tends to keep all the men on the job.

MR. CROMWELL: The impression a great many people have that caution means deliberation and slowness of operation is a great mistake. It is my conviction that a drive which instills ideas of caution in the minds of the men soon counterbalances any tendency at the beginning of the drive to operate deliberately, because the new confidence gained will permit them to work much faster at the finish of the drive.

DIVIDING ACCIDENTS INTO GROUPS

MR. CROMWELL: I have always divided accidents into two groups: The total number of accidents and accidents that cause lost time—in that way you can get at the core of the situation. Suppose you have thirty-six accidents a year in your plant; there might not be one that causes loss of time. Another plant may have only ten accidents a year, but all of the ten may cause loss of time. The plant that had thirty-six accidents looks to be a very bad proposition as against the ten, but if you consider only lost-time accidents you will see that the plant with the thirty-six accidents is away up on the list. One superintendent may pay a good deal of attention to small accidents; another superintendent may practically disregard them.

CHAIRMAN EATON: Our medical department and, in fact, every branch sends in reports of trivial scratches and cuts; on the margin of the report is shown whether or not infection has resulted. From that marginal line I know of the efficiency of either the trained nurse that has rendered first aid or the medical department officer—whether he has decided with reference to compensation for each case or not. I know just how efficient the medical department at that plant is. If I don't get weekly or monthly reports of trivial accidents I go after them and want

to know why. You can't run a plant without some cuts or scratches, especially in the canning industry, so your plan of separating injuries into two groups is a good one and both groups should be scrutinized very carefully. Trivial cuts and scratches should be watched, with a view to ascertaining the efficiency of the medical department; lost-time accidents should be scrutinized in order to ascertain the efficiency of subsequent dressings. I follow up the system of the medical department and then the question of care.

AGE OF WORKER AFFECTS RECOVERY

I might suggest that another feature is the age of the party injured. We had an experience in California in which a man 65 years of age was injured and in another plant, doing the same work, a man of 22 was injured; the man of 22 was back to work in two weeks, though he suffered a more serious injury than the older man, who was back to work in six months. I investigated to find why they had put that old man on hazardous work—they claimed they could not get young men. Then I went into the feature of hiring and found that in adjacent plants, something like ten miles away, they were able to hire young men at the same wage we were paying the old men for this particular hazardous operation. I had a comparison to work on and suggested that they eliminate the old men on hazardous work. They could hire them if they had to, but to avoid putting them on hazardous work.

DR. W. H. WOOD (Willard Storage Battery Company): On the matter of trivial accidents, even young men should sometimes be transferred—gotten out of positions where small accidents occur with frequency—because even small accidents, occurring with frequency or with a number of men, make for delays and consequent curtailing of efficiency. They should be removed to some other position and men more fitted to this work given their places.

CHAIRMAN EATON: What do you mean, the record being kept in the doctor's office?

DR. WOOD: Yes.

CHAIRMAN EATON: If you find a square peg in a round hole you would find a square hole for him to fit into?

DR. WOOD: Yes. Temperament has a great deal to do with it. Some men can handle rapidly moving stuff; others cannot. When a man begins to bump his thumb while doing his work it is possible that he may not be fitted for just that particular kind of labor. Then again, a man may have a tendency to drop heavy stuff. He could possibly be transferred and would be more fitted to handle work that required less muscle and more activity. A man may not have nimbleness and yet be able to handle bigger stuff. In other words, as you say, the round man in the round hole, and the square man in the square hole.

MR. SUTTON: Mr. Cromwell and I coincide in our opinion that it is very splendid to keep a record of trivial accidents, but in a contest we feel that it is much better that only the lost-time injuries be counted, because in our plant it has been proven that in any sort of a contest,

the men do not report trivial accidents—they feel their department will look that much worse.

I want to ask a question—Mr. McClellan has answered it in part. After a no-accident week or month is there likely to follow a reaction? Mr. McClellan's answer was in the negative. I would like to hear the experience of some of the rest of the gentlemen present. Is there an inclination to let down after a drive; is there a reactionary effect?

SAFETY DRIVE EFFECTIVE FOR SEVERAL MONTHS

MR. F. A. HASSE (Corn Products Refining Company): For a period of one or two months after a drive we have always had a better record than we had previously. The third or fourth month our accidents have a tendency to climb up again. We take into consideration, in safety drives, only where a man has lost one or more days. That is what we count as a lost-time accident.

CHAIRMAN EATON: I agree with Mr. Hasse and I think you gentlemen also agree on the matter of lost time. But the contest should be based on the actual time lost during the drive and not on a trivial accident, because the men cover up scratches and abrasions if they figure it is going to be charged against them in the contest.

MR. HASSE: If I were carrying on a drive I would lay particular stress on individuals reporting all small injuries.

MR. CROMWELL: Another point, we should get the safety drive down to every person in the plant. I think some foremen fail in getting it across to everybody, including the foreigners. Sometimes they only spread it to the more intelligent men in the department.

Our safety man goes to the various departments and notifies the foremen. We try to have the foreman pick out someone to explain what is wanted to all the men and to see that they understand the drive is on. We visit every department, pick interpreters who speak the languages of the employees, when necessary, and get it across to every employee in that way.

CHAIRMAN EATON: We will now have the pleasure of hearing a paper by Dr. W. H. Lipman.

THE DOCTOR'S OFFICE AND ITS RELATION TO ABSENCE FROM WORK

WM. H. LIPMAN, M. D., SWIFT & Co., CHICAGO.

The value and importance of medical service in industry has passed the experimental stage. It is just as necessary to arrange for this service as it is to carry fire or other insurance. Medical service is nothing more or less than health insurance. It was the custom a few years ago; when it was desired to emphasize the importance of medical service, to compare the workman to a machine. As it is necessary to inspect and repair machines in order to keep them in good condition, so is it necessary to provide medical service for the working force. The principle of the comparison is true, but it is inadequate. The human body is unquestionably a wonderful machine, but it is more than that; it is human and the machine is merely mechanical.

There is one great difference between a machine and a man or woman from the standpoint of medical service. In order to prevent accidents or damage to the machines it is only necessary to look after the various parts, but you cannot leave the responsibility of preventing accidents to the machine; but with people it is just opposite. Success in accident prevention depends almost entirely on the will and enthusiasm of the workers, protection of the machinery and other equipment being only of secondary importance.

It is to be regretted that there are no available figures on the number of accidents that occur each year in the entire industrial field in this country. The writer believes that one of the most important measures in the safety movement is to take steps to collect this information. From figures so far available it is, perhaps, safe to say that every person industrially employed meets with one accident per year; or in other words, there are about 35,000,000 industrial accidents in the United States annually. That is a great number and when we remember that the slightest of these accidents is potentially capable of causing prolonged or permanent disability, and even loss of limb or life, we can at once see the importance of providing prompt and adequate treatment for all accidents.

It was found early by bright and far-seeing men in industry—and the packing industry was among the first—that to have a doctor on the plant meant a great saving of time and a reduction of lawsuits to a minimum, with all the unpleasantness they bring.

GREAT ADVANCE MADE IN INDUSTRIAL MEDICINE

Like every other undertaking, industrial medical service at its beginning was not all that could be desired and medical men did not always grasp nor comprehend the true function of medicine in industry. However, it is no exaggeration to say that industrial medicine today is of as high caliber and governed by as high principles and standards as any medical specialty, and industrial medicine, in a sense, is a specialty.

The function of industrial medicine can best be expressed by one word, *prevention*; that is, prevention of disability with its attendant loss of time and other ill effects. When properly and thoroughly organized, industrial medicine should begin with physical examination of employees, either at the time applicants are engaged or shortly after. No phase of industrial medicine has been so grossly misunderstood as physical examination. It has been charged repeatedly that physical examination is used as a means of discovering a pretext for discharging some employee. As far as the writer is aware there was never any positive evidence that is was used in that way, and if it has it was only done in a few isolated instances, not sufficient to detract from the great service physical examination offers both the employee and the employer.

Physical examination has three purposes in view: *First*, to prevent placing a man or woman with a contagious disease among the working force. *Second*, to discover physical defects in order to prevent a man from taking work that may aggravate this defect. *Third*, it makes it possible to discover diseases of which the applicant is unaware and at

the time when a cure is still possible. It, therefore, can easily be seen that physical examination is of considerable benefit to the employee and to the employer.

It is often stated that physical examination gives the employer an opportunity to discover and take a record of physical defects and deformities and in that way prevent an employee from claiming compensation on the ground that these defects were produced by accident. That such information may be a help in cases of malingering is, of course, true but it cannot be too strongly emphasized that gathering this information is in no way the function of physical examination. Furthermore, while it is true that we meet with malingering in industry, as well as in every other walk of life, those who have had considerable experience with industrial injuries know very well that malingering, as a whole, is no more prevalent in industry than in any other human endeavor and that, after all, it plays but a small part in the expense occasioned by industrial injuries.

MAY PREVENT LOSS OF TIME AND SERIOUS RESULTS

Of course, it is in the treatment of accidents that the industrial medical man has his greatest opportunity to prevent loss of time and serious results. He attaches major importance to the slightest injury, because he knows full well what possibilities each injury holds. Anyone connected with the casualty department of an industry or, to go further than that, any foreman, knows that the injuries that do the most harm are those that are neglected and are not given treatment promptly after their occurrence. The best proof of this is that the few injuries that are neglected cause more disability and loss of time than the great majority of accidents, slight and severe, that receive prompt and adequate treatment. Infection of slight injuries that have not been treated is the most potent cause of loss of time.

After an injury has been treated the next important step in the care of a case is to follow it up to see that treatment is continued as required until recovery. Next to infection, failure to follow up the cases is one of the most common causes of disability. On the other hand, by following all cases closely and promptly they will respond and get well as quickly as the nature of the case permits. In this part of the work the doctor must co-operate closely, first of all, with the patient, which means that he must not only give him proper treatment but he must see that he is handled in the proper spirit and with due consideration. In that way the doctor will have no difficulty in securing the confidence of the patient and keeping it throughout the course of treatment. The doctor must also work hand and hand with the entire organization, in order that he may get the information necessary for a proper understanding of his cases and he must also keep the departments informed of the progress the injured men are making, to enable the department to arrange the work in accordance with the prospects of their men returning to work.

THE PHYSICIAN AND THE SMALLER EMPLOYER

So far we have been discussing this subject, to a considerable extent, from the standpoint of the larger packing house. We presume

that some of the members of the Packers and Tanners' Section belong to what is known as the small packers group and it is, therefore, in order to discuss medical problems as they affect organizations of their size. Essentially the medical problems of the small packing house are the same as those of the larger ones, the difference being only one of size. The injuries sustained, as far as our experience goes, are virtually the same.

We cannot expect every small packing house to keep a doctor on the plant all the time, but we believe that every packing house ought to provide good medical care for its employees, because it is cheaper in the end. It is poor business to try to economize too closely on medical expense, because one neglected case may cost a great deal more than was saved in the attempt to reduce medical expense. The writer has in mind a small packing house which was in the habit of dressing injuries on the plant and sent but few to doctors. It got along without any trouble for a number of years, but one day a man with a small scalp wound was treated at the plant and allowed to return to work—he died of lockjaw as result of the injury twelve days later. It is possible that treatment given this man by a competent physician would have prevented the lockjaw.

It seems to the writer that the best arrangement for a small plant is to have a nearby physician train someone at the plant to administer so-called first-aid treatment in every case and send the more serious cases to the physician for treatment immediately after first-aid has been administered. It is unwise to allow an untrained person at the plant decide which cases should and which cases should not be sent to a physician—the tendency is not to send enough. There is a temptation on the part of the injured, as well as the men in charge of the plant, to keep a man at work rather than send him out, but it is best for the men and for the organization rather to send too many injuries out than not enough. The only way to be sure that this is done is to have the physician train a responsible person at the plant in the safest steps to take in a given case, whether the case is kept at the plant or sent to the physician.

DOCTOR FIRST TO UNDERSTAND CONDITIONS

Another opportunity for the industrial physician to reduce loss of time is in the chance he has to promote safety. He is the first to know which department of the plant has the most accidents; in other words, which department seems to have broken down in safety work or for any other cause has had an increase in accidents. He is the first to know the departments that are negligent in sending their cases for treatment; in other words, he knows which department is furnishing the most infections and the most complications. The wide-awake physician can tell which department is in earnest in its safety work and which is not. If the same kind of accident frequently recurs in a given department he knows that the first accident did not teach anything and that no steps were taken to prevent a repetition. By pointing out these things to the head of the department or to the superintendent, as the case may be, in the proper spirit of helpfulness and co-operation, the physician will do a great deal to prevent loss of time.

One of the most difficult problems the industrial physician has to consider is that of malingering. As was stated above, there is not a great deal of malingering in industry, but we meet with it occasionally and when we do it requires a great deal of experience and considerable tact to overcome it. First of all, the physician must be absolutely certain that the injured is malingering, and that is not always easy—he must exhaust every possible means to assure himself that he is dealing with a malingerer. After he is convinced that the patient is malingering the physician must not be too slow to say so, but not until then. Many malingerers can be made to see the injustice of their attitude if they are approached properly, but the physician must never treat the injured rudely, even though he is convinced that he is dealing with a malingerer, because he will soon get the reputation of being a “rough neck” and then his usefulness to the men and to the company will cease.

DISCUSSION

CHAIRMAN EATON: Dr. Wood will answer questions. I think you gentlemen will agree that unless you co-operate closely with the medical department you will not secure the results you desire.

DR. WOOD: Your first impression and information is of great value. The doctor gets that from the patient. If the safety man is on the job and co-operating with the medical department he gets this information from the workmen and the foreman before they have a chance to talk it over and mix their impressions.

MR. J. I. FISHER (Safety Director, Willard Storage Battery Co., Cleveland, O.): I am a safety man and find in accidents requiring investigation that our medical department investigation and my own generally coincide. They go into it thoroughly and get the first impression from the man. When I go into the factory to make an investigation I find that witnesses generally describe the accident in almost the same manner as does the patient. This shows the close co-operation between the medical department and the workmen.

FIRST IMPRESSIONS ARE MOST ACCURATE

DR. WOOD: Two investigations made by separate departments get practically the same information. Twenty-four hours later if two investigations are made we haven't the same information.

CHAIRMAN EATON: Even if the safety man makes an immediate investigation, if the operator who was injured has moved a guard, inadvertently, or intentionally taken a risk, he won't tell you, but he may tell the doctor.

MR. McCLELLAN: Where we had a patient come in who had removed a guard, while the wound was being dressed he would tell the doctor how it happened. When he came to the desk of the clerk to make a statement he changed it altogether.

DR. WOOD: The psychology of giving information to the doctor is that we are trained from the cradle up to tell the doctor the truth.

MR. FISHER: We had a non-industrial accident about four weeks ago. The man came back in two days and said that he had been injured

in a certain department. Upon investigation I found he had been talking to a fellow countryman and had received information that led him to go to the medical department. He would have become a malingerer, but I gave him the honest facts and he got out.

DR. WOOD: A man's first interest is self-preservation and he gives facts accordingly. His secondary interest is a financial one—that is the reason your first impressions are real ones, so far as injuries are concerned.

CHAIRMAN EATON: Dr. Wood, from your experience, what is the best time for the doctor to take care of a case—just as soon as it happens? I mean an ordinary accident.

DR. WOOD: As early as possible. The first question, not only for treatment, but for information, should be "How did it happen?" The answer gives you an idea of how serious the infection may be, how deep the wound may be and what may have been carried into the wound.

If you treat a patient and want his co-operation you must bear in mind that the patient's first interest is self-preservation. The doctor's first interest should be the patient's interest. Fortunately, the patient's interest and the firm's interest are always one, but it is pretty hard, sometimes, to get the men to take that view. If you look at it in the light of the patient's interest first, the firm's interest is always just underneath, and you get the angle which catches all sides.

MR. FISHER: No doubt every company has interpreters; sometimes we use them in the medical department. I think it is a very good thing to investigate your interpreters.

CHAIRMAN EATON: Regarding their character or their interest?

VIEWPOINT MAY BE HONEST BUT FAULTY

DR. WOOD: Not only that, but their psychology. Their view may be an honest one from their own standpoint, but it might not be an honest view from the company's standpoint. On the other hand, it might not be an honest view from the patient's standpoint—I don't know which would be worse. It would be as bad to have their viewpoint biased against the company as it would be for the company.

CHAIRMAN EATON: Do you think it is a good system, where you are in doubt as to an interpreter, to call in one from another department?

DR. WOOD: He should be under the medical department's control—he should have absorbed the spirit of that department. Psychology is a wonderful thing and I think it would be well to leave the selection of interpreters to the medical department.

CHAIRMAN EATON: One section of Dr. Lipman's paper reads: "It seems to the writer that the best arrangement for a small plant is to have a nearby physician train some one at the plant to administer so-called first-aid treatment in every case and send the more serious cases to the physician for treatment immediately after first-aid has been administered." From my experience, you can't train a layman sufficiently for him to pass on the question as to whether a case is serious or not.

DR. WOOD: One trouble that might develop with your layman: He would begin to take pride in his work and see if he could not reduce the

amount of turnovers to the physician—he would have that tendency. It is human nature, when you are put in a position, to come as near filling it as possible. He would gradually feel that he could cover a little more, a little more, and still a little more. It would be very easy for him to over-step. I am not saying that it is not the best move; I do not see any other way.

CHAIRMAN EATON: Don't you think it depends on the size of the plant? There is the question of economics. Does it pay, according to the size of the plant, to have a physician instruct or train a layman, or would it be better, figuring on the number of employees, to have a trained nurse?

DR. WOOD: I think it would be better to have some one trained under the physician that the cases are to be referred to. Let the physician pick the man—give him the whole job; let him train the attendant. If the plant is not big enough to require all the time of the man on first-aid work there is no reason why he should not do clerical work as well. Have him directly under the physician; hired and directed by the physician; then the tendency would be to put the job through properly.

TRAINED LAYMAN OR NURSE

CHAIRMAN EATON: Do you believe, by following that principle, you would encourage the plant management, from an economic viewpoint, to prefer a trained layman who could do other work, where the plant is large enough to really afford a trained nurse?

DR. WOOD: If a plant is large enough there should be a trained attendant on the job all the time. If the plant is small, the main part of the man's job ought to be first aid; he could do other things incidentally, rather than do something else and render first-aid incidentally. He should be hired from the first-aid standpoint; if he is a clerical man, and if he has time, he could work on records and similar work. If he is not a clerical man there are probably smaller things he could do.

CHAIRMAN EATON: Dr. Lipman has given thought to the question of malingering, and of treating malingers. My experience with them has been that, if a man has been making a pretty fair wage and his compensation is less than half of what he has been making, he is not going to malingering. But in some cases, where they are making small wages and where the minimum compensation is more than half of what they have been making, then watch out for malingers.

DR. WOOD: Or they may have society insurance.

MR. McCLELLAN: Yes.

DR. WOOD: The bulk of malingers really have a mental condition. A man may not have been sick before and he does not know how serious his trouble is. If he does not feel well it amounts to a whole lot to him. He thinks it does not mean much to the company if he gets back to work or if he does not. He thinks: "I am not going to take any chances on getting worse." He is a little afraid.

Self-preservation has a lot to do with malingering. To get a man thinking that his whole interest is in self-preservation is to hold him

back. If you can get him to see that use at a certain time is better than no use—that he is going to have the same old job and that he will be watched to see that the job is not too heavy—then the man feels the company is looking out for him. He thinks: "They are paying me full time for only doing a quarter of the work." That is really the way that we cut down lost time. That is the psychology of the situation.

MALINGERING NOT SO PREVALENT AS SUPPOSED

If a man is a malingerer he ought not to be threatened; he ought to be relieved of his job. But I can't imagine so much malingering as we hear about. Of course, during hard times, the men report more ailments, such as strained backs, that you can't tell anything about—that is malingering. I don't know how such cases should be handled—you may discharge someone who really has a permanent injury.

CHAIRMAN EATON: They hand all records to the industrial board and to the board's physicians if they feel they are unjustly dealt with.

DR. WOOD: Some men do suffer strains and are laid up for months. If there happens to be an epidemic of strained backs just ahead of a lay off, it is pretty hard for the industrial board to say whether they are assumed or genuine—it is hard for anyone to say which are malingerers.

MR. FISHER: You find them among the Latin race more than any other.

DR. WOOD: Such things become contagious in certain groups. This subject was taken up at one time by the American Steel and Wire Company, with several other concerns, I believe.

MR. CROMWELL: What do you think about an examination of the employee before he is hired?

CHAIRMAN EATON: In some of our plants we need a number of men immediately for a certain class of work and they can't very well be examined before they start to work. The best plan is to examine them as they can be spared from their work—as the rush in that particular department lets up a little. When conditions are normal and the labor supply is plentiful, I believe in an examination before the men go to work.

MR. McCLELLAN: We had a physical examination. We hired the men, put them to work and then the doctor called them in and examined them. We know that this plan will work out all right, but it is a question of whether it would work out better on Monday and Tuesday morning or later in the week.

DR. WOOD: A firm might better have a sliding system than one that is hard and fast. You have busy hiring days and don't want to hold up production. While it might be all right at the end of the week, it does not always work so well in the beginning. When you have two systems you can slide along during rush times.

MR. McCLELLAN: What do you suggest?

DR. WOOD: You ought to have a partial examination—it would be superficial, simply to eliminate contagious diseases and hernia. Something should be done, otherwise there is danger not only to the work-

man, but to other employees and there should be sufficient medical examination to obviate that.

APPOINTMENT OF NOMINATING COMMITTEE

CHAIRMAN EATON: I will appoint on the Nominating Committee Messrs. W. L. McClellan, H. K. Batchelder and O. F. W. Cromwell.

GENERAL ROUND-TABLE DISCUSSION

Our next consideration is a general round-table discussion, the first subject selected being: "Auto and Hand Trucks; Their Hazards and Remedies." The second is a group of topics, "Lighting Systems," "Ventilation," and "Passageways, Floors and Stairways."

Floors and stairways are especially interesting. I have been impressing our various superintendents and plant managers with the necessity for the proper lighting of stairways, proper hand railings and the doing away with slippery floors. However, I am a little ahead of the subject.

All of us have hand trucks, I presume, and most of us have auto trucks. All of us have had injuries from hand trucks and although we may have had but few injuries to our own people by auto trucks we have injured outsiders.

MR. DUNCAN: By auto trucks you refer to the trucks that run around the plant?

CHAIRMAN EATON: Auto trucks that take up products both in and outside the plant. We have a small auto truck that takes the place of a hand truck. The subject also covers the automotive trucks that carry our products out of the plant. There are hazards, such as brakes, tires and steering gear out of order and the dangers attendant if all necessary precautions have not been taken before the truck goes on its work. The same applies to trucks that are not automotive. The pushed truck is one of the well-known hazards—inability to see what is in front of it makes it a hazardous method of operation if it is pushed instead of being pulled. There is the question of pushing trucks along the crowded aisles and running into things.

MR. McCLELLAN: The pushed truck is the greater hazard from the standpoint of furniture.

MR. BATCHELDER: We have had a great many accidents with hand trucks by workmen who pulled them up to a certain place and then walk off; someone would come along and fall over them. All trucks are arranged now so that when the truck has been pulled to the point where they want to stop, the man using it hooks the handle so it will remain up.

MR. CROMWELL: Is that the same way trucks are handled by railroads—when the truck stops the weight on the other end balances it and it will stand up?

MR. BATCHELDER: No. I never noticed anything of that kind.

MR. CROMWELL: Even with a coil spring there might be accidents. But if you have a weight on the end, when the handle stands up it is out of the way.

The man pulling a truck has the more hazardous position, compared to the fellow who is pushing; that is so in tanneries, because of slippery floors. A man may be pulling a heavy truck, and if he slips he may break both knee caps.

TREATMENT FOR SLIPPERY FLOORS

DR. WOOD: On some of our floors we use epsom salts, as well as on our tables. I read a paper on the subject a few years ago at the National Safety Council Congress. Such a system might be used on wet floors in tanning rooms:

MR. CROMWELL: We couldn't use it in a tannery—we would have to wash it off every ten minutes.

MR. BATCHELDER: Some one made the suggestion that we furnish hob nails to our men to put on their boots. We tried it out with great success.

CHAIRMAN EATON: That does not offer a solution for greasy floors. Would the epsom salt solution obviate greasy floors?

DR. WOOD: If you were to put baking soda or anything in the way of potash, soda salts or any potash salts on your greasy floors you would have a skating rink, but sulphates won't form soaps.

MR. McCLELLAN: We had a four-story department in our gut plant where the floor was smooth-finished concrete. Any time the room was wet and you stepped on a piece of gut you lost your footing. We had accident after accident and I tried various solutions, but with indifferent result. Finally, with a brush and mop, I ran some muriatic acid over a section of the floor and then turned the hose on it. The acid ate the smooth surface off the concrete and left it rough; we haven't had an accident since.

DR. WOOD: The industrial commission requires that wooden slats be used in the bathrooms. We have 135 shower baths and the floors become very slippery. We furnish the men a liquid soap to bathe with. The soap runs down on the slats, works into them, and they become very slippery. I go through the baths three times a week and I have to be very careful. We have never had an accident; we prefer the rubber matting to the slats. The matting would not do around a canning or packing plant, because the grease would immediately attack it.

MR. McCLELLAN: We are between the devil and the deep sea. If the floor is too rough the grease gets in and we cannot wash it out. If it is not rough enough, the grease makes it slippery.

DR. WOOD: You might try epsom salts; you will fill up the holes and yet not have a surface that grease will slide on, and the epsom salts will wash off. It should not saponify your grease.

BELLS AND HORNS FOR TRUCKS

MR. FISHER: We have twenty-five department trucks and have had a great deal of trouble in getting an alarm horn or bell to work properly—they were always out of order. I would like information on what kind of an alarm signal can be used.

MR. CROMWELL: I don't know that we use anything but an ordinary clap bell.

MR. BATCHELDER: We use the ordinary Klaxon horn.

MR. McCLELLAN: We have Klaxon horns on all our trucks.

MR. FISHER: We have used push buttons, where they work by hand ratchets. We have tried bells and electric bells; we tried push buttons on the handles; we tried handles that turned up, but there was always a failure somewhere.

MR. McCLELLAN: Bells that you push with your foot were not a success. We have had no trouble with Klaxon horns.

MR. FISHER: We use horns; we have to go around some bad corners and the accident hazard is there.

MR. CROMWELL: Do you ever have accidents from men riding on trucks?

MR. FISHER: No. The only people that ride in our plants are the men that run the trucks.

CHAIRMAN EATON: Doctor, I would like to have you say something about ventilation. That is a very important item in our industry.

DR. WOOD: A ventilating system, properly designed, is more effective than open windows. We have a large plant and our ventilating system, like all the rest, is well organized; in other words, it works with the windows and doors closed. Our ventilation is better in winter than it is in the summer. I am a thorough believer in artificial ventilation, unless the plant is small, and the system should be designed to operate with the windows closed. Unless you are pumping fresh oxygen in you have to get back to the significance of a man going into a building, where, no matter how fresh the air may be, he feels stuffed up because his eyes meet glass in every direction. We have a perfectly working ventilation system, but our doors and windows are open a good deal of the time during the summer. The air in the plant is changed every twenty minutes—you see, we have a lead hazard and a dust hazard. We go into such things more thoroughly than other plants could afford to.

CHAIRMAN EATON: Some of the girls who furnish the designs that go on cans complain of headache. That is eliminated by good ventilation, as a rule, but some of the girls have headaches. As a medical officer you would not have people work there?

TRANSFER AND PLACING OF EMPLOYEES

DR. WOOD: No. I believe in elimination and transfer. One of the chief services of the medical department should be to balance up the transferring and proper placing of employees, taking into consideration their peculiarities. Some people cannot stand certain odors; some cannot stand certain noises, it causes nervousness; some cannot stand everyone rushing, others cannot stand everyone moving slowly. When a real symptom, such as a headache develops, it is time to transfer them.

We know, for instance, that the Latin races cannot work around lead; the Slavic races are not similarly affected. There are certain reasons for that; we can trace it back to certain characteristics. If a doctor studies the hazard he may be able to tell definitely what class of people would be affected.

CHAIRMAN EATON: That is what I wanted to get at—which race was adaptable to that kind of work with the least serious results. I noticed also that females are more subject to headache in this work than the men.

DR. WOOD: That is probably true. Females are more susceptible to odors in any instance; their general make up is more sensitive. In departments where fine work is done female labor is more or less necessary. We might want to eliminate female labor, but we can't. The same organism that makes them more fitted for delicate work and more responsive to conditions makes them more responsive to odors, and things of that nature affect them.

MR. CROMWELL: Do any of you gentlemen know where I could get good spring faucets for washrooms? I have had that put up to me by several superintendents. If we do not have spring faucets the men go away and allow the water to run. We want to prevent this.

MR. FISHER: If you solve that you will solve a very difficult question. We have about 800 faucets and we have three janitors whose duty it is to keep the faucets and lights turned off when not in use. Did you ever find a faucet running that you could not turn off? You will find that if your water pumps from the power plant—the packing will come through and sift into the seats.

MR. CROMWELL: I have been repeatedly asked for a spring faucet to prevent leaking.

MR. BATCHELDER: I can give you the address of a company that sells such a faucet. It works just the opposite from the common faucet—when it is turned off the pressure of the water keeps the seat in place, so that it is almost impossible for it to leak.

SLIPPING AND FALLING HAZARDS

CHAIRMAN EATON: We have with us Mr. H. W. Mowery, who will give us a little talk on slipping hazards.

MR. H. W. MOWERY (American Abrasive Metal Company): The slipping hazard is extremely serious. The state labor department reports almost universally show that the greatest number of severe casualties are caused by falls. In New York City (Manhattan only) we average about 170 persons killed per year by falls on stairs and sidewalks; more than we have from fires, surface cars and elevators combined.

The slipping or falling hazard is great, not only in industrial life but is a public hazard as well. In the packing and tanning industries, owing to the conditions under which you work and the nature of the materials which you use, there are unquestionably many slipping hazards that must be guarded against. One of the principal hazards is in the use of metallic floor inserts—cast iron, steel, brass and other metal surfaces which people walk or pass over to and from their labor. Then you have terazzo floors or wood floors which are watersoaked, or have other materials on them of a slippery nature—grease, etc. Practically all of these hazards can be eliminated in some manner or another.

I have heard recommended the plan of painting floors and scattering sand thereon while the paint was wet, but that is a temporary makeshift; it is like putting ashes or sand on an icy surface in the wintertime.

You can overcome these hazards permanently. There are various materials on the market manufactured especially for the purpose. Iron, bronze, aluminum, rubber and tile now are made with a grit permanently embedded in the wearing surface. Rubber is mixed with an abrasive grit and vulcanized under high pressure, so that a material of high dielectric strength and anti-slip quality is obtained. It is extremely durable and does not become slippery when it is covered with water and grease.

You may also have anti-slip tiles—we all know how slippery the ordinary tile is. A tile is now produced in which carborundum is mixed throughout and used either in the small ceramic forms in conjunction with ordinary tile or alone as a solid floor surface. In this tile the slipping hazard has been eliminated.

CHAIRMAN EATON: We have had a very good meeting and all have benefited by the discussions.

The Section then adjourned.

WEDNESDAY AFTERNOON SESSION

CHAIRMAN EATON: I will call on the Nominating Committee for their report.

MR. BATCHELDER: After careful consideration your committee wish to submit the following names for officers of the Packers and Tanners' Section for the ensuing term: John M. Eaton of Libby, McNeill & Libby, Chairman; O. F. W. Cromwell of Central Leather Company, New York City, Vice-Chairman; W. F. McClellan of Armour & Company, representing the packers, Vice-Chairman, and H. M. Richardson of Oscar Mayer Company, Secretary. The committee suggests that the Chairman select the officers of the other committees. Respectfully submitted:

HENRY K. BATCHELDER,
O. F. W. CROMWELL,
W. F. MCCLELLAN.

(Upon motion the recommendations of the committee were concurred in.)

CHAIRMAN EATON: Our next paper will be given by Mr. H. K. Batchelder.

SAFETY AT THE TANNERY

H. K. BATCHELDER, A. C. LAWRENCE LEATHER COMPANY, PEABODY, MASS.

The man who undertakes to do safety work in a tannery probably has a more difficult task confronting him than men encounter in most industries, for he has a greater variety of hazards. A good many of these are peculiar to the leather industry and besides he is handicapped by a mixture of nationalities in the working force with which he has to deal.

The primary operations of leather-making necessitate heavy and wet work, combining the hazards of slipping, danger of being injured by machinery and also the chance of being burned by chemicals used in the tanning processes. Many of the operations are done by machines, ranging from large presses weighing tons down to the small machines used for cutting innersoles and welting, and the problem of keeping down accidents in the tannery is no easy one to contend with.

We find that the same initiative, good judgment, common sense and business sagacity are as indispensable to the handling of a good safety organization as in any other successful enterprise. The management must be entirely in accord with the movement and we can say in our case, from the time safety work was first taken up, the management gave it their whole-hearted support and backed the movement to the limit, sparing no time or expense to make the plants a safe place in which to work.

SAFETY CAMPAIGN AS OUTLINED BY LAWRENCE COMPANY

At the time our own safety campaign was started the A. C. Lawrence Leather Company was among the pioneers to take up safety work in Eastern Massachusetts, and with the full support and co-operation of the management we began our work by placing all the mechanical safeguards on the machinery and equipment which were thought necessary at that time.

We then turned our energy toward the educational phase of the work by holding monthly meetings of superintendents, foremen, master mechanics, the plant physician and all other persons interested in safety work. The general program was first to have a talk by as prominent a safety man as we were able to secure. After the address our accidents for the month were discussed and suggestions as to ways and means of avoiding similar accidents were talked over, followed by a general discussion on all matters pertaining to safety. Through these meetings great interest in the safety movement was stimulated and many valuable ideas were brought out. As a result of these meetings, the second stage of our safety program was accomplished, namely, the education of the organizations which was responsible for the results of the work.

After holding such meetings for several seasons, in connection with which we were continually getting the safety ideas across to the employees in different ways, we adopted the plan of organization and follow-up, which is now in operation, and carried it out as follows:

SAFETY ORGANIZATION AND HOW IT OPERATES

Our three plants at Peabody are divided into four major divisions: Sheep, Hide, Waters River and National Calfskin Company plants. A man active and interested in safety work is chosen from each of these divisions to represent his group as head of the safety unit for a term of one year. The duty of this man is to choose the members of the monthly inspection committee, which is comprised of three men in each unit, and their work is to make a thorough inspection of the unit and render a report of all hazardous conditions found. Members of the various committees are exchanged, so that a man on one committee has a chance to

inspect all units during his period of service. After the inspection committee has finished its duties and completed its work its report is gone over by the head of the safety unit, and any complaints or suggestions of a serious nature are personally investigated and considered with the committee by the head of the unit, after which the report is submitted to the chairman of the safety committee; after approval by the general superintendent the report is forwarded to the master mechanic for execution. If any of the recommendations are found to be impracticable the reason is explained to the head of the safety unit at the next monthly meeting.

Another committee is composed of the master mechanic, chief electrician and office manager and its duty is to make a special examination and report conditions in connection with all serious or fatal accidents; the object being to prevent future accidents of a similar character.

A monthly meeting is held which is attended by the chairman of the safety committee, heads of the safety units, plant physician and master mechanic. The inspection and accident reports for the previous month are discussed in detail, after which specific hazards—generally the hazards which result in the most accidents—are discussed, with the result that many valuable suggestions are brought out.

MEDICAL DEPARTMENT AND SUGGESTION DEPARTMENT

We have a hospital located at each plant and these are in charge of a physician and three nurses. All persons meeting with accidents or suffering illness, no matter how trivial, are immediately sent to the plant hospital and reports of the case are made to the main office both by the medical department and the foreman.

The suggestion department has been in operation for several months and all employees ranking below the assistant foremen are requested to submit safety suggestions for the removal of hazards of any kind or description; for this they receive a cash reward, based on merit.

PROPER PLACEMENT OF INJURED EMPLOYEES

The policy of the company has always extended to obtaining the proper placement of all persons injured in our industry, in view of securing them positions where they can develop for further advancement consistent with their ability.

STATISTICS ARE GIVEN PROMINENT PLACE

We publish periodically in our plant magazine departmental accident statistics in simple form, emphasizing the frequency of lost-time accidents, also their severity. These statistics are in graphic form, so that each department can see exactly the progress being made. From time to time we make our own bulletins through photographing particular hazards and injuries and publish these in our plant magazine, also placing them on bulletin boards and using them as pay-envelope inserts.

You may say "Yes, that all sounds very fine," and you will naturally ask "What have you actually accomplished in the reduction of accidents?" My answer is that we have completely changed conditions in our plants. I can remember when it was almost a daily occurrence to have men come to the office badly injured and in need of a doctor. In every tannery the

same condition existed and it was looked upon as a part of the game. Thanks to our work along safety lines, this condition is entirely changed and serious accidents are very infrequent as we realize that most accidents are preventable. We have educated our entire organization to take safety as a serious part of their duty to the company and their fellow-employees.

We have as complete a system of mechanical safeguarding as our organization could devise and install. Among a few of the most important installations of safeguarding, which have either eliminated or reduced to a minimum serious accidents, are the following:

PINWHEEL AND EMBOSSING MACHINE GUARDS

A positive spring lock for the shipper in connection with the pinwheel. Before installing this device a man would get his head and shoulders in the door of the pinwheel and if the shipper was not properly adjusted, or something hit the shipper which would throw on the belt and start the wheel, the result was that the man would be crushed between the wheel and the post supporting the same; this sometimes resulted in a fatality. Since the installation of this device we have had no accidents from this cause.

The embossing machine is a very dangerous piece of mechanism and men working on it were continually losing their hands and even their arms by being crushed between the plates of these presses. In our last accident, several years ago, a man lost both his hands. Through the activity of our safety committee guards were installed on these machines in the form of tables built wide enough so that it was impossible for the operator or feeder to reach under the plate. The operator and feeder are also furnished with flat sticks to smooth out any wrinkles in the stock; this was formerly done by reaching in between the plates. Since the installation of these safeguards we have not had a single accident on any of these machines.

STRIPPING MACHINE

The stripping machine in our cutstock department is another device which caused a lot of trouble in the past. This machine is a knife several feet long which comes down with a bang on a wooden block when released by a foot pedal; oftentimes the operator would take a chance and attempt to adjust the leather under the knife as it was falling, and this practice sometimes resulted in the loss of several fingers or even a hand. These machines are now equipped with a safeguard wherein it is necessary for the operator to use both hands in order to operate the machine, thereby making it impossible for him to reach under the knife while the machine is in operation. The device has entirely eliminated accidents on this machine.

SLIPPERY FLOORS, CHEMICALS AND GOOD HOUSEKEEPING

We put hobnails in the heels of the rubber boots of the men working in wet and slippery places, thus minimizing accidents from slipping or falling.

We formerly had a large number of accidents due to the careless handling of chemicals, but by the use of proper precaution in covering

the tops of carboys with burlap when loading or unloading, and the use of pumps in transferring acids from carboys to smaller receptacles in the factory, used as measures, we have greatly minimized the number of acid burns.

We do not allow the slightest letup in our safety campaign; by carrying on the work we feel that we are relieving a lot of unnecessary suffering and expense to our men, in addition to making a substantial saving to the company.

DISCUSSION

MR. MOODY: What kind of floors have you got? Concrete?

MR. BATCHELDER: We have all kinds. Most accidents occur on wooden floors, which are more or less greasy.

MR. MOODY: Do you supply your workmen with shoes or do you supply hobnails only?

MR. BATCHELDER: We supply the nails; the men have some one put them on their shoes.

MR. CROMWELL: Hobnails are all right until they become worn, then they slip all over.

MR. McCLELLAN: Have you a guard on the front of the fleshing machine?

MR. BATCHELDER: No. There are many machines in the tanning industry that it is almost impossible to guard—you cannot get the stock into the machine if you use an ordinary guard. We have what is called a Sheridan embossing press—a difficult machine to guard. The men formerly fed the skins into it and if a skin wrinkled the man would take a chance and attempt to smooth it out—if the plate came down he would get caught. A good many accidents occur in small plants because of this machine. We put on a guard, so that a man can only reach in so far; if he has a wrinkle, we furnish a stick with which to smooth it out. We haven't had an accident with an embossing machine for five or six years.

MR. T. H. PLATT (Endicott-Johnson Corporation): How are they operated, by trip or overhead? We had trip machines, but eliminated hazards by putting in an overhead system where it was necessary to pull with both hands.

MR. BATCHELDER: We tried that type of guard. You can't pull it down with one hand, ordinarily, but our men hitched the two together and used one hand instead of two.

CHAIRMAN EATON: We will now have a paper by Mr. W. L. McClellan.

EMPLOYEES' REPRESENTATION WITH REFERENCE TO SAFETY

W. F. McCLELLAN, ARMOUR & COMPANY, CHICAGO.

At meetings and conferences of this nature it is customary to talk about the foremen's place in safety work. For years we have had this subject before us until now, I believe, it is not unfair to say that field of

discussion is exhausted. Do not think for an instant that I mean to intimate that our talks here are not worth while, or that the working of this safety mine would not produce some valuable nuggets. We would not be where we are today were it not for the attention which, in the past, we have devoted to educating the foreman and convincing him that he is the keystone of the arch.

Now it is time, I believe, for us to reach directly the men whom the foremen supervise. We have made some efforts at this in the past but I believe, to a great extent, they have been abortive. We have gone at them in a pedagogical way, telling them the best safety device was a careful man and that the injured paid heaviest for his accident. We have posted bulletins and we have consumed many columns in house organs and we have stuffed pay envelopes with brightly colored safety slogans.

All of these things have stirred up some interest in the minds of the men in the ranks. We have realized this and we have tried safety committees with some success. It is my purpose today to explain to you what we have been doing along safety lines at Armour & Company, through the energy supplied by our employees' representation plan. Pardon me if I take a minute or two to explain what this plan is. I promise I will not discuss its merits or treat it from any point of view except accident prevention.

The Armour plan provides for a conference board composed of an equal number of employees and management representatives—the management appoints its members and the employees elect theirs by secret ballot. Working under these are four divisional committees, where both sides to the agreement have equal representation, picked in the manner I have mentioned. There is a general conference board for all plants, which is not necessary to discuss here. The committees and plant conference board deal with all local problems of interest to employer and employee. They settle such subjects as rates of pay, hours of labor, working conditions, health and sanitation, waste elimination and accident prevention. The conference board has original jurisdiction in some matters, but as a rule is an appeal body. For the purpose of facilitating work there are several standing committees of the conference board on which both management and employees have equal representation. I will discuss only one of these, the safety and accident prevention committee.

MAKEUP OF CONFERENCE BOARDS

Each of our plants has a conference board and each board has a safety and accident prevention committee. In Chicago, where I am most familiar with the workings of this body, the safety committee is composed of the safety inspector of the plant, the general timekeeper, an hourly paid machinist who has shown a special interest in safeguards and who, before he came here, was formerly a master mechanic for another concern, and a clear-thinking laborer—a veteran in the service of Armour & Company. We four get together for a little discussion on every serious accident. We do the things which would naturally be done under the old conditions by management representatives alone; that is, we try to find the real

cause of the accident, prevent its recurrence and educate the men to avoid this hazard.

But the work does not end with this committee. When the next meeting of the conference board is called one of the employee members is on his feet before the meeting has progressed five minutes, demanding that some immediate action be taken to prevent a repetition of the carelessness or conditions which brought about this injury to his fellow worker. The plant conference board wants to hear this too. They will stop discussing wages and other vital subjects to talk safety. Think of it, gentlemen, at the same meeting of the conference board at which the question of a reduction of wages was up for consideration the board spent the greater part of its time laying plans for a "no-accident week" in eight of our largest plants.

A few months ago the conference board made plans for our second semi-annual "no-accident week" at the same meeting a readjustment of hours was up for consideration. These two incidents prove, to my mind at least, that where the worker is given an equal representation with the management in the discussion of questions concerning his welfare he will place his personal safety upon the same plane with his livelihood.

Let me describe to you the routine work of our safety and accident prevention committee. Every month the committee of four makes a trip of inspection about the plant. No one knows we are coming and we drop in on a department when a superintendent and the workers least expect us. As soon as an injury-breeding spot is found, we stop, call in the department superintendent and the men working on the job and demand satisfaction. If we don't get it instantly a report is sent to our plant superintendent and, gentlemen, I want to tell you right here that means immediate action. I have been making inspection trips day in and day out for years. I have used up many reams of white paper in writing reports and making recommendations for mechanical improvements.

EVERYONE CO-OPERATES WITH BOARD

But this committee, composed of both employee and management representatives, gets what it wants instantly—everyone co-operates with it. Let me cite an example: A few days before I came here one of the employee representatives on one of our divisional committees discovered a hazardous place in an out-of-the-way nook of our power-house which had to be visited by a temperature man every hour of the day and night. He had reported this before and had been assured that the place would be repaired as soon as it was possible to get mechanics to do the work. When the safety committee got this report from the employee representative in the mechanical division they fired over to the superintendent's office a request for immediate action. The day after this report was received in the chief's office mechanics were found to do this work and the spot is now safe. Our form of accident reports does not suit the safety committee and these men are now working on an improved system of tabulation which we hope will give us a better line on just what Old Man Carelessness does in our packing-house.

I have referred previously to our "no-accident weeks," which are run every six months under the direction of the safety and accident prevention committee of the plant conference boards.

A "no-accident week" was held by eight large plants of Armour & Company, from May 22 to 27, inclusive. These plants are located at Chicago, Kansas City, Omaha, Sioux City, East St. Louis, Fort Worth, St. Paul and St. Joseph. The number of employees who participated in this drive in these eight plants totaled 20,000 persons. Six months ago a similar drive was launched at these same plants and the banner was won by St. Joseph. It has been decided since then to make this a semi-annual affair and it has proven to be a very popular event.

The method used in arriving at the percentage of accidents is based against the actual number of employees at work in each of the plants each day. For example: On the first day of the drive Chicago had 6,711 employees with a total of 9 accidents for the day, or a percentage of 0.13. Kansas City, with 2,811 employees, had 4 accidents, or a percentage of 0.14, etc. This principle was followed through for the entire week—showing the actual count of employees for each day at all plants. Telegrams were received every morning showing the numbers of employees at work the previous day and the accidents for that day. After all were received the Chicago plant, in turn, would wire each of the plants, giving the standing of accidents to date for all plants.

PLANNING A "NO-ACCIDENT" CAMPAIGN

Wide publicity was given to this "no-accident week" by way of advertising in the plant magazine, which is known as the *Oval* and is printed at all plants and distributed to each employee. Safety posters from the National Safety Council were distributed to all departments and placed in conspicuous places where they could easily be seen. The pictures showed the results of carelessness and thoughtlessness and cautioned the workers to be ever careful and thoughtful in their daily work. Safety buttons were also distributed throughout the plant to all employees and these were worn all through the week of the drive. It was not uncommon to run across men who still had their safety buttons from the first "no-accident week," held six months ago, and who had been wearing them continuously since that time. They said they were a daily reminder to be careful.

A personal letter was addressed to each employee by the superintendent in all of the plants included in this drive, telling them about the "no-accident week," in which a personal appeal was made to them to make a good record for their plant and also for their department and outlining in detail the results of accidents. These letters were signed by the superintendents of the respective plants.

At the noon hour it was interesting to see the hundreds of employees gathering around the score boards which were erected in several places through the plant, and which showed the standings of the different plants; many of the employees cheered to show their enthusiasm.

Various talks were held by the plant superintendents and safety inspectors, urging the men to be ever careful to avoid accidents and also urged them to bring first honors to their own plant.

The accident prevention committee of the plant conference board was in charge of this safety drive. The committee consists of three members from the management and three members from the employees. This is a permanent committee and acts on all matters of safety and accident prevention throughout the year. All details in connection with this work were handled by these men. The employees were cautioned to report any accident, no matter how slight, to the doctor's office and not try to cover it up in order to make a good showing for their plant.

Accidents during "no-accident week" were reduced 50 per cent. The effect of this drive reflected itself the following week by showing a great reduction over the number of accidents occurring before the drive was made.

NOT ONE SERIOUS ACCIDENT DURING CAMPAIGN

Chicago won first place and the banner by having the remarkable record of only forty-four accidents, none of them serious, for the entire week out of 7,000 employees. Kansas City showed the next best record with a total of 43 accidents among 3,000 employees.

It was also decided to award a pennant to the department in each plant which showed the least number of accidents during this drive. However, in Chicago, there were so many departments that had no accidents for the week it was suggested that the pennant be awarded to the division having the least number of accidents. There are four divisions: Pork, beef, production and mechanical. After this was agreed upon the pennant was exhibited in each department of the division winning the pennant for a few days and was then placed on permanent exhibition where it could be seen by visitors who might come to the plant.

Another feature which had a prominent part in this safety drive was a series of lectures in safety given by the National Safety Council and was known as "The Foremen's Training Course." Twenty-six of our foremen graduated from this course and it was pleasing to note that not one accident occurred during "no-accident week" in any of the departments managed by these foremen.

The work of the safety committee does not end here nor does the safety work of the representation plan end with the committee. Each employee and each management representative on the board wears a badge of identification while he is on the job.

I have told you, to the best of my ability, what has been done for safety through the employees' representation at Armour's. But all this would have fallen flat had we not had a safety enthusiast sitting just inside the door of the office marked "superintendent." Mr. Myrick D. Harding, the superintendent of our plant, has held up the hands of the safety committee on every occasion; he is a thoroughly practical man, who approves of safety both in theory and in practice. It is easy for the conference board to inspire interest in accident prevention when the

members have an enthusiast to support them as the man is in the superintendent's chair.

DISCUSSION

CHAIRMAN EATON: Any questions? I am sure that Mr. McClellan will be glad to answer.

MR. MOODY: What do you call an accident in a "no-accident week?"

MR. MCCLELLAN: Our committee decided that an accident was anything that caused an abrasion of the skin; they included sprains. We counted everything that went into the doctor's office as an accident.

A MEMBER: What effect has the council meeting had on the regular safety organization?

MR. MCCLELLAN: I know of one; it keeps them on their toes. They never know when the committee is going to drop in on them and the foreman knows that he cannot fire a man for coming to the front with a suggestion. If you are working for a foreman and you call his attention to something and you do not get action, you may call in the employees' representative; he will soon find out why action has not been taken; or, better still, if there is no meeting and it is a serious matter, he will report to the chairman of the divisional committee.

MR. E. G. LAUGHLIN (Chicago Safety Council): You have no employees' safety rallies?

MR. MCCLELLAN: Only when we are holding drives.

MR. CROMWELL: Don't you think it better to hold meetings every two weeks?

MR. MCCLELLAN: We seem to think the system is all right.

MR. CROMWELL: I think it keeps you more on your toes.

MR. MOODY: It might be interesting to hear how we handle that at the Cudahy Packing Company. We have the employees' representation plan. As a consequence of the organization of the conference board, in the four plants where we have it in effect, and the institution of certain committees, we discontinued our plant safety committee—the safety committee of the conference board took over the work.

Our safety committee varies in size from eight to as many as fourteen or fifteen; the chairman is elected by the committee and it is generally an employee who is elected. Our safety committee has no authority, but the effect of its recommendations is almost the same. They make a plant inspection once a month. We divide our plants into divisions. For instance, if our committee is one of eight, we divide the plant into four sections. If it happens to be a committee of twelve, we divide it into six sections.

EMPLOYEES' INSPECTION INSURES INTEREST

The committee makes inspections of all the departments in their particular division and recommends improvements, such as the guarding of machinery, etc. We find that by having employees make inspections, with other representatives, we get them interested and they know what constitutes a dangerous condition more than some managers' representative might. As a consequence, we have obtained a great many very

valuable suggestions and materially reduced accidents in each of our plants.

MR. PLATT: Do you have just one safety committee working with your council?

MR. McCLELLAN: Yes. The committee works with the general plant conference board.

MR. LAUGHLIN: How do you maintain the interest of employees in safety without some sort of a meeting for them every now and then?

MR. McCLELLAN: I go around the plant and make safety talks; it takes about three months to reach every department. We also use moving pictures during the colder months.

MR. MOODY: We have employees' representatives in the plant and have multiplied our benefits in that way—it doubles the number of men that have an interest in safety. We discuss the various matters and the men have seen the effect of employees' representation. They are convinced that the company is backing them up and is making every effort to improve conditions.

Each month a report of the accidents that have occurred is made by the nurse in charge of each plant. The report is divided into departments, showing how accidents occurred in each section and whether they are minor or lost-time accidents. By having this report turned over to the safety committee we get an additional benefit.

The superintendent calls the safety committee together and they discuss departments where the number of accidents appear to be unduly large, considering the number of employees and the type of work in which they are engaged. They decide at the meeting to investigate conditions in such departments. The method of procedure is the appointment by the safety committee chairman of a sub-committee of four members. They go to the nurse in charge and obtain the individual reports covering each accident in the particular departments they are analyzing or investigating. Those are looked over and they discuss possible remedies with the foreman of the department. The committee goes right at the proposition of finding out why, how, where and when the accidents occurred. They go to the particular place and see if there is something they can suggest which will remedy the condition that brought about the accident.

EMPLOYEES ANALYZE CAUSES OF ACCIDENTS

We have just started the analyses of accidents and it is surprising how helpful they are. In one department there were a considerable number of eye accidents and upon investigation we learned just what the causes were—we immediately took steps to prevent similar occurrences. We practically eliminated the eye accidents in that department which were preventable.

Employees show a deep interest in following up safety features. We are going to broadcast that feature of our work by sending a letter to each employee in the plant, explaining the developments that have occurred through investigations of the sub-committee of the safety accident committee.

MR. McCLELLAN: That is the way we work.

Mr. Moody: We are trying to spread the information of what is being done and, as a consequence, the employees' representatives get into the matter.

CHAIRMAN EATON: The next subject is a paper by myself.

SAFETY ORGANIZATION AND ITS MONEY VALUE

J. M. EATON, LIBBY, MCNEILL & LIBBY, CHICAGO, ILL.

The monetary returns to and the improved working conditions brought about, resulting in better understanding of mutual problems and actually better and more cheerful working hours for employees, in the plants of corporations having efficient safety organizations functioning through not only prosperous periods but also periods of depression, can be easily understood by those who come in daily contact with safety problems. We should, however, gather the facts and present them in concrete form, marshalling such information under the subject to which it rightfully belongs in order to convince those who do not understand and therefore fail to acknowledge the money value of safety work as well as its value from an industrial relations standpoint.

REDUCED LABOR TURNOVER

Large and expensive labor turnover is one of the constant worries of the plant superintendent, increasing his production cost to an extent not realized by those who look to him to keep down operating expenses. If he is fortunate in having efficient foremen and a properly functioning plant employment department, he knows that the manufactured article turned out by his plant, if his various skilled and unskilled labor gangs are kept intact, will not cost in excess of the amount figured out in advance and will enable it to be sold at a profit in competition with goods of similar manufacture.

Avoidable or preventable accidents often take from the ranks of skilled as well as unskilled labor men who cannot be spared and necessitates their immediate replacement by new help which is incompetent or, if competent, sufficiently unfamiliar with conditions and surroundings to prevent its being able to keep up the percentage of output which was effective previous to the accident. This new help, while being trained, is a liability instead of an asset and the wage cost during such training, on an average, is 50 per cent loss. Any foreman of a department where there is machinery or other equally hazardous operations knows that new help is worth practically nothing to him the first day, little more the following day and only increases in real service value as the employee becomes familiar with the machinery, the safety appliances, the duties, and accustomed to his surroundings. There is then a relaxation of both foreman and new help from strain, with machine-like workmanship, increased and efficient production; the help being then classed as productive and actually earning, under the skilled leadership of an efficient foreman, the wages paid.

The plant with a skilled safety supervisor and inspector, and where the size of the payroll justifies a complete safety organization, will not

have its labor turnover costs unnecessarily increased through avoidable industrial accidents and the morale of its workers will be of the highest, with resulting pride in achievement and the enthusiastic co-operation of all concerned.

REDUCED INSURANCE PREMIUMS

In taking up the next item of this discussion, or the reduction of insurance premium costs as a result of an efficient safety organization, the insurance department of the firm or corporation is easily shown as a very important cog in the wheel of successful plant operation. Such a department of any corporation or company, employing a large labor force, and therefore amenable to the compensation acts of the various states—if on the job—will keep in close touch with the safety department, and if, as with our firm, those two departments are combined with the personal-injury claim department, under one head, thus enabling close co-operation in its various activities, the insurance companies handling the risks are kept busy figuring on reductions in rates and on credits, etc., as a result of the constantly decreasing cost experience at the various plants.

Premium rates as fixed by the rating bureaus of the various states are usually considered correct, according to the hazards involved in the plant operations. If, however, your insurance department is familiar with these hazards and assists the insurance company in properly classifying them, your premium cost can, as a rule, be considerably reduced, and you will find the up-to-date insurance broker more than willing to assist you in obtaining the reduction due by presenting your correct classification to the bureau.

Another feature to be considered is that often, in the larger plants, too many employees of a department, although in separate buildings, are classified in the more hazardous operations; whereas if the insurance department, with the co-operation of the safety supervisor and the time-keeper, will separate these classes of labor according to the actual hazards of operations when preparing the yearly audit, the corresponding reduction in premium rate on a part of them can be readily obtained from the insurance company.

A very common ground for complaint is the failure of the underwriting departments of some insurance companies to obtain changes in classification of the operations of their assured on account of their not studying through personal observation the actual operations themselves. As a consequence they are unable to present the question of classification change intelligently to the State Insurance Department when such action is necessary in order to effect a reduction in rate. Here, then, is another avenue through which your safety engineer in co-operation with the insurance department can be of actual monetary value to his firm, by presenting in simple, yet clear-cut comprehensive figures, the actual hazards involved.

Thus you can readily see that the safety man, who is using every argument with the executives of his corporation at the present time to convince them that his department is essential and to prevent the curtailing of his activities, if not familiar with the classifications to which

the operations of the various departments of his firm's business belong, should acquaint himself at once and see that the insurance department of the firm is likewise familiar with them and is insisting that their insurance carrier or broker follows up these items closely with the state rating board or bureaus, obtaining credits and reductions in rates, where due.

INCREASED PRODUCTION

We now come to the effect of a safety organization on production and from close observation of many of our most hazardous operations we have found that protection to the operator of a hazardous machine enables him to go ahead without fear and to turn out more product; whereas, previously, although he may have been an experienced and skilled operator, he was subconsciously aware of the danger and was compelled to curtail his output at times when he found that he was nervous and could not figure on being so sure and skillful in the manipulation of the machine. By protecting all skilled and unskilled labor from danger through guards on machines, gears, belts, etc., you secure a continuous machine-like flow of product through the various production channels and without interruptions on account of the stopping of machines, shutting off of power and breaking down of morale as a result of injuries.

Nothing will throw a force of men or women workers (whether skilled or otherwise) into confusion, with resultant breaking down of productive efficiency, quicker than a serious accident to a fellow-worker. When the plant manager realizes that his failure to properly guard a machine or educate an employee along safety lines has resulted in a serious injury to a skilled workman who is hard to replace, with resultant stopping of machinery and production in that department and with the department's morale shot to pieces and output for the day seriously curtailed, he realizes the value of safety work with reference to production standards.

Summing up the monetary value of a safety organization we find:
1. That in actual figures the labor turnover saving is approximately 5 to 10 per cent. 2. The insurance premium reduction will run from 20 to 35 per cent in states where there are no rate supervising bureaus, from 5 to 10 per cent in states that have such supervision, and greater or less in monopolistic states, or states which forbid outside insurance companies from operating therein. 3. That the amount of increased production depends on the number of hazardous operations which can be efficiently guarded, so that the operators can increase their speed without danger to themselves.

SERVICE ON SAFETY COMMITTEES AN HONOR

In conclusion and with respect to the safety training obtained by the various workers in the plant, the fact of being assigned to serve on a safety committee is considered an honor by the average worker and where plants are large enough to have a workmen's committee, in addition to the executive or general committee, it is an educational value to the various workers who become members, in that it makes them an asset to the firm even after their term expires. The safety idea, having been thoroughly drilled into them, becomes an habitual thought, constantly cropping up

in caution and advice to their fellow-workers, saving not only themselves but others from serious injury and also the firm unnecessary lost-time and labor turn-over cost.

DISCUSSION

MR. BATCHELDER: I am interested in some of the figures you quote relative to a plant of 2,000 employees with no safety organization and a similar plant with a safety organization. What do you base your figures on?

CHAIRMAN EATON: On my own plant, experience in Chicago; our medical office reports, and my own statistical records. Before I went into the organization we had no safety proposition. I remember the doctor's office mentioning handling so many new accidents a day.

MR. BATCHELDER: I had a report, brought out at random—April of this year—and it checks very well with your statement. We have a good safety system.

MR. CROMWELL: I find from statistics that we have more accidents to men aged 21 to 30 than we have in any other series of ages.

MR. MOODY: Minor accidents?

CHAIRMAN EATON: Yes; the men are back at work in a week, as a rule. About 33 per cent of accidents last more than two weeks; you will find there are older men who cannot recuperate as rapidly as the young fellows.

MR. CROMWELL: Accidents are more serious to older men.

CHAIRMAN EATON: I make it a point to place older men on less hazardous work. Where this is not a practical proposition I see they receive special training in safety work—this will cut down your experience cost a great deal. That is the system I follow and insist on in our various plants.

MR. CROMWELL: When a man is injured and you replace him with another employee, you do not mention the fact that you have a bigger hazard there.

CHAIRMAN EATON: I mentioned the fact that in order to train him his actual monetary value for the first day is nil, a little more the next day; it probably takes a week before he begins to earn the money that you pay him.

MR. CROMWELL: You also have the added hazard of his being injured because he is not familiar with the work.

CHAIRMAN EATON: Now, if there is nothing further, I will consider a motion to adjourn.

The Section then adjourned.

Paper and Pulp Section

August 29 and 30, 1922

W. A. GLEASON, Chairman

Safety Director, Hammermill Paper Company, Erie, Pa.

ADAM WILKINSON, Vice-Chairman

American Writing Paper Company, Holyoke, Mass.

MISS EMILIE RAUB, Secretary

Dill & Collins Company, Philadelphia, Pa.

TUESDAY MORNING SESSION

CHAIRMAN GLEASON: Due to conditions we are just emerging from in the paper, as well as other trades, the work of the Paper and Pulp Section has not made the progress we hoped for during the past year. We do not wish to convey the thought that we have not gone forward, because the work of the members of the different committees was ably carried on.

Arrangements were completed for a series of articles with photographs illustrating some of the methods adopted to prevent accidents. The first article, "Safety in the Yard," was written by your Chairman and outlined the hazards of loading, unloading and piling of material necessary to the manufacture of paper and the hand tools necessary to the industry. Other articles were as follows:

"Wood Room"—Hand tools, handling wood on and off conveyors, sawing, barking, washing and chipping wood, chip bin dangers.

"Sulphite Mill"—Digester hazards, wet floors, screening and washing stock; handling and mixing bleach.

"Beater Room"—Trucking and piling stock, wet and slippery floors; carelessness around beating engines.

"Paper Mill"—Drying, calendering, rewinding paper.

"Finishing Room"—Cutting, trimming, sealing, packing, shipping.

These were by Mr. Rosebush, Mr. Drumb, Mr. Steffen, and other members of this Section. The articles created a great deal of comment among the members.

I attended the sessions of the Executive Committee at Detroit on April 10. The reports of the General Committees outlining the problems of this and other Sections were received and discussed; also passed on

the Safe Practice articles to make them as applicable as possible to the industry. Arrangements for the Congress were also discussed and we trust that you have and will share in its many activities.

An effort was also made to follow up cancellations of membership, due to the severe hardship suffered by some plants. We have the assurance of former members that they will renew their affiliations just as soon as it is possible for them to do so.

The standardized report showing accidents in paper mills, published in an issue of *The National Safety News* some time ago, proved interesting to members who had compiled reports and gave them an idea as to how they compared with other mills. No doubt you will hear more about this from Mr. Sandel.

Through the kindness of Mr. Bullock of the American Paper and Pulp Association a bulletin was sent out asking members to send representatives to the Congress and to support the efforts of the Program Committee. Since the completion of the program a letter was sent to all the leading mills in the New England and Middle Western States, whether members of the Council or not, outlining the program and asking them to send representatives and bring their safety problems to the Congress.

We will now hear the Secretary's report.

SECRETARY'S REPORT

During the year 1921 and 1922 nine new members have been added to the Paper and Pulp Section, making a total of 133. The work of the Section has progressed favorably during the year and while membership has not markedly increased, due to conditions, the Section hopes to make a more favorable showing as conditions are changing for the better.

The various committees have been active and in touch with the Chairman, the Bulletin Committee furnishing two bulletins each month and has kept the Section supplied during the year. The Membership Committee, on advice of the National Safety Council, has not made very strenuous efforts to push the membership campaign. The Program Committee has been active and arranged a program which speaks for itself.

I should like to recommend that the Chairman and Secretary be selected from one locality. The Secretary could be of much more assistance to the Chairman if meetings could be arranged and the work talked over. Respectfully submitted,

EMILIE I. RAUB, Secretary.

REPORT OF THE BULLETIN COMMITTEE

M. G. HOYMAN, KIMBERLY-CLARK COMPANY, CHAIRMAN.

Members of the Committee are as follows: Robert M. Altman, Marathon Paper Mills, Rothschild, Wis.; W. J. Peacock, Northern Paper Mills, Green Bay, Wis.; Ellis Frampton, Hammermill Paper Company, Erie, Pa.; F. W. Braun, Employers Mutual Liability Insurance Company, Wausau, Wis., and Raymond A. Steffen, Champion Coated Paper Company, Hamilton, Ohio.

I am pleased to say that every member of the committee contributed material for the bulletins of this Section.

On Feb. 7 and 8 there met at Green Bay the following members of the above committee: Mr. Altman, Mr. Peacock, Mr. Solensten of the National Safety Council and M. G. Hoyman. Through the courtesy of the Northern Paper Mills the meeting was held at their plant. The purpose of the meeting was to talk over and plan the most desirable subjects for bulletins, using such data as we could get and trying to determine the accidents that happen with most frequency.

After spending considerable time determining what subjects should be photographed for bulletins a photographer was brought in and various pictures were taken. These pictures, with the material furnished by the other members of the committee, have kept this Section very well supplied and have been satisfactory, we hope.

APPOINTMENT OF NOMINATING COMMITTEE

CHAIRMAN GLEASON: I will select as members of the Nominating Committee Mr. M. G. Hoyman, Kimberly-Clary Company, Neenah, Wis.; Robert Altman, Marathon Paper Mills, Rothschild, Wis., and Raymond A. Steffen, Champion Coated Paper Company, Hamilton, Ohio. They will report at tomorrow's meeting.

IMPROVING FOREMANSHIP

F. THEODORE STRUCK, ASSISTANT DIRECTOR OF VOCATIONAL EDUCATION, STATE DEPARTMENT OF PUBLIC INSTRUCTION, HARRISBURG, PA.

Foremen hold a unique and an important place in industry. On the one hand a foreman represents the men; he has come up through the ranks, he knows his work and understands the point of view of his workers, for he has been, and to a considerable extent still is one of them. A successful foreman is a leader. His opinions are highly regarded by the men and his efforts can be expended so as to be of much value to them.

A foreman, on the other hand, represents the management to his men. He has been selected as a foreman because he has proven himself to be a good workman, because he has given evidence of unusual ability and because he has been loyal to the firm. As foreman, the obligation rests upon him to instill and perpetuate that same loyalty on the part of his workers toward the management, to interpret to the men the policies of the company and to present to the management the points of view of those he supervises. He is the connecting link between the men and the management and his success will depend very largely upon his ability to understand, to analyze and to harmonize, when possible, the points of view of the men and of the management. Foremen must not only be fair in their dealings, but should be able to instill in others the point of view that has won them recognition.

Foremen, almost without exception, owe their position, to a greater or less degree, to the fact that they have an inquiring or a "problem-solving" attitude of mind. They are big enough to want to know all

about their work. I have said that foremen know their jobs. This is true in so far as a knowledge of the production end is concerned, but sometimes it does not carry over to some of those responsibilities that are peculiar to foremanship. For example, a worker's main job often consists in doing a certain kind of work that is more or less difficult, that is, mastered during a learning period before he becomes a foreman, whereas a foreman's job may involve (1) supervisory responsibilities, (2) managerial responsibilities and (3) instructional responsibilities, some of which are relatively new to him.

QUALIFICATIONS OF A SUCCESSFUL FOREMAN

It must not be taken for granted that a man who is an expert workman, one who "knows his job" thoroughly from the production standpoint, is necessarily a good instructor. It is true that one must know his job thoroughly before he can successfully instruct others in it, but he must be able to do more than that. The following is required for good instruction:

Ability to do the job—This includes the necessary technical knowledge and skill required.

Ability to analyze the job—This means, for the purposes of instruction, a careful and detailed inventory of the teaching content of the whole job.

Ability to arrange the instruction in a good teaching order. A good instructional order is not necessarily a logical order, but one that closely combines theory and practice; one that stimulates interest on the part of the learner. It must frequently be adapted to fit in with production requirements.

Ability to effectively impart the instruction—This requires a thorough knowledge of what is to be taught, a keen interest in the learner, an understanding of how to teach and some capacity to instruct others.

Ability to measure the results attained—Instruction from a production standpoint is of value only in so far as it results in achievement on the job. This final step of checking up the effectiveness of instruction is important.

Organized or systematic instruction is much more effective than haphazard instruction. As competition increases it will be more and more necessary to provide carefully planned instruction. It is wasteful of time, human energy and destructive to materials, tools and equipment to have learners "pick up" their occupational knowledge and skill. Modern foremanship definitely involves more or less responsibility for instruction. Even when there is a special training department, with a separate instructional staff, it will be necessary to secure the co-operation of all foremen. The latter will want to be informed and are competent to give help.

WAYS OF IMPROVING FOREMANSHIP

There are a number of ways of improving foremanship, some of which are more effective than others; among them are the following:

By means of "trial and error" on the job.

By means of reading and individual home study.

By means of organized home study or correspondence courses.

By means of lectures or illustrated talks.

By means of foremen's conferences.

One or more of these methods may be used to advantage, depending upon such conditions as: The time available, the nature of the instruction, the personnel of the group and instructional means available.

Very good results have been attained through foremen's conferences in which small groups have met in round-table fashion to discuss ways and means of self-improvement. This type of a foremen's conference may be illustrated by some that have recently been conducted by Mr. Frank Cushman of the Federal Board for Vocational Education, and also by the writer at the Hammermill Paper Company of Erie, Pa.

The conferences were intensive in nature. The groups of foremen met for five hours each day for two weeks. There were about sixteen foremen in each group. They met in a room in the service and personnel department building. The room was equipped with a large table, comfortable chairs, a blackboard and a blank paper chart about 3 by 4 feet in size. Much of the illustrative material that was developed during these conferences was wanted for future use, so it was placed upon the large paper sheets where it would be available to the men individually and collectively.

The conferences centered around the idea of job analysis as a means to improving foremanship. Each foreman made careful and detailed analyses of his various responsibilities. These were analyzed as to his supervisory responsibilities, his managerial responsibilities and his instructional responsibilities. Each foreman analyzed his own job, assisted by questions by the conference leader and by questions and suggestions by other foremen. It is evident that the main purpose of the conference leader was to assist the foremen to make their own analyses rather than to have him act as an outsider who tried to tell the foremen how to better their work. The latter method would not have succeeded as well.

After the problems of job analysis had been mastered, consideration was given to questions involving various types of co-operation, such as horizontal co-operation or that with other foremen, and vertical co-operation or that with workers on the one hand and with the management on the other. The success of American industry is due, in a large way, to our ability to produce high-grade goods quickly and economically. This is the main reason why we can pay men twice as much as English and four times as much as German employers. "Co-operation" is a fitting keystone for the arch of efficient production. The discussion on this topic was decidedly interesting and profitable.

ROUND-TABLE CONFERENCES FOR FOREMEN

After considering and discussing the most important elements of good instruction, arrangements were made to have each foreman teach some one thing to another foreman who had no previous training of that kind. This served several purposes; first, it placed each foreman in the position of a learner. This was valuable as it frequently happens that experts do not fully appreciate a "green" man's difficulties in learn-

ing something new; secondly, it placed each foreman in the position of an instructor who was closely watched and criticized by the other foremen of the group. Criticisms were reserved until after the completion of the instruction. Lastly, it showed clearly that a mastery of technical knowledge and trade skill does not in itself assure success as an instructor. In view of the fact that nearly all of the foremen had instructional responsibilities this little teaching practice, under supervision, was very helpful.

The foremen all attended voluntarily; the management of the Hammermill Paper Company did not care to have attendance upon any other basis. There is an exceptionally fine spirit in the plant; one of the company's slogans has for years been "Teach, don't boss!"

In order that the superintendents might be kept fully informed about the progress made and the conclusions reached in the foremen's conferences, the conference leader met the superintendents' group for half an hour daily.

Modifications of the intensive, round-table conference method of improving foremanship are being used quite extensively in Pennsylvania and elsewhere. Frequently this takes the form of a general meeting that may be attended by several hundred foremen. At this meeting some person presents or "opens" the discussion of some problem of mutual interest. This may take thirty minutes. At the conclusion of this presentation the foremen divide into small discussion groups of from ten to twenty persons. Each of such groups is in charge of a discussion leader. All discussion leaders meet before or at the close of the conference to compare results and to plan for the next conference.

Foremen's conferences of the latter type have been held in our State during evenings, one evening per week for perhaps ten weeks. The State Department of Public Instruction has co-operated in this through local boards of education and with the University of Pennsylvania. In other instances similar foremen's conferences are conducted by individual plants and sometimes on practically an all-the-year-round basis. Often foremen's conferences are discontinued during the summer when many persons are away on vacations.

Instruction such as has been described is not an overhead expense and not an experiment of doubtful value. It is, in the true sense of the word, a sound investment—one that has demonstrated its worth as a means of promoting alike the welfare of the men, foremen and management.

DISCUSSION

CHAIRMAN GLEASON: We had two courses in foremen's training in our plant. The first was conducted by Mr. Frank Cushman of the Federal Government. The second was conducted by Mr. Struck. Both courses were of invaluable assistance to us and to our foremen. The detail of the courses was handled as follows: We brought the foremen together for five hours each day, two hours and a half in the morning and two hours and a half in the afternoon. Mr. Cushman took personal charge and by means of questions brought out the information he desired. At first the

foremen were somewhat reluctant, not knowing his idea in bringing them together and getting information from them, but after the courses were finished the foremen and superintendents were very enthusiastic in their praise. The foremen went into the plant and instructed the workers regarding their work.

The analyzing of the jobs by the foremen was very instructive. Some of them learned things regarding their work they never knew before.

OTHER COURSES TO FOLLOW

MR. LARSEN (Marinette and Menominee Paper Company, Marinette, Wis.): How do you go about it to get the instructors? Did they offer their services or did you ask for them?

CHAIRMAN GLEASON: We got in touch with them through the educational department of the state. They offered their services at no expense whatever. They did not care to have any of the officials of the company in for the session; they just wanted to be closeted with the men. The Federal authorities offer this course to anyone and I would recommend it very highly.

MR. G. M. HAFENBRACK (Nekoosa-Edwards Paper Company): Do you intend to make this an annual feature or do you think one session is enough?

CHAIRMAN GLEASON: A little later on, maybe next year, we will carry on other classes. We planned at the time to have two classes by State and Federal vocational officers, and, later, one by Mr. C. B. Milner, assistant employment manager, who plans to carry on the work.

MR. DRUMB: Were the classes particularly adapted to the paper industry or to any industry?

CHAIRMAN GLEASON: To the paper industry, but they could be adapted to any industry, in principle.

MR. A. P. COSTIGAN (Secretary, Ontario Pulp and Paper Safety Association): In your training on safety problems, do your men all receive training?

CHAIRMAN GLEASON: Yes. The policy of the company is to have safety directed on the job.

MR. HAFENBRACK: I notice that Director Struck says that there was no obligation or pressure brought to bear on the foremen to attend these meetings. What would be your attitude if the foreman did not attend? Was he made to feel that he should attend?

CHAIRMAN GLEASON: We selected the foremen to take the course and only one out of thirty-two dropped the work. They were very willing to come into the session, and there was not one who did not express himself as being satisfied and benefited. They were somewhat reluctant the first day, before learning just what lines the classes would follow, but after that, they were enthusiastic.

CHAIRMAN GLEASON: The next paper will be given by Raymond A. Steffen.

THE GOGGLE PROBLEM IN A PAPER MILL

RAYMOND A. STEFFEN, CHAMPION COATED PAPER COMPANY, HAMILTON, OHIO

At a time, such as the present, when the prevention of accidents is so much under discussion and when Safety First is the slogan upon the banner behind which all here assembled are marching, it might be interesting to know just how the conservation of eyesight might be promulgated in the paper and pulp industry.

In the United States the total of industrial blind is approximately 15,000 or 13.5 per cent of the total blind population. Blindness resulting from industrial causes is the greatest single cause. In the State of Pennsylvania last year there were 550 eyes lost from industrial causes and this State reports that, since the year 1916, 3,364 eyes have been lost for which compensation to the amount of more than \$4,000,000 has been paid. In the State of Wisconsin last year there were 826 cases of eye injury for which \$606,284 was paid. During the year 1921 there was no case of the complete loss of an eye in the paper and pulp industry, as far as statistics are obtainable, but during the year previous five cases were recorded.

WHAT IS THE GOGGLE PROBLEM IN A PAPER MILL?

The first problem in a paper mill is to eliminate, as far as possible, the necessity for using goggles. Look over your plant and ascertain the number of movements which you might eliminate or the machines you can guard in such a way as to make the wearing of goggles unnecessary. Thus you simplify your problem and at the same time prevent many accidents. Some of these methods will be mentioned farther on.

The second problem is to educate the worker to realize the necessity of wearing goggles wherever a hazard is met. A hard and fast rule to this effect should be issued by the head of the firm and all superintendents, foremen and safety committeemen should know this rule.

It is advisable for each worker who does any work hazardous to the eye to have his own pair of goggles. He may either buy them himself or they may be loaned to him by the firm by which he is employed. Where goggles are loaned to employees it is the best plan to have them issued from your first-aid room, where possible, or from some other centrally located point, such as your storeroom department.

WHERE GOGGLES SHOULD BE WORK

Whatever method is employed, make them easy to obtain. We cannot stress this point enough, as it is one of the prime requirements of a "wear-your-goggles" campaign. When goggles are issued the workman may sign a slip, showing that he has borrowed same and, in case the workman quits, the cost is deducted from his pay. To attempt to give every employee, free of charge, a pair of goggles is an endless job and one which only invites trouble.

At this central distributing station all broken goggles can be repaired and all goggles be sterilized immediately upon being received. This last is very important. Probably the simplest method is to dip the

goggles in a formalin solution, made by putting three teaspoonfuls of 40 per cent formaldehyde into a quart of water.

Probably no other industry has such a variety of skilled and unskilled craftsmen, with attendant hazards, as the paper and pulp industry. First of these are the paper-makers. In most paper mills these men are subject to acid burns from sulphuric acid used in cleaning felts. First, be sure to provide your workers with inclinators for acid carboys or barrels and provide them with suitable goggles to protect their eyes from splashing.

Workers around bleaching tanks should be provided with goggles when engaged in work which might cause the bleach to splash into the eye. Goggles for these operations should be constructed with rubber frames and lenses of clear optical glass and kept in place with elastic headbands.

Silicate of soda is used in paper mills for making splices, etc., and this material has a tendency to crystalize around the edges of the cup or barrel or on the floor. Suitable goggles should be worn when cleaning up any amount of this material.

Some plants use an overhead crane for transporting rolls of paper from place to place. At our plant we received many complaints from operators because of dust, dirt, pieces of rust, etc., falling from tracks overhead. This was corrected by providing each operator with light-clear-glass dust goggles.

Millwrights and machinists employed in paper mills are constantly doing work which requires eye protection. Pouring molten babbitt metals into moulds for bearings, with the aid of moulder's clay, produces a hazard resulting from steam pockets exploding and throwing molten metal into workmen's eyes. Here a partial preventive is obtained by the use of one of several patented preparations to supersede the use of wet clay. These preparations, with a base of asbestos, linseed oil and clay prevent steam pockets. A good strong goggle should also be provided for this work.

Chipping parts of machines, gears, rivets, bolts, concrete floors or foundations also produce a hazard for which goggles are the only preventive. A regular chipper's goggle should be used for this work. Grinding on emery wheels produces a hazard which can be somewhat eliminated by the use of plate glass shields over wheels and all emery wheels should be so equipped. However, if much grinding is to be done, you should insist upon light-weight dust goggles being worn.

COLORED LENSES FOR WORK IN INTENSE HEAT

For arc or oxy-acetylene welding the use of colored lenses is necessary to protect the eyes from the ultra violet intense light and heat. The colors recommended are black, green or yellowish green. The cobalt blue often used is *not* effective.

Goggles for use by firemen in the power plant should also have colored lenses. The color used is light bluish green or sage green, as a protection from light rays and intense heat. These goggles should also be equipped with elastic headbands.

Workers engaged in tearing down buildings of brick or concrete construction, tearing up or repairing concrete floors, drilling holes in brick or concrete for expansion bolts, etc., are probably the chief causes of serious eye injuries. Under this heading come common laborers, pipe-fitters, brick masons and carpenters. Good strong chipper's goggles, such as are recommended for millwrights and machinists, should be used. This isolates the types of goggles for paper mill workers to four distinct types. (1) Strong chipper's goggle, (2) acid and fumes goggle, (3) colored-lens goggle and (4) dust goggle.

In overcoming objections to wearing goggles, bear in mind that the objector often has some real reason for his objection. Either (1) the goggle used is not properly fitted to the contour of his face, (2) the goggle may be too heavy for the work at hand, (3) the goggle may not be in good repair, or (4) wearing goggles is a new experience to him.

The greatest objection we have to wearing goggles is the sweating and fogging of the lenses. Paper-making is hot, steamy work and it is easy to see that this objection is well founded. To overcome this we are using a glycerine pencil with excellent results. One or two applications of this pencil will reduce fogging to a minimum.

The next greatest objection comes from the fellow who is not accustomed to wearing goggles. Have patience and help him get the goggle properly adjusted to his face and properly cleaned, telling him at the same time the advantages of their use; about his buddy who had a narrow escape from blindness just because he was wearing his goggles at the time a chip hit him in the face. Safety bulletins relating to goggles, posted on bulletin boards, will help; both those received from the National Safety Council and your home-made ones. One advantage of the home-made bulletin is that you can quote specific cases which the workers can verify.

USING GLASS EYES AS AN ARGUMENT

Some safety engineers employ the old but never-failing plan of carrying two or three glass eyes in their pocket. Finding a man who is doing work which is hazardous to the eyes and not wearing goggles he pulls them out and starts looking from worker to glass eyes. When asked what he is doing he remarks that he is just seeing if he has the same colored eye in stock, because if the worker don't get his goggles on he is going to need a glass eye. This usually breaks the ice for a good Safety First talk on goggles and sells the worker the idea at once.

Once in a great while you will encounter a seemingly hopeless case—one who will argue that goggles are all foolishness. That he has been chipping, grinding and using acids all his life and has never been injured. If, after using all known methods to convert him to the use of goggles, he fails to respond, it will be best to pay him off and let him go, giving both him and his fellow workers the real reason for doing so. Discharging workmen for failure to wear goggles is to be discouraged except, as I say, in exceptional cases.

It is said that there are the three classes of men: Those who have the initiative to invent, those who understand the invention after it is explained to them and those who do not understand and avoid the explanation. According to this, we have two-thirds of our workers to check up on and remind of their danger.

When we stop to think that the eye is involved in 10.6 per cent of all permanently disabling accidents, it is time for the paper and pulp industry to become interested in every individual exposing himself to a hazard which may be easily guarded against.

DISCUSSION

CHAIRMAN GLEASON: Four men were working on a gas relief pipe at our plant. The pipe was frozen, due to the chemical action of the acid. They were working on the pipe when it burst and the acid was thrown into their eyes. For the first twenty-four hours we did not know whether they would be blind or not. I posted on the bulletin board and used in the next issue of our house organ a personal statement from them stating their feelings in the matter, lying there for the first twenty-four hours, and not knowing whether or not they would ever see daylight again. That statement did much to solve the goggle problem in our plant.

MR. STEFFEN: It seems too bad that we should have a severe accident before we wake up to the fact that men are liable to be injured. We should not let matters go that far. Insist that men wear goggles and check them up to a point where they see the necessity for wearing them before an accident happens.

MR. HAFENBRACK: Those who have seen the bulletin will recall the picture of the blacksmith in front of a punch-shearing machine—he lost an eye as the result of a sliver coming off the die; his eye was removed about a week afterward. That bulletin stimulated the wearing of goggles in our mills; we made considerable capital out of the accident. It is true that it is too bad someone has to get hurt, but the fact that someone does get hurt should be taken advantage of. Just the other day a man came in with one goggle lens entirely shattered—he was holding the glass in his hand. He said: "If it had not been for my goggles I would have been out an eye." A piece flew out of the knife barker—he does not know yet what struck it.

REASONS WHY MEN OBJECT TO WEARING GOGGLES

MR. W. H. WHEELER (Canada Paper Company): We require our men to wear goggles, but they claim they hurt their eyes if they have to wear them any length of time. The men are not sent to an eye specialist to have the goggles fitted. I don't know whether or not others have had the same trouble; perhaps if you have, some advice could be given to overcome this condition.

MR. STEFFEN: Do you have a physical examination of your men?

MR. WHEELER: We have not.

MR. STEFFEN: You don't know whether or not the men's eyes were affected; it might be they had weak eyes. Some firms have the lenses

ground to fit the men's eyes, the same as a pair of glasses are fitted.

MR. DRUMB: A good many men do not like them because they did not like to do work which require the use of goggles.

MR. HAFENBRACK: The other day a man making size complained about dust getting into his eyes. He went to a physician and was told he should have been wearing glasses for years. Very often a man gets a silver or speck in his eye and goes to the doctor; the physician has a good chance to examine his eyes and pretty soon the man is wearing glasses—which we felt he should have been doing for years.

MR. W. J. PEACOCK (Northern Paper Mills): I suppose the insurance company pays the bill.

MR. HAFENBRACK: We are glad to pay it.

CHAIRMAN GLEASON: I don't know that we are using the best method to induce our men to wear goggles, but when a man works steadily at a job where he must use goggles I tell him to take a rest occasionally; I believe it will pay us in the long run to have him rest his eyes rather than have him take a chance and not use them at this work.

GOGGLES SAVE EYESIGHT

MR. CARL MORTENSEN (Maryland Casualty Company, Chicago): When a man's eyes are all right goggles or plain glasses won't cause him pain. If a man wears goggles and feels pain there is something wrong with his eyes; it is time for him to go to a doctor.

MR. HAFENBRACK: A doctor once called me up and said: "Some of your men think glasses are sufficient instead of goggles." A number of the men who were grinding said: "Yes, I am wearing glasses, why should I wear goggles? I cannot break these." Our answer is: "It is not a question whether the glasses break—it is a question of eye protection through the use of a proper style of goggles, where, if an accident occurs, the glass will not get to the eyes. Three concerns in our vicinity have emery wheels which run in twins, with a man at each wheel—a splinter or piece of steel may fly into a man's eye, from a wheel he is not working on. That happens frequently enough to make it worth while to see that only one man is working at a time and even then they should wear goggles.

MR. ADAM WILKINSON (American Writing Paper Company): The use of goggles is, of course, a question in the paper industry and I can see the point that possibly a man with weak eyes, who wears glasses, will find it inconvenient to wear goggles. One concern in our locality had the eyes of all their women employees examined, believing it would help them in their work. The investment proved to be worth while. It is possible that eye examination will be one of the conditions of employment of all men at the near future. When men have defective sight and cannot wear the ordinary goggles it will be necessary to fit them with corrective lenses.

MR. HOLGER JENSON (Maryland Casualty Company): Objection to the wearing of goggles is universal. Men wearing them perspire, making it somewhat of a hardship. I had trouble with a pair of glasses, some time ago and complained to the doctor. He examined them and told me

that the glasses were all right, that the trouble was with me—that I did not wear them steadily and that my sight was changing somewhat. After a time I became accustomed to them and had no further trouble. I can appreciate how men feel when they are working and perspiring while wearing goggles that are a lot heavier than the glasses I wear. With special care we can often eliminate the need for wearing goggles. In a great many conditions, where we compel men to wear them, we could improve conditions and probably avoid the necessity for the wearing of goggles.

PROPER LENSES MUST BE HAD

MR. J. R. BROWNELL (Equitable Life Assurance Society): At the risk of repetition I wish to lay stress on the great need of having eye corrections made in the lenses of goggles. If you are to meet hazards to the eyes you must have this done. I know of plants where a man is not allowed to wear goggles until he has had his eyes examined and the proper lens fitted—that has been found to be necessary from an efficiency operation standpoint. They found the work was falling away from some of the men, in certain operations, when they were given the standard goggles. When they were fitted with proper lens conditions improved. The difficulties of this question are many, but we know the solution. Goggles should be designed to provide ventilation as well as sight.

MR. WHEELER: Goggles will never be satisfactory until we have the eyes tested and lenses fitted to the eyes. If men have weak eyes, and do not see very well, when they receive goggles with proper lenses they will see so much better that they will be glad to wear them.

CHAIRMAN GLEASON: The next subject is "Safety in the Woodroom," by Frank A. Drumb of the Consolidated Water Power and Paper Company.

SAFETY IN THE WOODROOM

FRANK A. DRUMB, CONSOLIDATED WATER POWER AND PAPER COMPANY,
WISCONSIN RAPIDS, WIS.

I am frank to admit our woodroom is not 100 per cent safe. With a never-ending supply of logs being carried onto the saw docks, with saw carriages darting back and forth—up to the saws and back for a new mouthful—with the roar and shriek of the huge saws, as they cut the spruce and hemlock of our fast-diminishing forests into short lengths of pulpwood, the safety man in a paper mill has a hard problem when he attempts to eliminate accidents in a woodroom.

Picture several mechanical splitters, both vertical and horizontal; greedy and treacherous hand barkers, belts, pulleys, conveyors, falling blocks and a hundred other hazards which exist in other departments of a paper mill. Combine them into one little area and you have a good conception of a modern woodroom from a safety standpoint. Here, if anywhere in the mill, the individual must exercise the care which will prevent him from being hurt.

Every modern mill is making a sincere effort to guard its machinery. It has been our experience, in the woodroom, that the principal hazards

do not lie in unguarded machinery, but with the individual workman. Thoroughly reliable men—men who do their work safely, men who are old enough to realize that they are on the job for business, and who are not inclined to be joking with their partners while barking a block of wood—are the ones we are trying to keep steadily in our woodroom. There are so many machines which cannot be guarded that the matter of producing good safety records practically lies in the selection of the personnel. Careful men, who naturally do their work safely, will finish every month with perfect safety records, while reckless men will shatter the attempts of the most conscientious safety men.

SUPERINTENDENTS RESPONSIBLE FOR SAFETY WORK

In our mill the department head is absolutely responsible for safety work. It is just as important that he protect his men from injury as it is that he turn out a certain number of cords of wood ready for the grinders and digesters. Certainly the department head should be the man most interested in the safety of his men. He is held to account for his production and if he wants to have good production records he must have good safety records. At the head of each department is a man of sufficient training and executive ability to understand that safety must be recognized in our plant. This department head is held responsible for accidents in his department, and it is not at all unusual for him to be in the mill manager's office explaining how an accident happened.

While our safety department does some work directly with the men, in helping to prevent accidents in all departments, it also devotes a great deal of time to keeping the department superintendents in close touch with modern safe practices. One of the principal slogans on our safety bulletins is "Remember that no work in this mill is well done unless it is done safely!" We make a very determined effort to impress upon everyone that safety is just as much a part of their work as anything else they are instructed to do. The woodroom superintendent takes occasion very often to speak to individuals or groups of men in his department regarding safety—the same as he might about sorting the wood a little closer, keeping the department cleaned up a little better, or anything else connected with their routine work.

Under no circumstances would men in any department be given a red cap to wear should they all complete the month without an accident. I have read of this being done in factories and am frank to say that this would be in direct violation of our policy. We are making every effort to put safety on a stable basis—not a flag-waving proposition—but a real flat-footed man-to-man proposition that the men will take seriously. I do not believe that any serious-minded man in our mill would appreciate wearing a red cap because he had completed a month with a perfect safety record.

DISCONTINUED SAFETY RALLIES

During the last two years we have entirely eliminated safety rallies. Not with the idea that they were not educational to the men from a

safety standpoint and that they brought the matter to the attention of their families as well, but because safety must be a direct and determined part of our mill policy and, like the other policies in the mill, must go to the men direct from their superintendent. It may take a little longer to put it over, but when it does get over it is so firmly fixed in their minds that they will connect it directly with their work and not with a pleasant evening they spent in strange surroundings where a few fellows put on a vaudeville act, a band played and they went home well pleased—but possibly too lightly impressed. I am not under the impression that safety rallies or any other method of boosting safety is not all right, but personally I am very much in favor of getting away from theoretical methods of putting safety over in a plant and getting down to a practical basis.

To illustrate what I mean I might say that in our plants a man who makes a safety suggestion which is considered unusually good and which is put into operation is paid a cash bonus for his suggestion. If the suggestion is considered good but not good enough to warrant a cash payment, he is written a letter by the safety director or the mill manager. Copies of the letters are filed with the man's personal record and if in the course of a year or two he had made several suggestions he gets a cash bonus on the basis of his several suggestions. It does not always result in a cash bonus, but often has a very decided effect in the matter of making promotions. A man who makes good suggestions is considered a more likely candidate for promotion than a man of equal ability who never makes a suggestion.

On the other hand, if a man in the organization appears to be having more accidents than are necessary his department superintendent invariably discusses the matter with him. If it appeared that he is not making an attempt to better himself, the safety director or the mill manager writes him a letter, calling his attention to the fact that only safe men are wanted in our plants. Where a man persistently takes chances there is no hesitation on the part of the management to discharge the offender.

Safety in our woodroom starts at the millpond and hotpond, where the spruce and hemlock is unloaded from the cars or from storage for its first process in paper making, removing the bark. There are probably few jobs around the mill that are as dangerous as the work on the hotpond, for here an accident is very apt to be serious. The best method with which I am familiar for unloading logs from the cars is through the use of safety car stakes, which release the stakes from the side opposite from which the cars are being unloaded. If the logs are being unloaded into the hotpond directly from the shipper it is probable that the railroad company's cars will not be equipped with safety stakes and the stakes must be chopped off. This is a dangerous job and only the most reliable men are permitted to do the work.

"WATCH YOUR PARTNER ALL THE TIME"

One of the very important things which should be impressed upon any crew of men working on the hotpond is that of watching their partners at all times. The safest way is probably to keep the crews as small

as possible, and our experience has been that two men work together better than any other combination. We have found that two men can put enough logs in the hotpond to keep a mill running which uses from fifteen to twenty cords per hour. Due to the fact that this is especially dangerous work it is important to make the working conditions as safe as possible. See that tracks are kept clear of bark and that the footing is as good as it possibly can be. Safety at the point of unloading your logs is a thing which can be aided very materially by the railroad companies and the shippers.

The fact that spikes should not be driven into logs coming to a paper mill should be very thoroughly impressed upon logging companies, and if all pulp wood shippers and consumers would combine their efforts to getting railway companies to equip their cars with safety stakes another great hazard might easily be eliminated.

Jack ladders to the saws are not dangerous, nor are conveyors, if the men are made to understand clearly that the management will not tolerate attempts to ride them. Men often will take a chance and ride up a conveyor rather than walk, if they think they can do so without the boss seeing them. It is well understood in our mill that this is the direct route to the time check and we have no trouble. One method of discouraging attempts to ride conveyors is to have good, substantial, well-guarded walkways up the inclines.

Circular saws, which cut the logs into two-foot lengths, are responsible for a great many accidents, which vary from a slight cut to a fatality. The hazard which most woodrooms guard against is the "kick back" or the danger of a block being thrown back from the saws and striking the operator. This is a hazard which is quite easy to guard against, however, and either a heavy meshed wire between the saws and the operator or a heavy wooden slat guard will protect the man operating the saws. Of the two guards, I would say that the wire mesh was the most practical, as it will readily stop splinters of wood which might be thrown through a slat guard.

SAFETY IN HANDLING SAWS

For a time we experienced a good deal of trouble in handling saws which were being shipped. We were unable to use hooks for this purpose, due to the fact that our saws had to be slid flatways through conveyors and going up and down the stairs. Our woodroom superintendent originated a guard which slips around the teeth of the saw; this serves not only as a safety guard but protects the teeth as well and saves a great many minor injuries due to cuts on the hands. One of the primary things to keep in mind in preventing injuries in the woodroom is keeping your saws sharp at all times. Dull saws slow up production and endanger your men.

If a woodroom is laid out so that the conveyors do not have to make sharp-angle turns the safety man is lucky, as clogged conveyors are dangerous. Some woodrooms, however, cannot be arranged to avoid some of these sharp turns and an occasional clog is bound to result. Short-handled pike poles are handy to have at these places and under no

circumstances should men be permitted to kick out a clog. I recall a particular instance where one of our safest men—a man who had never been injured in a woodroom—saw a conveyor clog and thought that he could kick the block out and get away with it. The result was a badly pinched foot. It was caught between two blocks and resulted in a disability which lasted several days.

If the wood is handled in the large rotary barking drums the chance for an accident is quite remote, as the only danger would be from an exposed gear on the drive or the chance of a man falling into the drum—both of which can be guarded against. Where motor drives are used for the conveyors it is a very good plan to make a liberal use of emergency stop buttons, not only for the safety of your man but to stop the conveyors in case of a jam. In our woodroom we have some of our conveyors tied together, so that when one stops it throws the others out. We have found this very satisfactory.

The disc hand barker, however, is not so safe, and many serious accidents have resulted from their use. Here, if anywhere in the woodroom, the services of a careful and steady man are required. A moment's thoughtlessness may result in a very serious accident, and many woodroom, the services of a careful and steady man are required. A moment's with their hands. Flying particles of wood and bark make a constant hazard for the eyes, and in many mills the men are required to wear goggles. We do not insist on the use of goggles for men working on our hand barkers, because we feel that with the goggles becoming dusty and the perspiration running into a man's eyes he is more apt to have an accident with them than he is without. This is largely a matter of opinion, however, and I believe you would hear a good many expressions on both sides of the question.

ACCIDENTS ON HAND SPLITTERS

The hand splitters are impossible to guard and accidents which result from a man getting his hand under them are very serious. The only preventive is a careful man, one who is constantly watching his work. It is a very poor plan to have his work so that he must ever look behind him, as our experience has been that accidents which occur on our hand barkers were due to a man turning around to throw a piece of wood to his rear and in so doing left the other hand lying on the block—turning his body pulled the other hand around under the knife. We have been fortunate in not having any really serious accidents on our hand barkers or hand splitters. It is a pretty good plan to have it understood among the splitter and barker workmen that under no circumstances should they talk to another man or engage in any conversation during their work. To do their work safely their attention must be continually on the machine they are operating.

Chippers which cut the blocks for the digesters are dangerous pieces of machinery, but when they are installed below the floor level, with a long spout leading to the knives, they are comparatively safe. Sharp knives on your chippers make things safer and they keep up production in the woodroom, in addition to giving the digesters good, clean-cut chips.

Men engaged in changing chipper knives must be absolutely reliable and must learn to keep all bolts, bearings and other adjustments in repair. Have your chippers inspected often and train your men to inspect the disc for cracks twice daily while changing knives. It is a good plan to have an emergency stop button placed where the operator can reach it and stop the chipper instantly.

Safety in the woodroom not only protects the man from the danger of being hurt by a piece of machinery, but the general health of the man must be considered as well. Rotary chip screens, which roll the chips over and over in the process of sorting, throw out considerable dust. Dust breathed day after day by the workmen will settle in their lungs and irritate them. A cover over the screen is a good protection against the dust and a blower or suction which removes the dust entirely will keep the air in this department much clearer.

One of the first cases of industrial disease for which compensation was allowed by the Wisconsin Industrial Commission occurred recently, when a grinderman proved to the satisfaction of the commission that he had contracted tuberculosis while working in the grinder-room. Healthy men will give a better day's work than will a man who is breathing air laden with dust particles. If you are not worried over the health of your men you are certainly looking for the maximum in production and to get it you must offer healthy conditions.

GENERAL CONDITION OF PLANT AFFECTS ACCIDENTS

The hazards in the woodroom are either multiplied or diminished by the general conditions under which the plant is being run. In our mill the sulphite is not bleached, which means that the hemlock wood must be sorted very carefully and every particle of bark removed before it goes to the grinders. Here centers a very material source of accidents, which does not exist if the wood is simply routed through the barking drums and is sent on the digesters and grinders with more or less bark still attached to it. With the careful sorting the hand barkers and hand splitters come into play and it is here that men are often injured. Piles of rotten wood, which cannot always be cleared away during the working shift while the usable grade of chips is being run through the screens, increases the hazard. The general run of wood and the condition in which it comes into the woodroom also varies the situation to some extent. Wood which has soaked in the water for a long period, and comes to the woodroom with the bark fairly falling off it, presents a much smaller hazard than does the greener wood which is quite hard.

We know, in our mill, that the general appearance of the plant will have a marked effect upon the frame of mind in which a man will be while working in the department. While it will not affect all men, we believe that a neat-appearing, well-swept woodroom will stimulate the work a man does and certainly a neat, well-kept place materially cuts down the tripping and falling hazard. In your woodroom, above all things, proper arrangement should be made for good ventilation and drainage. Considerable water will drain from the barking drums and the conveyors, and with the water properly taken care of it does not run

all over the floor, offering slipping and falling hazards as well as a very disagreeable and unhealthy odor. We try to keep all departments of the mill clean at all times, not only because we are proud of the institution in which we work and wish to have our men feel the same way about it, but because we feel that a man works with a clearer, freer mind in a clean place. Portions of wornout conveyor chains, sprockets, belts and other odds and ends are kept in better shape and are a good deal easier to find if placed in a small auxiliary storeroom.

In the average woodroom a general use is made of pike poles and picaroons. The best quality of picaroons will be found to be none too good for handling your wood during the winter months when the blocks are frozen. They will retain their points and instead of bouncing off the wood and hitting the operator when they are struck against the block, will drive into the block. During the winter months, when frozen wood is being handled, men must be careful, and in spite of all care you will probably experience accidents in which men bruise their hands and feet.

USE GOGGLES WHEN GRINDING

We keep tools sharp and in good shape all the time, and believe it advisable to have an emery wheel handy for the work. In grinding on an emery wheel there is always the hazard of injury to the eyes, but by hanging a pair of goggles where they are in the way if not on the operator's eyes it does not take very long to get the men to use them. We have found the idea of writing a short letter to the foreman, calling his attention to the fact that we saw one of his men grinding without using goggles, a very practical way to eliminate this habit. By naming the man who was grinding without them the foreman can go directly to him and find the reason why he did not wear the goggles. It shows the men that they are not only being checked by the safety department on these matters, but their foreman as well is being kept in touch with their carelessness. The foreman realizes that safety rules are to be enforced and very little trouble is experienced.

Electrical hazards in the woodroom are about the same as they are in every other department of the mill. It is a good plan to have all the men realize that unless they understand electrical equipment they should not attempt to start machinery. The use of "hold" cards on all starters, when men are working on them, is imperative if any pretense is made to operate safely and even then, if men are not careful, accidents may happen. "Hold" cards should be put through the padlock holes on the square "D" switch when the switch is in the closed position, in order to be sure to prevent accidents. If this is not done a man can throw the switch into starting position without seeing the "Hold" card.

I recall an instance where a man went down to place a "Hold" card on a pump. Seeing that the electricians already had one there he went back to his work of fitting a pipe. A short time later the electrician completed his work and came back to the starter, starting the pump. The pipe fitter heard a roar in the pipe and looked in to see what was going on. Just at that time the water came through and he and his helper

got a good bath as well as a lesson about putting their own "Hold" cards on a starter.

Runways should be placed over conveyors at convenient places; this will discourage the practice of climbing over the conveyors while they are moving. Provide—at any cost—passages, guards and runways for your oilers, so that all machinery may be oiled quickly and safely while running. Such safeguards will eliminate accidents and will prevent burned-out bearings and frequent shutdowns by giving oilers an incentive to inspect their machinery often.

BULLETIN BOARD IN EACH DEPARTMENT

In our woodroom, as well as in other departments of the mill, we have a bulletin board which indicates daily the number of days each department has run without a lost-time injury. This bulletin board is used for posting of safety bulletins or any other information which we wish to get to the men. We use the National Safety Council Bulletins very liberally, but also have a bulletin system of our own which has been quite successful. Through a press bureau we receive a daily clipping service on all accidents occurring throughout the State. With the use of a brush we do some large lettering and post the clippings on the boards. The men are very much interested and we believe that they keep the matter of safety constantly before the men in an interesting way. Departmental safety cards show at the end of each month how many accidents have occurred. At the end of the month the mill manager writes each department superintendent a letter, reviewing all accidents in his department during the month and commenting on any safety work which has been done. Very often suggestions are made as to how some of these accidents might have been prevented.

Through this campaign for safety in our plant we have aroused a good deal of interest in the departmental superintendents and at their meetings safety is very often quite generally discussed. The superintendents have found it an interesting subject and from them we have received some of our best safety suggestions. We have an occasional mill inspection for safety and encourage suggestions at any time from the men about the plant.

DISCUSSION

MR. COSTIGAN: You said there were certain hazards in the woodroom that cannot be eliminated. If that is so, then the logical conclusion is for engineers to throw up the problem and say: "What is the use?" My experience as a safety engineer extends over quite a number of years and there is no experience that I have had so far that brings me to the conclusion that things cannot be improved.

Shortly after talking about hazards that cannot be eliminated you say you hold your superintendent of the department responsible. How can you hold the superintendent of a department responsible for hazards over which he has no control and which cannot be eliminated? The contention is not logical. My experience goes to prove there are few, if any hazards in the woodroom or in the mill that cannot be, if not

eliminated, very much improved, and my reason for saying what I do this morning is for the purpose of nipping in the bud the thing which, to my mind, is wrong. This department is one of the biggest hazards in a pulp and paper mill, but is not a place that cannot be improved; like the poor, they are always with us.

CHAIRMAN GLEASON: The committee working on the safety code for paper and pulp mills met yesterday afternoon, and started a tentative draft. They have some questions that they wished further information about. The committee will take up the process from the very beginning, with the addition of two or three general subjects. Members of the committee have not had experience in a number of special departments, and for that reason are asking members of the Section to help in getting points clearly presented—one is the sulphate process. Someone present familiar with the sulphate process may tell us where it is different from the sulphite process; also the rag and other processes.

SULPHATE AND SULPHITE PROCESSES

MR. WILKINSON: There are various preparations for old paper, especially magazines, and various methods of preparing them. In Pittsburgh, for instance, they have what they call an open system—washing them. They do not use a bleaching boiler; that is, they do not put them into a boiler. It is not a bleaching boiler; that is a misnomer—it does not do anything which is entirely different, but I am not very familiar with the system. Then a lot of stock is handled something like rags, and there are other systems of putting it in liquid form. Mr. White of the Vocational Education Department some two years ago made an analysis of the paper industry. We assigned two men from our laboratory and they spent at least two weeks with him in various mills; probably this report would furnish the committee some definite information. I have a copy of the report and will send it to the committee. It is a complete analysis of the industry. The idea was that it could be used by the association for educating the workers.

MR. ALTMAN: Did Mr. White take up the point of safety?

MR. WILKINSON: The entire process.

MR. ALTMAN: That would give us what we want; we could get the processes from various sources. We want to know if there is anything particularly dangerous about processes we are not familiar with.

MR. HOFENBRACK: Mr. Wilkinson might sit in on one of your safety code meetings and if there are others who can explain the process of their companies this would be a splendid time to get their advice.

MR. ALTMAN: We did a little digging on it yesterday; in fact, we have done that for four or five months; it is a case of eliminating things that really are general in character. What we want is something special, and if Mr. Wilkinson can help us we will send him a copy of the draft for criticism. We have practically concluded our meetings for this week and our next meeting may be in a locality where Mr. Wilkinson would not be able to attend.

HAZARDS PECULIAR TO THE SEVERAL PROCESSES

MR. WILKINSON: We have a large number of photographs of various operations that have, from time to time, been used as advertising matter. These would probably explain to the committee some of the operations. I will be glad to check over the draft if the committee desires.

CHAIRMAN GLEASON: Are there any hazards peculiar to the sulphite process that are not of the same type as the sulphate process?

MR. PHILLIPS: Sulphate process hazards are entirely different from the sulphite. The soda and sulphate are similar. The trouble is we have the soda, sulphate and sulphite. We find the most trouble is from the burner, or from the caustic or nitrate process. One difficulty we have yet to overcome is that a great many of our employees are troubled with boils from working in the sulphate. It does not trouble all of them, and if we find a man who is subject to boils, caused by nitrate, we shift him to some other department. We hope to overcome this trouble. Sulphate and sulphite hazard problems are altogether different, because sulphite does not burn; at least, we have had no trouble.

MR. ALTMAN: What we want in the code is really something in the way of creating improved machinery in manufacture, in that particular process, that is different from that used in the sulphite process. It is not so much a case of burning, because we will have in time a "dope," if you want to use that expression, against that particular acid. But if there is anything, for instance, in the cooking process, or in the making of your pulp about the pond, or where you are ready for the machine and where your machine will have to be changed in the way of a rewinder, or in the way of getting a reel so there will be a certain distance between the rolls, or something in the way of guards in some way to prevent burns—it is that point we want to take up rather than the peculiarities of the process.

MR. COSTIGAN: I would suggest that a copy of the draft be sent to Mr. Phillips, so that he can make suggestions. By doing that, and spreading the draft over a wider field, we might get a more comprehensive idea of the hazards in those two processes.

MR. ALTMAN: I will furnish him a copy of the draft.

GUARD FOR NIP OF CALENDERS

MR. ALTMAN: We are covering the nips of the supercalender by an angle iron guard; round guards prevent the fingers coming into the nip. The question that came before the committee yesterday was whether the calender stack at the machine should be guarded—whether it would tend to do away with the efficiency of the men, because in many cases where water is used you have your waterbox near the nip; where air is used you have your air going out of the nip—whether the various guards would impair the efficiency of your machine. In getting this out we are not only trying to keep away from accidents, we are trying to keep away from inefficiency of the men if we put guards on. The point we want to know is whether the hazard of the machine calender should be guarded in the same way as the hazard in the supercalender?

MR. COSTIGAN: It might be a good idea, if a certain number of drafts, or copies, are made, to send them to a source where we can get the best information available in the industry. Our Chairman is well acquainted and will be able to place copies of the draft where they will do the most good.

MR. WHEELER: Do they have codes in the various States?

MR. ALTMAN: No. We are getting up something peculiar to the paper and pulp industry; it will be national in scope.

The Section then adjourned.

WEDNESDAY MORNING SESSION

CHAIRMAN GLEASON: Our first discussion this morning will be by Mr. Adam Wilkinson, Labor Commissioner, American Writing Paper Company, Holyoke, Mass.

THE FOREMAN AND HIS RESPONSIBILITY FOR EMPLOYEES

ADAM WILKINSON, LABOR COMMISSIONER, AMERICAN WRITING PAPER COMPANY, HOLYOKE, MASS.

Much has been said about the foreman's responsibility for the safety of employees under his supervision. The strategic position occupied by the foreman in the paper industry makes it possible for him to exercise a great deal of influence in the field of accident prevention. It is not too much to say, however, that the management generally, in years gone by, has not expected the foreman to assume any great amount of responsibility for the safety of employees in his department. To maintain a uniform output of standard product has in most cases been the chief function of the foreman and when this was secured his services were generally considered satisfactory.

The safety movement is comparatively new, as is evidenced by the fact that this is the Eleventh Annual Safety Congress of the National Safety Council. Whatever great accomplishments have been made in this brief period have merely taken us from the field of propaganda into the field of practical accomplishments. In the paper-making industry it requires a long term of service before men are promoted to the position of foreman and it is safe to say that the majority of men occupying these positions today have done so for more than a decade past and before the days when the term Safety First had any real meaning. It is unfortunate, but nevertheless true, that many of our foremen today regard the safety movement as propaganda and when men regard this work as such they naturally feel that they have performed their full duty when a uniform output of standard product is maintained in their department.

What I have said heretofore is largely a review of the conditions that have governed the foreman in the past, and to assume a critical attitude toward the things that have been done or the things we fail to do will get us nowhere in our endeavors to prevent industrial accidents. With a full

understanding of the foreman's duties, as he has conceived them to be in the past, we can approach the question of securing the wholehearted co-operation of the foreman in our effort to prevent accidents in the future. Many progressive concerns that have made a careful study of industrial accidents have concentrated their efforts for safety work through the medium of the foreman.

Recognizing, as we do, the important part the foreman plays in accident prevention it becomes necessary for the person who directs safety work to maintain a close personal contact with the foreman. The interest displayed by the foreman will largely be reflected by the attitude of the employees under his supervision and to overlook the foreman in any plan for safety work will result in much wasted effort. The foreman is the leader in his department and no movement will advance very far without leadership. To make the foreman a leader in the safety movement should be one of the chief aims of the safety director. To bring the foreman to a full realization of his responsibility for the safety of employees under his supervision he must realize that any effort made to prevent accidents is not a side line, but one of his chief duties.

SAFETY CREED FOR FOREMEN

Our safety creed for the foreman should be. 1. The foreman should see that every employee is properly instructed how to do his work in a safe manner. 2. The foreman should maintain discipline in his department and prevent horseplay on the part of employees. 3. The foreman should advise the superintendent of any unsafe condition that exists in his department. 4. The foreman should be as much interested in the safety of the employees as he is in the quality of the product of his department.

With this somewhat brief explanation of what I have conceived to be the responsibilities of the foremen, I have attempted to get to the backbone of the subject. I am not one of those that feel that anything the foreman may have failed to do justifies criticism of the foreman's actions. If, in some of our industries, that which could have been done by the foremen to prevent accidents was not done, we cannot blame the foremen; we can blame the manager largely, because the foreman has not been expected, until just in recent years, to take any responsibility for employees under his supervision, and to assume a critical attitude is not the right thing to do.

The reaction from the foreman is very strong, but we can see, in all justness, that our safety work has been carried on in such a manner that the foreman really regards safety work as a side line and not one of his chief functions. When I made that statement I made it in a general sense; some particular industries and plants in some particular manufacturing industries have accomplished more than we have, and probably have spent more time in the education of foremen in safety work. Accident prevention, like production, depends largely on the quality of production that he sees and it is safe to assume that if the foreman can give instruction to the employees in his department as to what work shall be done he should exercise the same inference as to how

it could be done and prevent men from doing their work in an unsafe manner.

EMPLOYEES NOT PROPERLY INSTRUCTED

In my travels through the mills I had occasion to make studies of the various operations and one of the chief drawbacks that I see to this work is the inability or the indifference on the part of some foremen in not properly instructing employees. It is a very simple matter for new employees to receive injuries if they are not fully acquainted with the hazards of their jobs. For instance, in the simple operation of a cutter helper in the mills, where we manufacture book papers, the paper is put on cutters and it seems quite a simple operation, but a new man will come in and the old hand may give him the worst of it—that is a very simple matter. The old hand takes the easiest part of the work and the new man carries the load, with the result that sometimes it results in strains, which is so frequently the cause of industrial accidents. Great care must be given by the foremen to that phase of the situation—the proper instruction of employees, new employees in particular—and the prevention on the part of old employees from doing their work in a careless manner and who seem to have become indifferent to the hazards of their particular jobs.

Much more can be accomplished through the medium of the foreman than through any other, especially in the paper industry, where a large amount of supervision is required. That may not be true in all paper mills, but in the mills where fine papers are made it requires a good deal of supervision, and the foreman generally does not have a great number of employees to direct. It is quite possible for him to keep in very close contact and eliminate a lot of the present preventable accidents. There are many angles to this situation, I know, and situations differ in various sections of the country. This is true in the Eastern section, where practically all the paper mills have been built for a considerable length of time and it is difficult, at times, to even put proper safeguards on certain machinery without tearing the mills down. Every effort has been made to install all the mechanical safeguards possible, but work in the educational field can be carried on with a great deal of profit. We all agree that it can be carried through the foremen, and I say this without criticism of the foremen; the foreman has done in the past what he has been expected to do, but we can concentrate our efforts to advantage and get better results in the prevention of accidents if we pay more attention to him in the future.

DISCUSSION

CHAIRMAN GLEASON: Well, gentlemen, I believe that we all feel our accident prevention work depends on the foremen and more and more we are looking to vocational education as one of the chief factors in carrying on the work.

MR. AL. KROES: I would like to have an expression on the point of the foremen and production. We all know the foreman is picked by the industry as a man who can deliver production. Among the mills repre-

sented here, how far is the foreman expected to prevent accidents and how far is he supposed to increase production? In some mills accident prevention work is done by the safety supervisor, but the duty of the safety supervisor is entirely different and apart from the foreman's. I have been in small mills where the foreman is supposed to look after safety matters, but he was never properly instructed. I have asked such foremen: "What does the office want you to do in safety matters? Do they ever tell you specifically that you are looking after the safety of the plant?" "No, they have never mentioned it; they said: 'Keep things reasonably safe, but look out that it doesn't interfere with production.'"

EFFECTIVE SAFETY COMMITTEE PLAN

MR. WHEELER: We have a safety committee consisting of the general manager, the general superintendent and all the foremen and master mechanics of both our mills. We have a meeting the fourteenth of every month and every second month two inspectors are appointed; it is their duty to inspect both mills once every month. They are supposed to report on conditions where there is danger of accident—any pulley, gear or dog that is not correct. They pick up any information they can from any place where they have seen men working carelessly. At the meeting a list is read of all the accidents that have occurred during the month and this record is compared with the accidents of the same month of other years as far as possible. Safety work has gone on in our mills about three years. Accidents are discussed and thrashed out to see if there is any possible manner of avoiding similar ones by the installation of guards. A list of dangerous places is handed to the master mechanic and they are guarded at once. In our mills the office staff, the general manager, the general superintendent and the foremen get together and understand each other. As a consequence safety work is looked after about as well as it possibly can be.

MR. ZELDMAN: In our organizations the men often referred to as foremen are known as department superintendents; in charge of each department we have a superintendent, who is an executive, and under him are the foremen. All our safety work is carried on through the department superintendents and our safety department is maintained to educate them in safety work. Our idea is that the department superintendent is the man who should primarily be interested in safety work, because safety means production. Good safety records give good production records; at least, poor safety records mean poor production records.

SAFETY ENGINEER RECEIVES ALL ACCIDENT REPORTS

S. E. BIRD (Sears, Roebuck & Co.): I am in charge of construction for our various plants. We have a little different way of handling things than has been explained this morning and it may be of interest.

Sears, Roebuck & Co.'s place in safety is 100 per cent. Our safety engineer receives a report of every accident; he compiles records and sorts out the various jobs. We instruct the foremen of every department—I speak mainly of the wallpaper mill with which I am connected.

A great deal can be done through the foreman, because he is in more immediate contact with the men than the superintendent or the man higher up. I believe ours is a very wise policy, in having one department that is strictly responsible for all accidents—one that is familiar with all circumstances. Whenever an accident is reported a record is made in the safety engineer's office.

MR. KROES: In my ten years of contact with safety work I found one plant that had a good safety organization. They had a very good inspector, a man who had safety at heart and did all he could to point out dangerous conditions and practices. In most plants the inspector's report goes to a certain department—the foreman's desk or the safety supervisor's desk—and sticks there. Some things are done and others are not, but in this plant they took the men into their confidence in all safety matters. Copies of reports and recommendations of the inspectors were typewritten, with the heading "The inspector has recommended the following things for correction."

SAFETY MEN HELD RESPONSIBLE FOR WORK IN ZONES

MR. ERNEST AUGUSTUS (Mead Pulp & Paper Co., Chillicothe, Ohio): We have a somewhat similar system in the Mead Pulp and Paper Company. In addition to our safety organization we divide the mill into sections and appoint a safety commissioner for each; the man in each zone is directly responsible for the reporting of all accidents and unsafe conditions. In addition, each Monday afternoon we have a meeting in the general manager's office of all foremen and superintendents.

At this meeting all questions of production and other matters that come up in connection with the operation of the mill are discussed and at the end of the meeting each foreman is requested to report unsafe conditions—unguarded pulleys, bad stairways, or anything he considers should be corrected. That is put on the minutes and the man in charge of safety gets after the millwright or whoever sees to those things. At the next weekly meeting the question is asked whether unsafe conditions have been taken care of and if they have not, why not. Usually they are taken care of and any new things reported; in that way each foreman knows exactly what is going on in his department. A copy of the minutes is posted on the bulletin board so the men can see what has been found unsafe in their department and if it is not fixed, some man will come around and want to know why.

FULLEST PUBLICITY GIVEN SAFETY MATTERS

In addition, at the committee meeting, a different foreman is appointed every week, with the head of the safety department, to make an inspection of the mill. They report all unsafe conditions and in a general way how the plant looks to them. Publicity is given on our bulletin boards and in the plant paper.

MR. H. J. ALDRICH (Spencer Kellogg & Sons, Inc., Buffalo, N. Y.): We are self-insurers and the company, each period, sets aside the premiums that would otherwise be paid to insurance companies. Out of the fund so established all compensation, medical bills, etc., are paid;

and in addition some safety matters are take care of. The timekeeper is expected to make inspections of the plants every day; he reports to the superintendent and also to the safety director at Buffalo. Part of his salary is paid out of the safety fund and the safety department is in harmony with the superintendents at all times. Changes in the safety divisions are up to the superintendent.

CHAIRMAN GLEASON: We will proceed to our next subject, "Safety from the Superintendent's Viewpoint."

MR. E. W. STRIDDE (Kimberly-Clark Company, Niagara, Wis.): I want to say that Mr. Knickerbocker is one of our most persistent and consistent boosters of safety, and the results of his efforts have been reflected in a splendid record in his department.

SAFETY FROM THE SUPERINTENDENT'S VIEWPOINT

L. F. KNICKERBOCKER, SUPERINTENDENT, KIMBERLY-CLARK
COMPANY, NIAGARA, WIS.

The superintendent of a mill always likes to believe his plant is a safe place for his men to work. He likes to know that there are no unnecessary hazards, that dangerous machinery is well guarded from incautious fingers and arms; that elevator shafts, stairways or any place where a man may get hurt are adequately safeguarded. It is a relief to know when you give instructions for a job to be done, one that has more than the usual hazard, your foremen and men are safe to work on it with no unnecessary risks of injury. All in all, it is well worth while and a great satisfaction to know that your men know safety, think safety and believe in safety.

When the safety movement was first started we found a great deal of contempt for our efforts on the part of the men. The older ones were especially hard to convince and, of course, they held back the younger ones. The old-timers disliked being told how to do a job without getting hurt. The guards about machinery were a source of annoyance to them, bulletins and propaganda were all bunk, the safety director had some sort of a soft graft for a job. Their idea was that someone had to get hurt occasionally, for there always had been accidents and always would be accidents. They were not trying to get hurt, no, but they could not see how all this talking about safety was going to keep them from getting hurt. The guards about machinery were a source of annoyance to them, because they made them go around instead of reaching over and through places where they were accustomed to reach. Guards were frequently removed from about the machines and only grudgingly put back when demanded. We found men laying off for the slightest injury and for fictitious injuries. A chew of tobacco was considered the best first-aid remedy for a cut or scratch. Anyone who had to have first aid for minor cuts and bruises was a mollycoddle.

INSTRUCTING A NEW MAN IN SAFETY PROCEDURE

When a new man is started on a job he is told all about the dangers of accident incident to the job and the specific risks are pointed out to

him by the superintendent. This is not done in a way to make him afraid of his job, but just to show him where to be careful. We hire quite a number of young fellows, many just starting to work for the first time as supercalender helpers. In carrying the sheet through the calenders there is danger of a new man grabbing for the tail as it comes through in his hurry to carry it to the next sets of rolls and in grabbing he is very apt to get his fingers between the rolls. Some are tempted to feel of the rolls, while running, and in doing so have their fingers caught. Such dangers as these are pointed out to them, and they are told in starting the paper through to stop and start all over again, rather than put their fingers where they will get pinched. They are also cautioned about the use of elevators and the code of signals to be used.

It has been our experience that the best way to instill the spirit of safety in the men is through safety contests. Just the idea of a contest, something competitive, arouses the sporting blood in the men and they will go to their work with the idea of playing safe to win something. Each man looks out for the other fellow as well as himself; they begin unconsciously to get into team work on safety. They think of the disgrace and ridicule to be brought upon themselves if they get hurt and spoil a record. They think of building up a record and, once that record is established, they try to stick to it and, if possible, beat it. They get away from thinking of themselves only, if hurt, and the individual consequences. A man will take more unnecessary chances if he alone loses by it than he will if he is playing a game whereby his fellow players or workers lose if he loses. If a man sees a dangerous piece of machinery unguarded, a bad stairway, a hole in the floor, or an unlighted passageway, he will report it to the proper authority for remedy and not wait for the next fellow, who perhaps is not so observing and may get hurt. It gets the worker in the mill to feel somewhat like he does if he is playing a game of ball, and he knows there that teamwork counts. The men will watch the safety board like a scoreboard and if a red spot appears you will hear a disgusted "Now who got hurt?" That is the great benefit to be gained by a safety contest—the men learn cooperation in safety.

PROVEN VALUE OF SAFETY CONTESTS BETWEEN MILLS

Safety contests, if possible, should be arranged between different mills and not just between the departments in a mill; we have found that, by inter-departmental contests, there has always been some squabble as to which department certain workers belong, such as millwrights, electricians and other maintenance men. In many cases these men run more chances of getting hurt than the operating force, and in case of the disputed placing of an accident the men will lose heart. If it is mill against mill, the whole force of each is included and a fair competitive basis can be established to offset any difference in numbers of employees. Safety contests should be of sufficient duration—say two or three months—to get safety with a capital "S" fully established, so that the men will think safety after the contest is over. Neither should the contest be too long—

say six months or a year—because the men will lose interest in awaiting the outcome.

Another point in favor of the safety contest is the increased morale established. We have found that before we had safety contests the men would lay off for the slightest injury. Now, and especially so during a contest, they will stick to their jobs through their own choosing, even though somewhat handicapped. We leave it to the men to decide about coming back to work and sticking in case of injury. I believe it is wholly worth while to get such an *esprit de corps* established, because it is bound to show up in the work.

We post bulletins showing the weekly and monthly production of machine-tenders and their per cent of waste. These bulletins are closely watched, not only by the machine-tenders but by all the men at the machines, showing that the teamwork is there. Each machine-tender and his men wants the highest production and the least waste and, to show that keen rivalry exists, they will fight for a couple of hundred pounds of paper if they feel they are being done out of it. This rivalry has been built up until all existing records for production for the mill have been smashed, and in doing so the same high quality of paper was turned out. This illustrates how safety work and safety propaganda can build up good sound morale in a group of men; a morale that any superintendent might well be proud of, a morale that is worth real money in increased production and higher quality of paper. Safety work builds up the stamina to attain a record in safety, and this same stamina is carried to the attainment of other records.

RESULTS OBTAINED THROUGH FOREMEN TRAINED IN SAFETY WORK

To make a safety-first movement a success it is quite essential to have the backing of the directors of the company, for at times, perhaps, it will be necessary to bring a little pressure to bear where the movement lags or is weak. With the directors behind the movement you get co-operation of superintendents; they get co-operation of foremen and they, in turn, get the co-operation of the men. The foreman is the dominating figure and he is responsible for the safety of the men under him. If the foreman thinks safety, acts safety and apportions his work with an eye to safety, it is a sure shot his men will get the safety-thinking and acting habit.

In our mill we make the foreman directly responsible for the safety of the men under him. If a man is hurt we go to the foreman of that man's department for an explanation. If the department has no accidents or few accidents the foremen get the credit. Weekly bulletins are gotten out showing the safety record of each department and the foreman of each department is listed opposite his departmental record. These bulletins are posted and copies sent to the superintendent and company directors. No foreman likes to see a poor safety record opposite his name, when he knows his superiors are reading the record and that they believe in safety.

Most of our recommendations for machine guards and other safety improvements come from the foremen. They are the men that know the

hazards of their department better than anyone else. They are also the ones, through their foremen's club, to issue and accept challenges to safety contests with other mills. In our mill they have accepted the responsibility of safety; they have accepted it with a zest that is getting results and an enthusiasm that has caused them to go out for a world's record.

REMARKABLE NO-ACCIDENT RECORD AT NIAGARA MILL

The directors of the Kimberly-Clark Company have given the Safety First movement their enthusiastic support since its introduction in their mills. They put up prizes for the winners of the safety contests, such as a pennant for the winning mill and Eversharp pencils or overalls for the men in the mill with the best safety record. They pay for combined entertainments and safety meetings to which the men and their families are invited. In this way safety is instituted in the home, and with the home behind the movement you have an all-powerful influence for safety.

The Niagara Mill, with its enviable record for safety, has received the greater share of these prizes. In 1917 we had a total of eighty-three accidents with a total of 1,751 days lost and a cost of \$13,038.73. For 1919 this had been cut down to seventy-nine accidents with 897 days lost and a total cost of \$3,440.08. For 1921 we had the remarkable record of only twelve accidents with 371 days lost and a cost of \$1,129.62. The cost to carry our own compensation per \$100 of payroll has been cut from \$2.48 in 1917 to \$0.29 in 1921. In my own department, the beater-room has gone 355 days, to July 15, without an accident, the finishing-room 383 days and the machine-room 443 days.

DISCUSSION

MR. A. P. COSTIGANE (Safety Engineer, Ontario Pulp and Paper Makers Safety Association): I would like to outline something of what we are doing among the pulp and paper mills in Ontario. The association, of which I am secretary, derives its authority from the Workmen's Compensation Act and felt that some stimulus was required to push safety work. They tried all kinds of stunts—I think men engaged in safety work agree that you have to have a new stunt up your sleeve nearly all the time—the idea being to stimulate the men and take advantage of the sporting instinct that is latent in every individual.

The mills in our group, large and small, number about forty. Obviously it would not be fair to have large mills competing with small ones, because the hazards are unequal. In the large mills you have a division of authority that makes hazards more obvious; in the small mills the men take the lead more directly from the manager of the plant. That being the case the smaller mills are in one group, the larger in another. Trophies, in the form of a shield, are offered for the competition.

In addition to the shield we offered a commemoration flag, for this reason: If the mill won the shield trophy, it held it for a year or until it was won by some other mill with a better record. If they lost the shield they lost all record of having won the shield, except as the name appeared on one of the small shields, but we wanted the fact of having

won the record by that mill commemorated and kept before the minds of the employees for all time. Therefore we offered (with the shield) a commemoration flag to accompany the shield to the winning mill and to be their property. The flag is that of the Canadian Dominion, and carries an inscription that such and such a mill (the name is given) made the most excellent record during the year 1921. The flag remains in the possession of the winning mill and is hung up in some conspicuous place. The effect is this: Something is before the employees of that mill all the time commemorating the fact that they achieved a remarkable record in accident prevention. New men see the flag and ask: "What is the flag for? What competition did the mill win?" In that way they are interested in safety and due to the fact of the mill winning the flag a record is established, which the men are anxious to have repeated. Whether or not they win the flag another year does not matter—the spirit is there. The old men describe the whole competition and in so doing pass on the interest in safety to new comers. The competition has been remarkably successful and I was glad to learn that mills located in the United States have the same thing.

MR. B. R. MILLER (Worthington Pump & Machinery Corp., New York City): How do they base their figure on lost-time accidents? Do they combine both frequency and severity in making up the score?

EVERY LOST-TIME ACCIDENT NOTED

MR. COSTIGANE: In making up statistics we take note of every accident that involves lost time. If a man goes to a first-aid station and gets a dressing we do not consider it is a lost-time accident; where a man is off through a small injury and has to go to an outside department for a dressing, and is off three or four hours, that is considered. For severity we take a ten-hour day, twenty-five days a month, or 250 hours. Every mill sends to me, at the end of the month, the total number of payroll hours and that, divided by 250, gives the number of full-time workers for that period. It is on a basis of full-time workers that we established our system.

MR. MILLER: In case of partial disability, do you take an arbitrary standard for the number of days lost?

MR. COSTIGANE: No; time lost in an accident may be carried through the year and possibly to the next year.

CHAIRMAN GLEASON: We will pass to the next speaker, Mr. J. M. Sandel, of the National Safety Council.

UNIFORM ACCIDENT RECORDS FOR PAPER MILLS

J. M. SANDEL, NATIONAL SAFETY COUNCIL, CHICAGO

I would like to speak on the subject of "Uniform Accident Records for Paper Mills" as between mills. I will let Mr. Hoyman take care of the subject regarding statistics within a mill. I think he is better able to do that than I am.

We have published the accident records of several Sections of the Council and the Paper and Pulp Section records more completely than

any of the others as your Section has been particularly interested in such statistics. This is a very healthy condition of affairs; something the headquarters staff likes to see, and we would be glad to handle similar work for other Sections.

As a basis of comparison, where severe accidents have occurred, we use the standard table prepared by the United States Bureau of Labor Statistics, as this is approved by many statistical bodies and furnishes a definite basis for such work. In the use of the table arbitrary figures are set for certain severe accidents. The figures are as follows:

Nature of injury—	Days lost
Death	6,000
Permanent total disability.....	6,000
Arm above elbow, dismemberment.....	4,500
Arm at, or below elbow, dismemberment.....	3,600
Hand, dismemberment	3,000
Thumb, any permanent disability of	600
Any one finger, any permanent disability of.....	300
Two fingers, any permanent disability of.....	750
Three fingers, any permanent disability of.....	1,200
Four fingers, any permanent disability of.....	1,800
Thumb and one finger, any permanent disability of.....	1,200
Thumb and two fingers, any permanent disability of.....	1,500
Thumb and three fingers, any permanent disability of.....	2,000
Thumb and four fingers, any permanent disability of.....	2,400
Leg above knee, dismemberment.....	4,500
Leg at or below knee, dismemberment.....	3,000
Foot, dismemberment	2,400
Great toe, or any two or more toes, any permanent disability of....	300
One toe, other than great toe, any permanent disability of.....	1,800
One eye, loss of sight.....	1,800
Both eyes, loss of sight.....	6,000
One ear, loss of hearing.....	600
Both ears, loss of hearing.....	3,000

STATISTICAL TABLES USED FOR COMPARATIVE PURPOSES

You will note that the figures for death, permanent disability and the loss of sight of both eyes are the heaviest penalty, 6,000 days lost. So far those figures have worked out very well in comparing data from different mills. Some table like this is really necessary because without it you have no base to work from, and your statistics will not afford safety men in the different mills a comparison as to how they are progressing. There are some things in the system which may have to be ironed out later, because statistical material is more or less subject to change.

One feature in connection with paper mill statistics, I think, is also vitally necessary—something the Paper and Pulp Section will be glad to consider—a standard list of causes. Two Sections of the Council have agreed on such standard list—what constitutes a cause when a certain accident occurs. The Rubber Section and the Construction Section have taken the lead in this matter and copies of their statistical standards follow:

In determining to which cause the accident should be assigned the proximate or immediate cause should be determined. The condition or circumstance, the absence of which would have prevented the accident; but if there be more than one such condition or circumstance, then to the one most easily prevented. The various headings under "Machine Accidents, Tools and Accessories," refer to accidents occurring in the ordinary use of the machine. Accidents occurring while cleaning and repairing or handling should not be charged to the machine, but to the operation.

As an example: If a workman stumbles upon a defective floor and is injured by an unguarded gear, the cause would be the gear, as he received the injury from the gear and probably would not have been hurt had the gear been properly guarded.

Since it is impossible to suggest all of the causes that might be required in the different lines of rubber work, main divisions of causes have been made and blank spaces left for special cases that the various shops might desire to keep. It should be kept in mind that the cause classification is made to show what is wrong and what should be remedied, and no difficulty should be experienced in assigning the proper cause. The unclassified list should be kept as small as possible.

WELL-UNDERSTOOD DEFINITIONS ARE USED

That is what is meant by a well-understood definition of what shall be considered the cause. The Construction Section has settled the matter and has gone into it a little differently and at greater length, but they arrive at the same practical end. If you have a standard list of causes you will gain something that is not available at present—you will learn how different mills compare as to accident frequency and severity. You would learn how many men in each mill are injured from each cause, and it would be fairly easy to obtain the assistance necessary to overcome special troubles. This is in line with what members of the headquarters staff have been following up—to encourage members of the Council to use the Library and Information Bureau service more than formerly. With a standard list of causes the clearing-house for the dissemination of information to your Section would be in excellent shape to accomplish its mission to the advantage of all the Council members.

DISCUSSION

CHAIRMAN GLEASON: Do I understand that the Council is working out a plan of this kind and that they will submit it to the members?

MR. SANDEL: Before the Council does that they want the approval of the Section. If the members of the Section desire such action a committee should be appointed to formulate plans, etc. If this is done the Council will be glad to carry on the bulk of the office work and correspondence necessary to its success.

MR. COSTIGANE: I move the suggestion offered by Mr. Sandel be placed in the form of a motion and that it be adopted by the Section. (The motion was unanimously carried.)

CHAIRMAN GLEASON: The committee will consist of Mr. Wilkinson of the American Writing Paper Company; Mr. Hoyman of the Kimberly-Clark Company, and Mr. Larson of Marinette, Wis.

MAKING UP AN ACCIDENT REPORT

M. G. HOYMAN, KIMBERLY-CLARK COMPANY, NEENAH, WIS.

It is necessary, for several reasons, that we have accurate and uniform accident records. First, to accurately keep our own records in an up-to-date manner, that we may know the type of accidents which happen most frequently; second, for comparison with other companies, to determine our progress. As an example of what I mean by comparison,

you will remember that Mr. Stridde spoke of our paper-mill department, comprising the finishing-room and machine-room, as having gone up to 400 days without an accident. We have about 150 men in that department and they are continually asking me if that is a real record and whether other companies are beating it or not. Actually, I do not know just what others are doing, we have no way of determining. In the record mentioned in *The National Safety News* we may be able, by speculation, to determine what companies are referred to by the number of men employed. I wish it were possible to have more definite statistics so we might know whether we are gaining or losing ground. Everyone must feel that way.

There are one or two things in regard to these records that I would like to bring out. In order to constitute an accident, as I take it, it is necessary to lose time beyond the day in which the accident occurs. That, of course, would be universal, but what about the man that comes back to work and takes some other job? In our inter-mill contests we require that a man return and take up his own job in order that it will not constitute an accident. If he sees fit, and we can use him somewhere else, that would still be an accident. It is probably true that outside of the contest, at times, men are brought back and put to some kind of work where they can fill the place just as well, but for the purpose of our contest we require that he come back and do the same work.

WIDE RANGE OF OPINION IN COMPARING ACCIDENTS

In comparing mill accidents and days lost we have a wide range of opinion. Some mills take a man back and put him at sweeping or whatever he is fitted to do, while others, if he is not able to do his own particular line of work, may let him stay at home. So we cannot have, unless we agree on a universal standard, a real and direct comparison. I would like to have this matter discussed and to find what others are doing. Is there a standard that we could adopt for a man coming back and doing his own work? We have other standards; the number of days to be charged for a particular accident, but for minor accidents, which may mean loss of a week or less, we need a more definite understanding.

CHAIRMAN GLEASON: It is usually understood that the accident terminates when a man goes back to his position. At the same time, it is our policy when a paper machine tender, for instance, has a finger injured, to get him back on to his job, and where he has a wire to arrange, or something of that nature, to give him help to do it. We have cases of that kind and it is a matter that each plant has to settle on an individual basis. When we consider the actual number of days lost we do not follow that policy.

MR. COSTIGANE: We compensate men to the extent of their disability and in this matter we depend on the doctor. That puts the fixing of the extent of disability into the hands of a central department.

MAN MUST RETURN TO HIS PARTICULAR WORK

MR. HOYMAN: That question arose in our contest and interest was very keen at times as it would be natural to try to bring a man back as soon as possible. In order to get away from wrangling, we set the

standard that a man must come back and do his particular job. I am aware that does not always follow and leads to some variation; an accident is an accident regardless of severity. A man might pinch the end of his finger and lose a day; that is an accident. He might lose a leg, that would still be only an accident. In small accidents where a man loses a day and is brought back and put to sweeping, that would eliminate a part of the severity and would lead to a variation in the record. What are others doing along that line?

MR. C. W. HATHAWAY (H. Mueller Manufacturing Company, Decatur, Ill.): We have always insisted that a man return to his work. It often happens that a man—a millwright or other skilled worker—says that his compensation is not enough, compared to his rate, and the foreman will ask: "Can't you put him back at light work? He only has one hand hurt, or his knee is stiff," or something like that. But we have insisted that if a man cannot come back and do his own work he has to stay away until he can. We feel that is only a fair thing to do, because if a common laborer gets hurt and asks for a light job we might soon have the plant cluttered up with such cases.

MR. F. A. DRUMB: It is all right in computing statistics, to call the time lost until the man is able to come back, but when we consider a man is cut off from 65 per cent of his income, I believe he should be given work. If a man is working in a woodroom and injures his hand he may be able to do light work in that department and if he wants to come back we should try to help him. It is all right to call it lost time, but you have to use judgment in considering the man's income. One of the speakers said that in a contest the men were anxious to get back, but I found just the opposite—they were anxious to lay off.

CHAIRMAN GLEASON: It is more or less a matter that each mill will have to work out for itself. I do not believe any mill will make a practice of bringing employees back and letting them do nothing or work that they are not particularly fitted for just to get them back to work.

ACCIDENTS CAUSED BY MEN NOT WEARING SHOES

MR. WHEELER: We have quite a number of accidents every year caused by men not wearing shoes—by dropping weights on their feet, stubbing their toes, or cutting their feet with pieces of glass. This year several such accidents have occurred, averaging two days' lost time each. You can not get some men to work around a machine without shoes on, but it is almost impossible to get other men to do so. We have fought this practice for a long time and we would like to hear how others have overcome this trouble.

MR. ALTMAN: Many paper mills have the same proposition and will continue to have it. It is a matter of individual education and explaining to each fellow that it is best for him to use shoes. You can't make old paper-makers put shoes on because they are so used to running around the machines without them that they feel out of place with shoes on. In the case of a new man we may have a little influence and he will continue to wear shoes, but with the old fellows it is a hard proposition.

MR. G. M. HAFENBRACK: We have had two serious cases of infection in the last year, one a paper-machine tender; he was off thirteen weeks with a sliver that got under the hard skin; he thought he had it out. He painted his foot with a little iodine; I think he just sealed the sliver in. He spent several months meditating how foolish he was in not going to the first-aid department.

I talked with the superintendent of a large mill and he said he never went without shoes and I was surprised to see how many of his men were wearing them. If the superintendent has gone through his paper-making career wearing shoes, you will find that the men under him are inclined to do the same, but if the old-timer at the job has never worn shoes it is pretty sure he is not going to start now.

MR. DRUMB: In putting on wire we require all the men to wear shoes. We have a fellow that has worked in every paper mill in the United States and Canada, and he always wears shoes, but we have four or five new men—we are just breaking them in—that never wear shoes.

REPORT OF NOMINATING COMMITTEE

CHAIRMAN GLEASON: The Nominating Committee has offered the following selection as officers for the Section next year: Mr. Adam Wilkinson, Labor Commissioner, American Writing Paper Company, Holyoke, Mass., Chairman; George Phillips, Champion Fiber Company, Canton, N. C., Vice-Chairman; William F. Dewey, B. D. Rising Paper Company, Housatonic, Mass., Secretary. (Upon motion the report of the committee was concurred in.)

SUGGESTIONS FOR SAFETY CODE

CHAIRMAN GLEASON: The Committee working on the safety code for pulp and paper mills have several questions they would like to have discussed at this time. First is the question of guards for the nips of calenders.

MR. ALTMAN: We want the opinion of the Section regarding guards for calenders compared with guards on supercalenders; whether it is necessary or whether guards on the nips of the calenders of the machine are the same as for supercalenders. We did not want to impair the efficiency of the machine, because of the necessity in various cases of having the order ready for finishing or drying it is very frequently put on the stacks—whether the same guard that we have on the supercalenders should be applied on the stack calenders at the machine is the question. We all know the guards on the supercalender.

MR. HOYMAN: The advisability of placing guards largely depends on the machines. On some of ours there are guards on the calender rolls and on others there are not.

CHAIRMAN GLEASON: The next subject is hazards of the water run.

MR. ALTMAN: I don't believe we can help you on that subject. Can anyone point out the hazards of chip screens? We have never had

such accidents in our plant. Can anyone say anything about the ground wood process?

MR. DRUMB; On ground-wood work we have an excellent scheme. We had a rather severe accident in our grinding room; we called in the foreman and asked him if he could not arrange the work so that pocket doors would not drop down. He did so and the upper grinder is now fixed in such a way that a man cannot possibly drop it on his fingers; besides it makes the work much lighter and pleasanter for the operator. The old method took a good deal of effort to run the cylinder up with a big grinder; but it runs up with little effort under this scheme and the cylinder positively does not drop on a man's fingers.

The Section then adjourned.

Petroleum Section

August 29 and September 1, 1922 -

ROY S. BONSBIB, Chairman

Standard Oil Company (N. J.), New York City

ROY W. KELLEY, Vice-Chairman, Producing Division

Associated Oil Company, San Francisco, Calif.

J. C. LINDSAY, Vice-Chairman, Pipe Lines Division

Western Pipe Line Company, Casper, Wyo.

E. C. ESTERLY, Vice-Chairman, Manufacturing Division

Atlantic Refining Company, Philadelphia, Pa.

F. C. SINGLETON, Vice-Chairman, Marketing Division

Standard Oil Company (Indiana), Chicago, Ill.

V. R. CURRIE, Secretary

The Texas Company, Houston, Texas

TUESDAY MORNING SESSION.

CHAIRMAN BONSBIB: Petroleum is the last of the big industries to take up organized safety work and I believe that there is more need for real, organized safety work in ours than any other industry. It has all the hazards of other industries and some which are peculiar to itself. This Section of the Congress can do more real constructive work and be of greater assistance in the reduction of accidents than any other Section.

During the past year we have endeavored to interest the various oil companies and your Chairman has written a large number of letters to company officials. A number of conferences have been held with the American Petroleum Institute and these have been the means of starting an investigation which, I believe, will be of great assistance to the industry. One subject we have considered is the development of a gas mask to be used when working in fumes. This is important, as the effects of fumes are very destructive. A committee made a study of the situation and, much to our surprise, found that no one knew the exact nature of the fumes. A number of refineries had tried, by rule-of-thumb, to

develop a means of protection, but it is our belief that it will be impossible to provide a canister mask until we know the exact nature of the gases; until we know just what we must contend with, how can we do it?

LETHAL ELEMENTS CONTAINED IN GAS

The American Petroleum Institute was interested and a committee—consisting of Dr. Manning, Director of Research of the American Petroleum Institute; Dr. Sayers of the United States Public Health Service, Mr. Smith of the United States Bureau of Mines and myself—held a conference. We went over the field and laid out a plan of investigation. The nearest figures we could get on the cost for such an investigation as we planned was about \$25,000. The Bureau of Mines promptly assumed one-half of the cost and the other half has been raised by the American Petroleum Institute by contribution from the various oil companies throughout the United States, Canada and Mexico. I am happy to say that shortly after our conference the entire sum was subscribed and three men are now at work to determine the exact composition of the gas and the best means of protecting the worker—the exact amount of lethal elements contained in the gas. This work will mean a great deal to the petroleum industry in general.

During the past few months two men of our company (Mr. Armstrong and Mr. Patton) have done a great deal of work in the developing of a safe type of air hose mask. The work is not quite finished, but they are doing excellent work.

MATERIAL FOR BULLETIN SERVICE

We are also at work gathering material for our bulletin service. This work, to be effective, depends absolutely on material furnished by the various companies. It is impossible for your officers or those of the Council to produce bulletins without your co-operation. The bulletin should show an actual hazard, not something visionary. I don't believe in photographs that are specially posed. Everybody should carry a kodak. I would not think of going into a plant without one—you see many things that you can use in making bulletins; things that are really effective. Keep your eyes open and let's make our bulletin service a real help. To have a real kick in them we ought to show something of the peculiar hazards of the petroleum industry.

SECRETARY CURRIE: We devoted much of our time to securing new members and were quite successful, nine companies joining the Section.

In connection with the bulletin service I think that it would be well to ascertain what companies are getting out their own bulletins. If copies of these bulletins were sent to the Secretary of the Petroleum Section, and by him to the National Safety Council engineer, together with other necessary material, the bulletin service in the Petroleum Section could be developed into a very valuable service. I would request co-operation on the part of every delegate present to this end.

CHAIRMAN BONSB: That is an excellent suggestion. I only know of one company that gets out their own bulletins, the Associated Oil Companies of California.

In order to be effective the bulletin should be simple. When you include three or four things you divide the interest of the readers and do not make the impression you should. I am a great believer in home-made bulletins; if the member companies would send in ideas that could be worked up it would be very effective.

If you have a lot of material on the bulletin-board a man will come along and say: "Oh, hell! I haven't time to read all that junk." But if you have just one thing he will get it and pass it on, and you get your idea across. That is very important, at least that has been my experience. It is very important that you get the material to the Council. We print all the material that we can secure.

MR. EMIL J. SENNE (Vacuum Oil Company): In justification of the general type of bulletin, I want to say that that is not our set plan and we do not show the bulletins in that way. Our idea was to show the number of bulletins and the type used to display them. We have bulletins on exhibition at the employment entrance; the point where the man comes in. We use individual bulletins in the plant. For instance, the bulletin that relates to rubber gloves and the care and use of acids, we display those in the acid department. Another, on goggles, is used in the machine shop; we would not use the goggle bulletin where goggles are not required.

PLACE BULLETINS WHERE THEY WILL BE READ

CHAIRMAN BONSIB: I did not mean to criticize. What I wanted to point out was the importance of concentrating attention—the use of the right kind of bulletins at the right place. In one of our plants I saw a goggle bulletin over a pile of pipe fittings, outside of the shop. I mention the fact in order that you may be sure to get your bulletin and your sign right where it is going to bring home the idea. We will take up the subject of bulletins a little later.

The next thing on our program is the appointment of a Nominating Committee to select officers for the coming year. Mr. Winslow, Mr. Senne, Mr. Evans and Mr. Beaghen will please get together and make the selection, reporting at the next meeting.

Now comes the real part of our program. We did not have set papers prepared, because we believe a round-table discussion is more productive of information and interest. Before we take up the discussion, however, I would like to get a consensus of opinion. Whether we should continue this round-table discussion at the time of our meeting next year, or shall we have papers and a discussion following the reading of each paper. I would like to have this matter discussed. Your incoming officers will be able to meet your wishes.

MR. LAWRENCE BEAGHEN (Standard Oil Company of New Jersey): I think it would be well to publish in advance the papers we are to discuss. That will give each member an opportunity to prepare himself and to become acquainted with the particular topic; questions not brought out in the paper will be brought forward by other members.

COMMITTEE ON PROGRAM FAVORED

MR. EMIL J. SENNE (Vacuum Oil Company): I am also in favor of papers, for the reason that it gives a man who may be more familiar with a subject than others a chance to express himself fully. He gives his ideas to the others present and thereby brings about a discussion on the paper.

MR. S. M. LIPPINCOTT (Pennsylvania Manufacturers' Association Casualty Insurance Company): I believe in set papers. We could announce a subject of interest to our members and give them time to think it over. At the time of the Congress they would come prepared to make the most of the discussion.

MR. BEAGHEN: I do not favor a long-drawn-out dry paper, but some particular topic that will bring out an interesting point to start the argument; the rest will follow.

MR. E. A. TIMMS (Standard Oil Company, Bayonne, New Jersey): If you have papers it may take a long time to arrive at results. In a round-table discussion you bring up topics that are of vital interest to the member companies. I think you will arrive at results in that manner much quicker than you will by having papers.

MR. A. B. CON (The Texas Company): If you have a fixed subject the speaker is really the leader. It would seem to me as though the National Safety Council meetings would be best served by having papers. In the Sections where they have set papers the discussions are usually very good indeed.

MR. BEAGHEN: Research is the thing, and inasmuch as that is so I think we ought to have papers, but certainly not text books.

MR. LEROY W. EVANS (The Atlantic Refining Company): I think you get more knowledge out of a set paper, because it gives the man who delivers it an opportunity to study the various points of his subject; he has a splendid chance to put ample emphasis on certain points. The members ask questions and the subject is thoroughly considered and much benefit results.

CHAIRMAN BONSB: I take it to be the consensus of opinion that the Section favors the readings of the papers, to be followed by discussion. The incoming officers will please take note.

MEN LOATH TO ASSUME RESPONSIBILITY

We will now take up briefly the safety organization methods of accident prevention in the four big divisions of the petroleum industry. In this discussion we want you to feel free to ask questions to develop what you believe to be the best form of organization and the best general method of reducing accidents.

Your Chairman has had a good deal of experience in producing territories and I have found time and again that the men are loath to assume personal responsibility for accidents. They know better than anybody else how to prevent injuries. What is the best organization to reach those people? You have men working in towers eight hours a day; in many places ten; in others, five and six. Has anyone a suggestion as to what they think would be the best way a safety organization could

reach these men in the producing game—it really is one of the big fields.

The men in the producing field—as soon as you show them that you are not trying to tell them how to drill a well and that you are there to help them—are more susceptible to safety than any other workers in the petroleum industry; they are rough and ready fellows, but you cannot help but like them. This is a great field for safety work.

MR. SENNE: One of the principal hazards is that of fire.

CHAIRMAN BONSB: There is a fire hazard, of course, but it is not so serious with the modern methods of drilling wells—setting the boiler back from your rig. The men forget the rule and smoke sometimes, but when they get down to the gas and oil, they quit smoking, theoretically. Some of the biggest fires have been due to smoking, at least that is what they say. Generally speaking, I think the big hazards in the producing department are these: Falling objects from above; leaving wrenches upon the tubing boards; slipping, tripping and falling; slipping on the floor, and having tools strewn around, and defective ladders. However, with the modern steel derrick there is not so much danger as formerly.

The pipe line division is a very important part of the industry, because it is this department that takes the product to the refineries. Is there anyone here familiar with pipe lines.

CAMPAIGN OF EDUCATION BEST METHOD

MR. GIBSON: The pipe line industry is pretty well organized and has been pushing safety methods. In fact, all the companies, in general construction and operation of stations, have given more attention to it than the public generally knows. I know of one or two concerns that have been teaching safety to their workmen, and they have decreased accident 50 per cent.

There is nothing to do except educate and train them in every way; use every safety appliance possible; post your bulletin, as has been suggested, and have personal bulletins, if possible. At the end of each month we publish the number of accidents that occurred and other information. We go so far as to show typical cases, giving the names of the persons injured and where the accident occurred. That data is sent to every one of our plants, and read with a great deal of interest. Everyone down in Texas wants to find out what the fellow is doing at Wilburn and what changes they are making in their location. They read that stuff for no other reason than mere curiosity. They ask: "What is the fellow in the other plant doing?" This method creates more interest than anything else; the idea is to keep pounding into them "Safety First! Safety First!"

CHAIRMAN BONSB: My experience in pipe-line work rather emphasizes the importance of getting new men on the work where you are sure they are best fitted. In laying new lines you get a bunch of new men; it is a hard matter to keep a force of men steadily on the payroll. We have found that a three or four minute talk, occasionally, right on the job where the men are working, is very effective.

Another very important method is this little snappy two or three line poster. It is roughly printed, but I think they are wonderful. The

men notice them more than anything else: "Bill says I ain't no ——— fool; I watch my step!"

MR. COOKE: What is the cause of most accidents on pipe lines?

MR. D. J. WALLACE (Humble Oil and Refining Company): Carelessness. I cannot tell you all of the causes, but I think falling objects is the most dangerous feature.

MR. GIBSON: Do you keep records of accidents?

MR. WALLACE: Every accident is diagnosed down to its final analysis; when, how and what caused it.

MR. GIBSON: Do you find accidents are caused by hand tools?

CHAIRMAN BONSBIE: Do you have trouble through wrenches slipping?

MR. WALLACE: Not much.

CHAIRMAN BONSBIE: How do you prevent that type of injury?

MR. WALLACE: We do not have a great deal of trouble from those sources and they are of a minor nature; they do not worry us very much. The thing to do is to keep men from stepping on nails and to prevent things falling on their heads.

CHAIRMAN BONSBIE: Pipe line departments are pretty well organized, but I have noticed, especially around pumping stations, a tendency to leave wrenches and other objects laying around for someone to fall over. Have you such trouble?

MR. GIBSON: I do not think so.

CHAIRMAN BONSBIE: My experience in the pipe line division is that men have a tendency to forget to put away their wrenches and once in a while someone stumbles and falls. I am glad to know there is one company that does not have that trouble.

Now we come to the manufacturing division—we probably have more representatives in that department than in the others. We have all the peculiar hazards of each department in this Section. What is the most effective form of organization in refineries that will reach the men, maintain their interests and get results?

RESULTS SECURED THROUGH COMMITTEES

SECRETARY CURRIE: In my work I have some twenty-nine different plants, scattered all over the country. Our organization is composed of a central committee—a general chairman and a member from each of the large manufacturing units of our plants. Those members, in turn, are chairmen of committees in charge of the work at the different plants. The central committee meets twice a year and the plant committees once a month. The business is transacted through the central committee and the plant committees.

CHAIRMAN BONSBIE: What is the best form of committee; one composed of foremen, sub-foremen, gang leaders, or the workmen themselves? We have both types of organization in our company. When it comes to a committee, the big idea is not to go around and make a hundred suggestions, mixing up small things of less importance. My thought of a safety committee is one that will spread the gospel of safety among the employees. That is most important; a committee that will maintain

interest in safety. What type makes the best safety committeeman; one that will get results and maintain interest?

MR. SENNE: The foremen. We have an organization of foremen, such as Mr. Currie spoke about. The general committee, instead of meeting every six months, meet every three months. The meetings are attended by the chief safety men of each plant, by the foremen and sub-foremen. We have no experience in the way of workmen on the committee, for the reason that it is difficult to make any particular selection of that type of men. On our committee we want the foremen and sub-foremen, intelligent men who know just what the hazards are and the best way to approach the men and spread the gospel. We have found that form of committee to be very successful.

CHAIRMAN BONSB: Have you had any trouble with the foremen not attending a meeting because they are rushed with work?

MR. SENNE: We try to arrange our meetings convenient to the time of the various foremen.

CHAIRMAN BONSB: If the foremen cannot attend do you arrange it so that his assistant comes?

MR. SENNE: The sub-foreman takes his place. We have found that to be effective.

SECURING SUGGESTIONS FROM MEN ON JOB

MR. WALLACE: A refinery usually has a committee of about twenty-five men, split into sub-committees; a committee is given one zone for a month and then shifts around. Our committees are composed of heads of departments; the big advantage is that you get men with ideas, but it is a bit hard to synchronize and get them to act together. They work in this way: The man who has charge of the filter-house will appoint one of his good men; he will say: "Bill, go around and find just what the hazards are and give me all the dope you possibly can." He brings his suggestions to our committee meeting every month; we discuss them and get a lot of information that way.

MR. L. W. EVANS (Atlantic Refining Company, Franklin, Pa.): I cannot tell you very much about our Philadelphia plant, but at our Franklin (Pa.) plant we have an organization composed of seven members, taken from the different departments in the plant. We meet twice a month. We make inspections throughout the plant, and the usual topics are brought up. Of the seven members five are foremen, but it was not the intention of the management, when these men were appointed, to adhere strictly to foremen. One member of the committee works on the filling rack; he has had years of experience in handling gases and vapors. Another man is a yard master who has had considerable experience in the handling of cars and shipping; he is familiar with the hazards around a railroad. The man from the powerhouse is an electrician and a real mechanic. The rest of the fellows are representatives of the shop crafts.

CHAIRMAN BONSB: Have you found, from your experience, that a mixed committee of foremen and workmen is effective?

MR. EVANS: We have found the committee that I have just described to be very satisfactory.

MR. COOKE: We have not started a committee from the yards as yet, but we have a main committee of eighteen, composed of department heads. We make inspections through some part of the plant each week; that is, one section of the committee makes an inspection each week. Each sub-committee makes one inspection every six weeks and turns in a signed report with recommendations for the zone which they inspected. They have taken to the work quite enthusiastically and it helps to impress the men with whom they come in contact on inspection tours.

ZONE SYSTEM GIVES GOOD RESULTS

My experience has been with the zone system—it is an ideal one. All reports of inspection are signed by members of the committee. That is very important. When a man signs his name to a report he feels that it is part of his work. He thinks a long time before making suggestions or allowing suggestions to appear on that report that are not feasible or practical. Safety committees should see that every suggestion made by a committeeman is noted. If it is not practicable, the reasons for not carrying out the suggestion should be very carefully explained to the man who made the suggestion.

MR. TIMMS: I would like to ask Mr. Cooke who appoints the members of the committee that make the inspections of the different zones? Does that come from the chairman of your committee?

MR. COOKE: In order to start this discussion I submitted an inspection schedule, giving the names of the members of the committee and I numbered the zones. I submitted it to the committee for approval. It was adopted.

MR. TIMMS: At our Bayonne plant we have a committee of twenty-four. All are heads of departments and, personally, I think that the foreman is the man that should be interested. We meet once a month, at which time the chairman appoints three men to make an inspection of a zone. The plant is divided into six zones, so we get two inspections of each zone a year. It would be a good plan if the general superintendent of the plant sent a letter, over his signature, to the members of the committee, appointing them, as a committee, to make an inspection of the zone. That would be more effective than the chairman of the committee appointing the members and you would get better results, because that would require a report sent to the general superintendent with a copy to the chairman of the committee.

COMMITTEEMEN MAKE WRITTEN REPORTS

CHAIRMAN BONSB: That is an excellent idea; it makes the men feel that the general superintendent is the man that is interested.

MR. SENNE: I second that idea.

SECRETARY CURRIE: I think that would depend, largely, on the nature of your plant committee. At our large plants, where the general chairman is not even located at the plant, and the local chairman of the safety committee at that plant is usually the assistant superintendent or assistant general superintendent, and consequently empowered to give orders the same as the superintendent would be, in the safety meetings, he appoints at every meeting a committee of three or four to make the

inspection for the following period. That committee changes at every meeting and they do whatever he says. I don't think, in that case, a written report is necessary.

CHAIRMAN BONSB: If you get a letter from the boss, asking you to make an inspection of a certain district, you think: "The boss is interested and I am going at this thing twice as hard. I feel as if he has let me into his confidence." You work harder than you usually do. I want to bring that fact out. Of course, we have to remember that safety is something that helps the oil business. It is a very vital factor in the production, manufacture and sale of petroleum products, and in doing our safety work we have to get the people that are engaged in the oil business to feel that safety is a part of the business; in other words, sold on the idea.

MR. GIBSON: At the end of every sixty days we send a letter of commendation individually to the committeemen. They appreciate it.

KEEP MEETINGS INTERESTING

MR. J. M. STEFFEN (Standard Oil Company of Kansas): In our safety meetings, which are held once a month, oftentimes we invite the big boss, the superintendent or the president, to be present. They don't always take part but the very fact that they are there stimulates interest in the meeting; it shows the men on the work that the big man at the head of the concern is really interested.

CHAIRMAN BONSB: That is a very good thing. I know that a visit of the general superintendent to one of our works puts more pep into the committee than anything else that could happen to them.

MR. STEFFEN: One of the very best meetings we ever had was one that the superintendent attended, and he never said a word. He took it all in and it did him a lot of good.

CHAIRMAN BONSB: What do you believe is the most effective safety committee?

MR. VON THURMAN: We have a mixed committee. The selection is left to our safety man; he covers the plant every day and is constantly looking for men interested in that sort of thing. Sometimes a fellow is not interested and again you will find one very much interested; we put him on the safety committee.

We have on the committee the superintendent of the pressure stills—we call him our general labor foreman—and one or two other foremen of equal standing, and one old man who is known as "Pop" Harrington. "Pop" will always be on the committee, because he knows how to say a thing and how to get it across. He said recently: "If every man is looking out for his own safety in the best manner he can then 1,600 men are looking for safety every day." We have found that the big idea is to get a man that is a bug on the question. That is very important, no matter where he comes from. It is necessary to turn down some foremen because they do not show as much sympathy as they should toward the movement.

SHOULD COMMITTEEMEN BE PAID?

CHAIRMAN BONSB: Do you believe that money should be paid for safety suggestions?

MR. STEFFEN: Our company has not practiced the system of paying money for suggestions for the betterment of protection. For several years, before the safety department was adopted, I could go over the yard every day—half of my time, at least, is put in among the men, rubbing elbows with them—and if there is any one thing that causes trouble among the men it is the distribution of the prizes that are awarded for suggestions. That is the proposition you are up against. I get most of my safety suggestions verbally; that is a point I want to make. The average man in the yard is not in a position to write suggestions out intelligently, so that you can get at what he means. He will hesitate in sending them in; at least, I have found scores of times that a man will make an important verbal suggestion that he would not have thought of writing out and sending to me. Ninety-five per cent of the suggestions come to me verbally and I jot them down on a piece of paper, writing them out afterward. I make it a point to go out and talk to the men.

CHAIRMAN BONSB: That is a fine way to get suggestions. You talk to a man about a certain thing and keep asking questions. He will finally make a suggestion. I have found that to be very effective.

MR. WILLIAM WINSLOW (The Texas Company): We have no means of getting suggestions unless we go out and see the men and have personal talks. A good many suggestions come to our superintendents and assistants and foremen in the manner that has just been described, but most of our suggestions are in writing. Sub-committees, consisting of a foreman and two or three workmen make inspections monthly. The workmen naturally are more familiar with conditions and they offer the suggestions they get from their fellow workers. The members of the sub-committee get them and make a monthly report. However, they do not sign their names to the recommendations, as has been suggested here by someone. They get any number of suggestions, and these suggestions are acted upon in the monthly safety meeting, which is held by the foremen and the members of the committee. If some of them should happen to be passed over and held until the next month they are sure to be taken up at the next meeting; if necessary, that procedure is repeated until they can be passed on.

The fact that the workmen members are changed every three months or six month makes us feel that eventually we will reach all the men. The workmen are proud to be on that committee and by changing them frequently we will eventually get all of them to serve.

WHO IS BEST MAN TO SERVE AS CHAIRMAN?

CHAIRMAN BONSB: In one oil company that I am familiar with the minutes of the committee meetings are sent to the main safety man. He goes over them and if he notices things that are not being attended to he writes the general manager of that plant, asking if the suggestions are practical. I am told that has been very effective in

getting things done, because the foreman does not like to have embarrassing questions asked by the general manager.

I have another question I would like to hear discussed. Who should be chairman of the safety committee, the safety engineer or the assistant superintendent?

MR. WINSLOW: We believe that the superintendent or his assistant should be the chairman and the employment supervisor the secretary. A good deal of work is done by the secretary. The head of the plant should be the chairman, but the committee is in charge of the secretary.

MR. STEFFEN: In our plant we have a safety committee appointed originally by the management. This committee holds office for life.

CHAIRMAN BONSB: Is that a good idea?

MR. STEFFEN: Yes, I think it is as good as any I know of. I cannot say how long the term is. They left that open, so they could be fired any time they wanted to do so. I am chairman and I am responsible for the safety work. I always act as chairman at the meetings. We have a stenographer that writes up the minutes.

CHAIRMAN BONSB: I will tell you why I am opposed to the safety man being chairman of the committee. As I said a minute ago, the main thing is to give a man something to do that he is interested in. The safety man of the organization is supposed to be very much interested in safety; he does not need any prodding.

Another thing: If he is chairman the men will say: "That is his job; let him do it." Whereas, if you have someone that is not a safety man acting as chairman of the committee he has something to do, and if the safety man works it right he can do much more in that way than if he were chairman.

GET THE RANK-AND-FILE MAN INTERESTED

MR. BEAGHEN: It is all very well to have the general superintendent, the general manager, the superintendents of departments, the department heads, the foremen and sub-foremen on the central committee—have them interested all the time—but that is not enough. You have to get the rank-and-file man interested—the humblest man in your plants—and impress safety upon his mind, or this particular man will not go to his foreman and report some particular hazard in the plant, for fear he will get condemnation from the foreman. That is true in 90 per cent of the cases you run across. If you have a committee made up of the rank-and-file—a mixed committee—you will fare better in your safety work than if you had it made up entirely of foremen. Our committee consists of ten men and two men are assigned to each particular zone; we have weekly inspections and weekly meetings; we usually meet on Wednesday afternoons. Wednesday morning is entirely taken up with inspections. The two men travel together in one particular zone and inspect one part of the plant. They report to the chairman and discuss the hazards they found. Recommendations are made and recorded, referred to the superintendent for his approval and then go to the board.

I find from experience that you get better results if you work directly with the men, the rank-and-file, than you do with the superintendent. It is understood that the superintendent, if he is a good one, is a thorough safety man from start to finish. I have also found that by having personal contact with the men you will hear their suggestions, as has already been stated. You will have more success in that way than if you came in contact with the department heads and the sub-foremen. Those men will be greatly interested and will be glad to know that somebody is backing them up; they will come to you finally and show you the bad spots the average foreman does not see. He will work right by them day after day without seeing them, but the rank-and-file men do not do that. They see these things and feel they ought to be attended to.

I think we are making wonderful success. I feel that the employees' committee is the one to have. You are close to the men all the time. The rank-and-file are the men that do the work and wear the goggles.

PLAY UP THE UNUSUAL THING TO HOLD ATTENTION

CHAIRMAN BONSB: Are there any other remarks? It is the unusual thing that attracts attention. The things we see every day we pay little attention to. I am a very strong believer, whether a man knows anything about the business or not, if he is the right type of man, to put him on a safety committee.

I want to ask a question. It is this: How often should safety committee meetings be held to be effective? How long should the meeting last? These, to my mind, are two very important factors in successful committee work.

MR. STEFFEN: I would say not oftener than once a month.

CHAIRMAN BONSB: Why?

MR. STEFFEN: The men get tired of it and there is not enough material to make a successful meeting.

MR. TIMMIS: That may happen when you have a superintendent's meeting, but if you have an employees' meeting you will not have that condition.

CHAIRMAN BONSB: The meetings do not lag?

INSPECT THE OTHER FELLOW'S DEPARTMENT

MR. TIMM: They don't lag a bit, from the minute they start until they finish.

Supposing I am one of the inspectors on the committee and we go to some particular part of the plant, say the pressure stills. I will say to the superintendent: "We represent the safety committee and I would like to inspect your department. Would you care to go along with us." He answers: "No; I am busy and can't spare the time." His assistant is also very busy. Then I will say "How about your foreman?" If we cannot get a foreman I will ask: "Do you mind if we go alone?" He will answer: "Yes, go on."

So we go through the department, and ask questions of the stillmen and helpers—anybody we come in contact with—and in that way become familiar with every part of the refinery.

MR. VON THURMAN: How long do they hold their places?

MR. TIMMS: They swing about. The same eight men are on the committee for a year, regular employees.

MR. VON THURMAN: How much time are they supposed to take in inspecting?

MR. TIMMS: From early in the morning until noontime. In the afternoon we have our safety meetings. The hazards are reported and recommendations made. The superintendent gets a copy of the minutes.

MR. VON THURMAN: How often do you have your meetings?

MR. TIMMS: Every two weeks. In the meantime we receive suggestions from other parts of the refinery, from men who are not on the safety committee. They report to the members of the safety committee or to me, if I happen to be around. You get a lot of things in that way.

MR. STEFFEN: How long does the safety meeting last?

MR. TIMMS: That all depends on the extent of the business. We are entitled to the entire afternoon for our meeting, but we hustle through as quickly as possible and then go over the old items.

The items that came up at the last meeting are discussed in detail, and we ascertain whether or not they have been taken care of. If not, we put them in the minutes of the second meeting, with the notation: "Second reference." If the item comes up for a second conference the superintendent writes the particular department head a letter, asking if it is worth consideration. If so, to have it taken care of.

MR. VON THURMAN: What percentage of time is lost because of accidents?

MR. TIMMS: I cannot give you the data on that.

MR. VON THURMAN: Suppose someone is injured because of something the foreman might easily have prevented. Have you any way of penalizing the foreman?

MR. TIMMS: We have, but we seldom actually penalize the men; we discipline them—usually a lay-off or something of that sort.

CHARGING ACCIDENTS TO DEPARTMENTS

MR. VON THURMAN: You have a first-aid. Do they carry the time of the man who is injured?

MR. TIMMS: No. That is carried by our benefit and employment bureaus.

MR. VON THURMAN: Does the man or the company take care of medical expenses?

MR. TIMMS: The company takes care of that in the general plant overhead.

MR. VON THURMAN: Is that entered against the foreman's department? Would that be a penalty?

MR. TIMMS: Every foreman is directly interested in his department and wants to keep his overhead down.

MR. VON THURMAN: If the man was the head of a department, say, of fifty men, that would increase his cost of operation?

MR. SENNE: Every month the various plants issue a report showing costs and the accidents that occur during that month—time lost and compensation paid. This is charged against the department that man is working in; we also have a sheet showing accidents terminating that month. That is for the information of the general safety committee, the local safety committee, the general superintendent and chief safety man.

MR. VON THURMAN: Compensation? Do you mean what is paid under the State law?

MR. SENNE: Under the company's plan; in excess of the State law. In that way the largest departments are penalized the heaviest. The sum is charged against the department; it creates considerable interest in the plant when the cases come up for discussion, whether they should be charged against the department or not.

MR. VON THURMAN: Who decides the question?

MR. SENNE: The safety department of the plant decides it.

MR. VON THURMAN: The safety department and the first-aid department work along the same general line, and we let them make the decision. They decide whether the foreman or the man who was hurt was to blame.

DISCIPLINE A REMEDY FOR ACCIDENTS

CHAIRMAN BONSB: I know of a company that penalizes a foreman by laying him off for any accident that occurs in his department.

MR. BOYER (Atlantic Refining Company): What do you do to the person directly responsible for an accident? Do you penalize the individual? The foreman may have fifty men working for him; what happens to the man who causes the accident? Every sin carries its own penalty, and that is true of powder mills and oil refineries.

CHAIRMAN BONSB: The question of penalizing the man that caused the accident is something to be worked out.

MR. STEFFEN: That just depends upon the nature and result of the accident; the conditions under which it occurred. We fired a man for causing an accident that put out another fellow's eye. Fired him on the spot.

CHAIRMAN BONSB: Do you think you should do that?

MR. STEFFEN: It was the result of horse play.

CHAIRMAN BONSB: I don't think firing is the best plan.

MR. STEFFEN: It all depends on the nature of the accident and the circumstances surrounding it. You cannot make a hard and fast rule.

MR. COOKE: On a number of occasions we have laid off men for a period of from three days to two weeks for causing accidents to employees—where it was a clear-cut case of carelessness that caused the other fellow to get hurt. In the refinery department of our plant there are about 1,000 employees, and we adopted a rule that when a man is hurt through another's carelessness the person that caused the accident is laid off for the period of disability of the injured, not to exceed two weeks.

CHAIRMAN BONSB: I think that is good.

MR. VON THUEMAN: It is a little difficult to say just what is done in each case. They are referred to the manager and he holds a kangaroo court; whatever decision is reached is the thing that sticks.

CHAIRMAN BONSBIE: The court idea is very good. Going back to the length of time of a safety committee meeting, I think it should not, under any circumstances, last more than an hour and a half. The men get tired and if their minds wander your work is not effective. The chairman should take up the salient features to be discussed. If the men know that the meeting is going to last an hour and a half they will be there. They say: "I won't waste the whole afternoon." It is up to the chairman to close the meeting when the time is up.

MR. STEFFEN: Our meetings last about an hour.

CHAIRMAN BONSBIE: That is good. How do you do it?

MEN INTERESTED IN ESSENTIAL TOPICS

MR. STEFFEN: We quit at 4:30 and the men go to the meeting at 4 o'clock; when the 4:30 whistle blows they are dismissed. If, however, there is anything so interesting that the men feel that they should stay awhile longer we let them stay on their own time.

MR. COOKE: Do they stay?

MR. STEFFEN: Yes, sir. At times they stay an hour. If you have a subject that is of interest and if the men are willing to stay on their own time, let them stay. You can tell by the atmosphere in your meeting whether they want to stay or not. Sometimes our meetings last until 5 o'clock, a half-hour overtime, and everyone is on his own time.

CHAIRMAN BONSBIE: If you have a committee meeting once a week for an hour it is much more effective than a three-hour session once a month. We all like to have our little chats at regular intervals, rather than to get together and have one big talk at longer intervals. If you will acquaint everyone with the topics which are to be taken up at that meeting, leaving out non-essentials, they will come loaded for action. It is up to the chairman to see there is no lagging. In every meeting there are members who have some idea they want to know about; they start talking and everybody's mind is not on the subject, but if everyone's on their toes over something that is interesting it is a different proposition. The chairman should keep them pepped up.

MR. STEFFEN: The men do not feel the responsibility of keeping the subject pepped up.

CHAIRMAN BONSBIE: If you have a chairman they will say that it is his business.

MR. STEFFEN: Every month we send a written notice to every committeeman; we suggest this, that and the other thing that ought to be taken up at the meeting—then the men make it a point to investigate and come loaded. It is up to the chairman to make suggestions; sometimes you get a response and sometimes you don't.

MEETINGS SHOULD BE AT STATED TIME

CHAIRMAN BONSBIE: Every man has a sore spot that you can sound him on and he will holler, but you don't want to do it so he will be sore.

SECRETARY CURRIE: The time of holding meetings, I think, depends largely on conditions existing at a particular plant. We have meetings in the morning and in the afternoon; we have one committee that has held ninety monthly meetings on their own time in the evening, after working hours. They meet at the cafeteria and we furnish their meals. They sit down and chat, taking their time; following the dinner they go to the committee-room and transact their business. That is one of the best committees we have and their work has been very effective.

CHAIRMAN BONSB: I support Mr. Currie on the idea of having a meal and after the meal a meeting. That is a splendid idea. Food seems to inspire thought. If a man has had a good dinner he is not likely to get sore at anybody.

MR. STEFFEN: I do not like to be called in the midst of my duties to attend a meeting. If I know that the last Thursday of every month is when we are to hold our meetings, I can make my plans accordingly, but if I am called away from my work I am not prepared to give a meeting my best thought. The question of holding regular meetings is a very important one.

CHAIRMAN BONSB: I am glad you brought that up, Mr. Steffen. That is a very important matter.

Let us now pass on to the marketing division.

SAFETY WORK IN MARKETING DIVISION

It is an astonishing thing how our sales people take the safety idea and the matter of accidents in sales departments. It is one of the most difficult things in the world to put safety across in a sales department, due to the varied nature of the work. I am happy to say that the Standard organization, in the sales department, have the best record of all in industrial accidents.

MR. VON THURMAN: When you speak of sales department do you mean the salesroom?

CHAIRMAN BONSB: The sales department, from the time the product leaves the particular sales station until it is delivered to the consumer.

MR. VON THURMAN: The filling station or tank wagon?

CHAIRMAN BONSB: Yes, the tank wagon and filling station; that includes receiving it from the tank car up to the time it is delivered, to the customer. I don't know of an organization having a special method of maintaining interest in the sales department, but we try to make our branch manager responsible for the safety of his men—we found that to be very effective. We conduct an educational program, another very important matter.

MR. DIES: A great many mistakes may be made in the handling of oil and a great many accidents occur. Sometimes you see accidents where they have used gasoline for kerosene—something of that sort.

CHAIRMAN BONSB: The mixing of gasoline with kerosene keeps our sales department busy. Many customers are careless about marking their cans, especially the small dealer—he will keep gasoline alongside kerosene. Also you must impress upon motor truck drivers the necessity of knowing whether it is gasoline or kerosene. The big accidents are

due to motor vehicles. Teach the men proper driving, proper starting of the cars and proper inspection. It has been brought out very distinctly at our meetings that most accidents are not due to the drivers themselves. Possibly other vehicles run into our tank wagons and cause accidents.

MR. C. A. TATUM (Texas Employers' Insurance Association): There are a great many hazards in the marketing of petroleum that seem to have been disregarded heretofore. A paper is to be read this afternoon on static electricity before one of the Sections. It should be very interesting. You have a good many men (not only on your tank wagons) that make mistakes. A particularly bad habit is that of having unprotected electric light globes in your gasoline stations.

CHAIRMAN BONSB: We assume that the drivers of our wagons knows more than they really do. One of the most common causes of accidents in the handling of motor trucks is backfiring when they crank the motor. Ask a man if he knows how to crank a car and he will tell you: "I have been driving ten years; of course I know how to crank a car." He goes along for a time but he eventually has his arm broken.

In our company I was interested in going around amongst the drivers to find that the men take hold of the handle like this (indicating). We had a number of broken arms, but ever since we instructed our drivers to hold the handle in this manner (indicating) we have not had one broken arm. You might have a bruise but you will never get a fracture. Is a very important thing to see that they know how to crank a car in the correct way.

MR. STEFFEN: They have an anti-kick device for Fords.

MR. WALLIS: We have been stressing this in the Council bulletins; it has been of quite a little help.

MR. BOYER: We produced a safety bulletin and our salesmen were given definite instructions on how to crank a Ford car.

CHAIRMAN BONSB: You cannot emphasize that too much. One big trouble in safety work is that we assume a man knows more than he really does. We have to be careful in talking to them, because the man is mad in a minute if he thinks you doubt his intelligence.

MR. EVANS: The Atlantic Company, in connection with an educational program for the benefit of the drivers, have published bulletins and issued pamphlets dealing with safety in driving and handling materials.

CHAIRMAN BONSB: That is fine. Going back to production: What is the best way of getting up on the tower? Do you use ladders? A very good method is to extend the ladder up above the water table. You see the ladder on so many rigs is cut down here (indicating), about the second tier, and that makes it necessary for a man to climb up through here (indicating) and over here. It takes a lot of time and he may slip, due to the fact that the top is covered with oil. Have you ever climbed one of them? I did it twice, but I won't do it any more. It is a dangerous operation and lots of people have been hurt due to that condition. The conception of safety is not developed, as a rule.

until a man is killed. We have not had anyone killed, but I have noticed, in several of the big fields, that they extended the ladder two or three feet. In extending the ladder you avoid the danger of falling from the top.

LADDERS AND GUARD RAILS

MR. STEFFEN: You do not extend the rounds to the top, just the handholds.

CHAIRMAN BONSB: The ladder itself is extended.

MR. STEFFEN: What is the idea of handholds three feet above the top?

CHAIRMAN BONSB: So you can reach over. I have noticed that on all of the rigs.

MR. GIBSON: How do you get your ladder over the watertable without letting it tip back?

CHAIRMAN BONSB: Start down low and you scarcely notice it. That strikes me as being a good thing and, I believe, that is the feeling of many members. Don't you consider it a good investment?

MR. VON THURMAN: That depends on the weather and what is going on. If there is a high wind blowing, and a man goes up there without anything to hold to, he is liable to be blown off. We have been very lucky in not having any serious accidents of that sort.

CHAIRMAN BONSB: The Empire people have a guard rail around the top of their water table. That strikes me as a good idea.

MR. VON THURMAN: There is another idea, that of putting up a piece of 2x4 or 2x6, with the rounds carried diagonally to the top of the table. They say that is very satisfactory.

CHAIRMAN BONSB: That sounds very good. Another thing that is very important is the use of wire. The oil companies in California are using twisted wire in place of nails, because nails are apt to rust or the wood may decay that holds them.

A man that goes out in the oil fields has to be a very peculiar individual. He has to be an expert psychologist, a master diplomat, and know a little about the business of oil production. That is one department in safety work in the petroleum industry where you have to be awful careful with a man. You have to use mighty good judgment, otherwise you are going to have a war on your hands and liable to be chased out of the camp.

REACHING A MAN THROUGH HIS FAMILY

MR. CONNOLLY: With the field operators in the State of Oklahoma, regardless of the fact that we have not, so far, drawn up a definite program as to just how we are going to do the work, nevertheless I have found that these men can be interested in safety if you get them to come into some community where you have a safety committee. What we have done so far has been very interesting and the men seem ready for the work. All you have to do is to keep up the interest among them.

We have not undertaken anything definite. Our work thus far has been embryonic, but we think the industry is ready for more men in the safety organizations. Many of our drilling operations are small and

there is a tendency for the drillers to be here today and somewhere else tomorrow. They are quite busy, but they seem to be the type of men that can be interested in safety. I think the organization has a great work to do among employees in the field.

CHAIRMAN BONSBIB: I am glad Oklahoma has taken up the work. California has probably done more along that line. We are trying to reach the men through special educational work. I have taken a large number of snapshots of actual conditions of men doing things as they should not do them and also how they should do them. I have had slides made of men working in the field. The problem is to reach the men in oil-producing territory.

I think you can reach them through their families. A man's family has a wonderful effect upon him and exerts a great influence. If you can get people sold on the idea of safety—get the families sold on the idea—you are going to get results that will count. We have conducted a large number of meetings in our marketing and manufacturing departments and have had wonderful success, because the women, as soon as they get their minds made up that their husbands are going to be safe, that is all there is to it—they are going to be safe. When a wife says good-bye and tells him to be careful he will remember her words; they ring in his ears all day.

In conducting meetings it is a good idea to get some local talent. You can always find someone that wants to sing or play or dance, but be careful about the length of time of your entertainment and meeting. One of the best poems I ever read was entitled "I Learned About Safety from Him." It has a wonderful effect. (Mrs. Roy S. Bonsib recited the poem.—See the *National Safety News* for May, 1921.) The following notice will be of interest:

NOTICE

Employees must wear goggles when performing any of the work indicated below. Violation of these rules will subject employees to the following penalties:

First offense, one week's suspension without pay.

Second offense, two weeks' suspension without pay.

Third offense, dismissal.

Machinists and Helpers:

Grinding on or truing up emery wheels.

Chipping.

Turning brass.

Repairing acid pumps.

Pouring hot babbitt.

Boilermakers and Helpers:

Cutting off rivets.

Chipping.

Caulking, when ordered by foreman.

Bucking-up under tanks, stills and agitators.

Passing hot rivets.

Electric and acetylene welding (special colored goggles for this work).

Rivet heaters, especially on outdoor jobs; foreman to rule on this.

Cutting down tanks, etc.

All men working near others who are cutting rivets, etc.

- Riveting under certain conditions; foremen to rule.
- Yard Gangs:**
 Cutting, drilling or chipping concrete, stone, brick, etc.
 Cleaning stills.
 Digging around acid lines.
 Handling soda, lime or similar material.
 Cleaning acid separators, etc.
- Carpenters and Helpers:**
 Cutting, drilling or chipping concrete, stone, brick and similar work.
 Grinding tools.
- Electricians and Helpers—Goggles:**
 Cutting, drilling or chipping concrete, stone, brick or similar material.
 Grinding.
- Electricians and Helpers—Rubber Gloves:**
 Working on all high-voltage equipment. Safety belts and jack straps to be used on all pole jobs.
- Pipe Fitters and Helpers:**
 Chipping steel, cast iron, concrete, brick, etc.
 Grinding on or truing-up emery wheels.
 Repairing acid lines, pumps, etc.
 Acetylene or electric welding (special colored goggles for this work).
 Heating and pouring lead or similar metal.
 Working in boilers.
- Treaters and Helpers:**
 Working around acid pumps, lines, etc.
 Breaking up soda.
 Drawing acid.
 Blowing out lines.
- Painters and Helpers:**
 When preparing rusty iron surfaces for paint.
- General Steam Men and Helpers:**
 Cleaning boiler plates.
 Cleaning soot chambers.
- Acid Works Men and Helpers:**
 Cleaning pans and stills.
 Blowing lines.
 Weighing acid.
 Taking apart, repairing pumps, lines, etc.

The above are considered the most dangerous lines of work in performing which goggles must be worn; however, all foremen are directed to instruct the men in their particular departments to use goggles in any other hazardous work not mentioned above.

VACUUM OIL COMPANY. E. H. Wright, Works Manager.

Educational work is very important, but in order for it to be effective you have to be very careful how you go about it.

USE AND MAKE-UP OF FIRE EXTINGUISHERS

Mr. Senne has raised a question about hand fire extinguishers. That is something that I think the petroleum industry is interested in. What is the best type of hand fire extinguisher? I would like to know what experience you have had in that regard, because there is nothing in the petroleum industry that causes more trouble than fire—the thing we are afraid of more than anything else. We could well afford to spend a little time in this discussion. What is the best type of hand fire extinguishers?

MR. VON THURMAN: It would depend on the fire. If it is a little pool of oil we use the small Foamite very successfully. We call them Foamite buckets. They hold about two and a half gallons, but five gallons is all right.

MR. WALLACE: Mr. Chairman, is it your idea that we should stick to one particular extinguisher?

CHAIRMAN BONSB: I think we should discuss the general experience. We are not here to pick out one particular extinguisher; they all have their place, but my idea is to get the experience of the members—the things they found to be effective.

MR. LIPPINCOTT: How do you distribute the acid in them? Have you ever had any experience with explosions? We had a peculiar accident. In one of our plants a man was testing the soda acid solution in a hand extinguisher of the two and one-half gallon type. He took hold of the hose to put it down on a certain part of the floor. Immediately there was an explosion and the top the container went about a hundred feet in the air. Evidently the top was not securely screwed on, probably was caught by a half thread, and when the pressure rose to a certain height it blew up.

FIRE EXTINGUISHERS AVAILABLE IN WINTER

CHAIRMAN BONSB: Tell us how you use an electric light globe that keeps it warm. That is an important matter.

MR. LIPPINCOTT: No doubt all the gentlemen connected with safety departments are familiar with the fact that soda acid extinguishers must be protected from freezing. The places where they are used are generally exposed—in the warehouse or down on the dock, where they have to be protected from freezing in the winter; they are all right in the summer.

That came to my attention and I devised a small housing for the extinguishers. This is explained in a paper I left with Mr. Bonsb. I don't claim that it is a new idea, but I perfected it and may interest you safety men to look over that paper as it makes the hand extinguisher available in winter as well as in summer.

The point about the housing is that you use a small electric light, a twenty-five volt bulb will suffice. You can run down to a temperature of zero; for anything below zero you will probably need a larger type. The house is equipped with small red panes of glass, this makes it discernible at night to the watchman in three directions, forward and on each side. Our plant and warehouse is equipped with that type of fire extinguisher, electrically heated. Of course, it is not adaptable to a warehouse where electric current is not available. I think the matter is well worth study and consideration.

MR. GIBSON: Have experiments ever been made in the use of calcium brine instead of water?

CHAIRMAN BONSB: I think that would have to be put up to a chemist. They are wonderful men and certain lines of chemistry present very difficult problems. They will tell you if you put anything in the extinguishers that reduces the solubility you are going to interfere

with the effect. If you have a solution of calcium chloride you will reduce the efficiency of your acid solution. It will lower the freezing point, but you won't get the efficiency; you won't get the generation of 202 that you would without the presence of it. Some work has been done on that point.

MR. BOYER: One thing to be noted in the use of acid in the soda solution is that if the extinguisher hangs on the wall, and remains there for an indefinite period of time, the soda will cake in the bottom of the container. I would suggest that periodically you have a man turn them upsidedown and let the soda be stirred up.

There is a fire extinguisher on exhibition in another room. I don't represent the company that sells them so I can speak my mind freely. It seems to be as near perfect as any extinguisher I have ever seen. It is a gallon proposition and the pressure is put on when it is filled. It is ready for immediate use with a hundred pounds pressure.

CO-OPERATION OF PUBLIC AND PRIVATE FIRE DEPARTMENTS

CHAIRMAN BONSB: You apply the pressure with a pump?

MR. BOYER: A pump; when you fill it, not when you go to a fire. The canister is tested to 400 pounds. You use a pint, we will say—maybe a pint will be enough for a particular fire—and you use about five pounds pressure; you will have 95 pounds pressure left and can simply put it away. If you desire, you can fill your container up to a gallon again. It seems to be about as good a thing, if not better, than anything I have ever seen.

MR. WALLACE: It has a gauge?

MR. BOYER: I suggested that to the salesman. He did not think well of it, although he said anything in connection with safety is very necessary.

May I ask this question: What is the attitude of company fire departments and the city fire departments, wherever the fire department is located?

CHAIRMAN BONSB: They should work hand in hand.

MR. STEFFEN: In our plant they do. We have the city waterworks hooked up with ours; by turning a valve we can throw our water into their pumps and they can do likewise. If a fire starts in our plant the city fire engines come rushing down. Our refineries are outside of the city, just over the city line.

CHAIRMAN BONSB: We have a very fine fire system of our own, but if you talk about types of piping you will start something.

MR. VON THURMAN: Generally speaking, our plant is equipped so the Foamite can be put on any fire that may occur within a reasonable distance without putting it out of the house where it is connected.

CHAIRMAN BONSB: Do you put it over the top or the sides?

MR. VON THURMAN: Over the sides.

CHAIRMAN BONSB: It seems to me that your Foamite pipe is liable to plug up and break the connection, whereas if you bring it up the side you get a greater distribution and a more even distribution.

MR. BOYER: The danger as I see it, in case of fire, the men might put on too much pressure all at once.

MR. VON THURMAN: It depends on how you carry the pipe in the middle of the tank; if it should burn down into the bottom of the tank there would be a bad condition.

MR. BOYER (going to blackboard): This is the side of the tank and this is cross-tied all the way down. This venter column is also cross-tied (indicating), the tank proper is like this and steel bars come down like that. On the outside is a cross-tie, at this point, and the oil is here. Your tank is located so there is not much oil in it. It is cross-tied in all sorts of ways to support the roof structure.

MR. VON THURMAN: What size of pipe?

MR. BOYER: They are using twelve-inch.

CHAIRMAN BONSB: Fire fighting is very highly specialized and we safety men must study the problem.

MR. VON THURMAN: Do you think a chemical extinguisher is all right?

CHAIRMAN BONSB: Yes; anything that will take care of fires. Get at the fire quickly—that is a mighty vital thing. You cannot afford to overlook anything connected with safety in the oil industry; safety is the important thing from the time the men go to work in the morning until they quit at night.

PHYSICAL EXAMINATION OF WORKMEN

MR. DIES: Do you advocate physical examinations for field work?

CHAIRMAN BONSB: Not for field work, but we practice it, to a certain extent, and we are trying to do more of it. Physical examination is a good thing for the man himself, and the men should appreciate it; the idea is not to reject them, but to find what work they should do.

We should hear some discussion on the subject of goggles. Everybody is interested in it and I don't know of a department in the oil industry where goggles do not come in. Each goggle is fitted for a certain job, and you will not get a man to wear them until you get one that is comfortable, easily adjusted and won't interfere with his work. There are lots of men with defective vision who do not know it—I was surprised to learn that I was near-sighted, I did not know it until I had an examination—I thought it was natural that I could not see things at a distance. Not long ago I was told of a man that was blind in one eye for years and did not know it. I am a great believer in getting a lens that is fitted to the particular man doing the work. If you do he will wear his goggles.

MR. BOYER: Does the company pay for the lens?

USE OF GOGGLES IN OIL INDUSTRY

much care of his goggles if the company pays for them as he would if he paid. I think the best plan is to have the man pay half and the company pay half. The man will not feel that he is getting something for nothing and is not an object of charity.

MR. BOYER: The prescription lens is all right for the older type of employees, but the younger men won't bother with it.

CHAIRMAN BONSBIB: I have found it is very necessary to show the man wearing goggles that they are for his protection. If you can convince him of that he will wear them. One of the best ways to do that is to show him a picture of eyes that have been lost—it makes a strong impression. I have been fortunate enough to have a section of an eye that has a little piece of steel in it, showing how the injury affected the eye. I am now looking for one of a badly infected eye. Make a man realize what being blind is like. Ask him to close his eyes and don't say a word for about two minutes, then ask him if he would like his eyes to be like that the rest of his life. It gets through a man. What do you think of the plan of the Vacuum Company specifying jobs where men must wear goggles?

MR. DIES: That is all right.

MR. SENNE: If you post such a rule the man who is not wearing goggles cannot tell you: "I did not know it was necessary to wear goggles." Then there is no escaping the responsibility of employing every safety method known in the oil business.

MR. MILLMAN (Aetna Life Insurance Company): I have found that the plan of making it compulsory and punishing a man for not wearing goggles does not prove satisfactory. It works a good deal like the prohibition amendment works—it is being violated all the time. When a set rule is made, the men think it is made only to be broken. The fewer rules you have the better. If you can convert a man he will wear goggles, because he knows he should wear them, but if you say he must wear them it is surprising if he don't slip them off at the first opportunity. The listing of places where goggles should be worn is an excellent idea and has proven very satisfactory, not only in the petroleum but in all industries. Tell the man where and why he should wear them and use a good deal of insistence to convert him.

It is all right for a company to discharge a man, but the first thing you know one of your very valuable men will be caught; you cannot discharge him and are up against it.

SAFETY COMMITTEE PASSES ON CAUSE OF INJURY

MR. VON THURMAN: We report a man to the employment manager for disregarding a safety rule. If we lay him off for two weeks he will come right back and say: "Mr. Bush, I cannot afford to lay off; I have a wife and four or five children." "All right, go home and bring your wife back with you," and Mr. Bush explains to the woman that her husband was grinding a drill without using a pair of goggles. It does not take that woman very long to put him straight.

CHAIRMAN BONSBIB: That comes back to my original statement, get the wives and children interested.

MR. BOYER: Is it permissible to report these ideas to the whole convention?

CHAIRMAN BONSBIB: Yes, surely.

MR. SENNE: How many workmen bring their wives back.

MR. VON THURMAN: We have had but one man refuse. He took offense and said: "Do you mean to intimate that I am not married?"

MR. GIBSON: What steps are taken to inquire into the cause of an accident and to find who is responsible?

CHAIRMAN BONSBIB: The best way is to have the members of the safety committee pass on it, because they are familiar with conditions. They can determine whether it was negligence or otherwise. On the other hand, you have this drawback: The men know the safety man and say: "You are a fine fellow to make me lose all this time."

MR. SENNE: It is my experience that if you will impress upon the men that if they receive an eye injury, due to the fact that they did not wear their goggles, that the company will not compensate them fully for the loss, due to the fact that they broke one of the safety rules, the men will wear their goggles to protect themselves.

INSTRUCTIONS GIVEN NEW MEN

CHAIRMAN BONSBIB: I have found that to be the case; if a man can be shown it is up to him to protect himself he will do it.

MR. VON THURMAN: We have a little plan in regard to that: The employment manager has certain instructions written out; he covers the entire ground, cautioning the men to be careful. We also have a general educational committee and it is their duty to conduct necessary campaigns of education.

CHAIRMAN BONSBIB: The plan of having the safety committee men give short talks is very good as it makes a deep impression on the men.

MR. SENNE: At the Bayonne plant, when a new man comes in, he is given a medical examination and sent to the safety department. The safety inspector gives him instructions regarding the particular department he is going to work in, pointing out the hazards and explaining in detail the safety work of the company and what the company expects of him.

MR. MILLMAN: I wonder if you safety inspectors practice what you preach. In making your inspections, do you always wear your goggles? You must wear them before you can expect the men to do so.

MR. SENNE: When I was a safety inspector and went into a factory where there was danger of having my eyes injured I wore goggles.

CHAIRMAN BONSBIB: If you are going through a department and you are wearing goggles the men see you wearing them; it has a very fine effect. The safety man must watch that he is not hurt himself.

CHAIRMAN BONSBIB: I wonder how many safety men actually go into places to see how unsafe they are. (Members hold up hands.) You are good safety men, but watch your step!

MR. MILLMAN: I have not heard anything regarding goggles used by electric welders. I believe that was covered in a bill drawn in regard to goggles ascribed in the safety rules for electric welding.

MR. SENNE: What do you want to wear goggles for when you are electric welding? You should have a hood.

MR. VON THURMAN: It depends on what device you have.

MR. SENNE: If you leave part of the skin exposed it will burn from the violet rays.

CHAIRMAN BONSB: Many people think they can look at welding but they feel the effect a week or ten days later. The protection of a man's arms is important; we had a bad accident from that cause.

[Editor's Note: Specifications for goggles and hoods for electric welding are contained in the U. S. Bureau of Standards' Head and Eye Protection Code.]

The meeting then adjourned.

FRIDAY MORNING SESSION

CHAIRMAN BONSB: You all know Mr. J. M. Sandel of the headquarters staff. (Mr. Sandel wrote upon the blackboard the table given below.)

STATISTICS, FIRST SIX MONTHS, 1922

Rank	Co. Ker No.	Average No. Employees	Hours Worked	Number Accidents	Number Days Lost	Frequency Per Cent	Severity Per Cent
1	1	192	270,912	5	31	18.5	.115
2	2	520	565,277	11	200	19.65	.354
3	4	2,868	2,579,264	67	1,342	18.76	.376
4	7	5,070	6,459,180	116	19,021	17.93	*2.94
5	5	1,408	1,769,479	59	7,142	33.5	†4.63

*Two fatalities, one arm, three fingers, one thumb.

†One fatality.

MR. J. M. SANDEL (National Safety Council Headquarters): I think you have all noted the publication of the statistics for the year 1921 for the Petroleum Section in *The National Safety News* for July. When we collected our data we notified the Section that we wanted to later collect records for the six months of 1922, and to present them to the Section at one of their meetings at this Congress. Six companies sent information for publication in the *News* for the year 1921 and five for the first six months of 1922. One of the companies asked the information to be released under a key number only. In view of that I thought it best not to announce the names of any of the companies.

As you all know, the severity rate is really the governing factor in accident prevention. You will notice that the companies having a severity rate of more than one have each experienced a fatality or other severe injury among their employees. Others had no dismemberments or other severe injuries. The fatalities, dismemberments and injuries of a serious nature increase the severity rate, because the penalties are fairly heavy, but without including any figure for the penalty the comparative record would not be a fair one. We have been using the scale of time losses adopted by the Industrial Accident Boards and the Bureau of Labor Statistics.

The headquarters staff would like to continue this work, if you desire it. We would be very glad to handle all the details in the Chicago office, and it would please us very much if more companies would send us the necessary information. You can be assured, gentlemen, we will hold everything in strictest confidence, and if there is anything in your record which you are in the least doubt about, that is, if

you believe your standing and your rates are not correct, we will go into the matter and adjust it.

DATA NECESSARY TO COMPILE STATISTICS

CHAIRMAN BONSB: We are all interested in seeing what other companies are doing in the reduction of accidents and also the operation of their safety work—it spurs us to be compared with some other organization. How many would like to see this work continued? (Members hold up hands.) Mr. Sandel, it is unanimous. Are there any questions you would like to ask Mr. Sandel?

MR. WALLACE: I would like to know how he arrives at the frequency rate of 18.5.

MR. SANDEL: The frequency rate is based on the number of accidents per million hours worked. We have 270,972 hours worked, which is .27 millions of hours. That feature is sometimes confusing. Use this .27 as your divisor and take 5 (the number of accidents) for your dividend, and your result is 18.5. The severity rate works out practically the same way. The severity rate is the number of days lost per thousand hours worked. You have 270 thousands of hours, divided into 31 (the number of days lost), and your answer .115.

MR. WALLACE: We figure the frequency rate by taking the total number of accidents reported and dividing by the number of men working. Those figures are averaged. It is practically the same thing, isn't it?

MR. SANDEL: Yes.

MR. WALLACE: My impression was that the frequency rate ought to include minor accidents; those that are really not lost-time accidents. For this reason: Our refinery, for instance, will have, during the day probably, quite a number of first-aid cases.

MR. SANDEL: That would be all right for your large businesses, but there is one objection to the inclusion of minor accidents in any statistics which are to be published and generally broadcasted; that is, if you show a large number of accidents, and you want to reduce the number, you are liable to have a lot of men refrain from going to the first aid.

MR. WALLACE: We want the first aid cases—we would rather have them.

MR. SANDEL: Exactly; it is very important that a man be encouraged to go to the first aid at once.

RULE-OF-THUMB METHODS IN SAFETY WORK

CHAIRMAN BONSB: Those of you who were here last Tuesday remember that the Chairman, in his report, stated that a special investigation was being conducted to determine the exact constitution of lethal elements and fumes and gases emanating from crude oil; especially those of high sulphur content. We know that fumes have been very disastrous, but nothing had been done, in a definite way, to determine their exact constitution. Efforts have been made in a sort of rule-of-thumb to try out means of protecting the workers, but I believe that is pure folly, because if you use a canister and don't know the nature

of the gas to be absorbed, then you don't know what to put in your canister to do that work.

A committee was organized, consisting of Dr. Manning, director of research of the American Petroleum Institute as chairman, Dr. Sayers of the United States Public Health Service, and Mr. Smith of the United States Bureau of Mines and myself. In going over the literature of previous experiences a very extensive investigation was planned. It was found that that investigation would cost somewhere in the neighborhood of \$25,000. The Bureau of Mines became responsible for half the sum and the remainder was raised by the American Petroleum Institute.

The investigation has been under way for several months and some very interesting information has been obtained by Dr. Sayers. We would all be interested to know the findings and I would like Dr. Sayers to give a little talk on the subject of gas and fume hazards and their prevention.

DR. SAYERS: I am sorry I did not bring definite information outside of what I have memorized, as I could bring you a number of exact analyses. Mr. Bonsib has asked me to stick to gases. First, we have a number of lethal gases around all factories and plants—wherever there is burning material. Wherever we are doing refining of any type, or manufacturing, or any special process of any kind, we have poisonous fumes, dust, or gases. The one that I have been most interested in, of course, is carbon monoxide.

CARBON MONOXIDE AND ITS DANGERS

I want to talk for a minute on carbon monoxide. Carbon monoxide is produced, as you know, by the burning of any material where there is not much oxygen, so much so that it causes complete combustion. That is true where you are running an automobile if the adjustment of your carburetor is not right—you will probably get as high as 13 per cent in your exhaust gas by burning material, but on ordinary four-cylinder machines, if running along under average conditions, you will produce from one to two cubic feet of carbon monoxide gas in its exhaust gas every minute. If you had that in a room of a thousand square feet, ten by ten, it would not take very long until you would have a rather high contamination.

Carbon monoxide combines with the hemoglobin of the blood; whenever it is so combined it is unable to carry oxygen and it has an entirely reversible reaction. If there is very little carbon monoxide present the oxygen will be reduced, and it has an entirely reversible reaction. It has an affinity for the hemoglobin 300 times that of oxygen and, therefore, if you have only one three-hundredths part as much carbon monoxide it will get one-half of the hemoglobin; if you take four parts in ten thousand it will eventually get 44 per cent. That is eventually, but it will take hours to occur, and in the body probably more than that—that is a laboratory condition.

In the treatment of carbon monoxide poisoning you should get your man to the fresh air. If he stops breathing give him artificial respiration;

if you have oxygen present, give him oxygen. The reason I say "give him oxygen" is because pure oxygen will reduce the carbon monoxide in the blood about four times as fast as will the oxygen in the air—your man will come out of it four times as rapidly. If the man has been exposed for several hours, and he has difficulty breathing or short breath, if you can add a little carbon dioxide to the oxygen he will breathe deeper; if he breathes deeper you will get oxygen into the blood.

You get the carbon monoxide out six times as fast if you use 5 per cent carbon dioxide with the oxygen, in other words 95 per cent pure oxygen—get your man to fresh air; keep him lying down. If you can get pure oxygen, give him pure oxygen. If you have carbon dioxide in oxygen, give him that. You had better have a physician along with you. The oxygen is usually available and we are recommending it in the Bureau of Mines.

Hydrogen Sulphide—I have told you how poisonous carbon monoxide is. Hydrogen sulphide is fully as poisonous if not more so. I told you that a man could stand carbon monoxide, four parts in ten thousand, for several hours. A man will die if placed in 5 per cent in ten thousand of hydrogen sulphide after a few hours—seven parts in ten thousand will kill him, quite often, in one hour. Those are very low percentages, or low concentrations. However, that is what we use for experiments in laboratories, low concentration of hydrogen sulphide, and that is the gas that probably causes the most trouble—which you have coming off crude petroleum—gas with a high sulphur contents.

Hydrogen sulphide, in high concentration, causes instant death. In very low concentrations, probably one part in 100,000 or even less, it will cause irritation of the eyes. This is followed by conjunctivitis, if breathed for several hours. It would take quite a little while to cause conjunctivitis, but if breathed for several hours it will cause irritation of the respiratory passages which may be followed, not always, by edema; that is, the serum in the blood stream comes out into the tissues and, later, in some cases, is followed by pneumonia. It is a very bad gas, but, fortunately, it has an odor which can be detected. This odor is masked, to a great extent, by the odors of other gases coming off petroleum, and makes it difficult to locate on that account.

FRESH AIR AND ARTIFICIAL RESPIRATION

In your tanks you may get it in percentages, that is, over the surface of your tanks; you may get it in certain percentages, and we have found it in some places as high as 13 per cent—I believe, in one instance, as high as 84 per cent, but that is very rare. When a person gets it in as high a percentage as that death follows within one or two breaths.

Get your men to fresh air; give them artificial respiration until the paralysis is over and your chances to bring them around are all right.

CHAIRMAN BONSB: How about amyl-nitrate?

DR. SAYERS: I would rather leave that out. There is some opinion against the use of amyl-nitrate; sometimes it is very good. It is a respiratory stimulant, and when you have a good respiratory stimulant

it helps a whole lot, but if you can give the men artificial respiration that is the best thing you can do.

One more thing about gases: We have taken various oils and we find that hydrogen sulphide comes out of them until you get them heated, but if you let it set, when you first get it, there is a lot coming off right along—but if you let it set or agitate it, the hydrogen sulphide leaves entirely. You can put the hydrogen sulphide back into it and then find it coming off. We have found, in a large number of cases, that if you take pure sulphur and dissolve it in any pure oil that you get hydrogen sulphide in integral quantities out of that also.

MR. SEAGRAVE: Could the doctor indicate in a general way the percentage of hydrogen sulphide of these different analyses? He mentioned "integral." I presume he referred, when he spoke of percentages, to percentages of petroleum vapors.

DR. SAYERS: No; hydrogen sulphide.

MR. SEAGRAVE: The percentage of the gas was as high, in some cases, as 84.

DR. SAYERS: In one case.

CHAIRMAN BONSB: Isn't it true that some poisons have an anesthetic effect; they tend to make people more susceptible to the lethal fumes?

DR. SAYERS: Yes; that is true; hydrogen sulphide is so lethal that if you protect your men from it, we don't need to worry about the others.

PORTABLE OXYGEN BREATHING APPARATUS

CHAIRMAN BONSB: Have you found anything in the nitrogen derivatives?

DR. SAYERS: We have gone over that and found there is none. We have also developed a breathing apparatus in our work, which will withstand gasoline and petroleum vapor fumes, so a man can go into a tank if necessary—it will probably be manufactured within the next few months. It is a self-contained oxygen breathing apparatus.

CHAIRMAN BONSB: Something on the Gibbs type?

DR. SAYERS: It is a little different. It is a half-hour apparatus and weighs 17 pounds complete. You can carry it on your back or in front; it is in a box. You can pick it up like a small typewriter and carry it around with you.

CHAIRMAN BONSB: Dr. Sayers did not know until yesterday afternoon that he was going to be here, but I told him he would be committing a crime if he did not give us something on the subject, because we are all interested.

Anybody here that would like to ask questions?

MR. E. G. QUESNEL (Barber Asphalt Company): You say hydrogen sulphide gas is formed from all crude oils?

DR. SAYERS: No; the high sulphur content.

MR. QUESNEL: Does that hold true of crude oil distilled from Gillsomite?

DR. SAYERS: Is there sulphur in it? How much?

MR. QUESNEL: A very slight percentage.

DR. SAYERS: If it is very slight, you would probably have very little, maybe none; it would not be like it is in crude oils.

CHAIRMAN BONSB: Gilsonite is one of the heavier products. There is a slight amount of sulphur in it, but owing to its base it would have a greater tendency to liberate the hydrogen sulphide than if it had an asphalt base. Literally, that would be true, because there is a great affinity between the asphalts and derivatives.

We have Mr. Seagraves with us and it would be interesting to hear what the commercial companies have done in the development of apparatus for protection against gases and fumes.

MEN PREFER MASK AND HOSE FOR GAS WORK

MR. SEAGRAVES (Mine Appliance Company): The only thing I can talk about in the way of protection is either the fresh-air outfit or the self-contained oxygen apparatus. I believe the self-contained oxygen apparatus used at this time, of the small type, is very dangerous. It has proven so by causing fatal accidents, owing to the impracticability of the rubber parts, so that the apparatus the doctor mentions would probably have the rubber parts so made that they will not be affected by the solvent fumes that you would run into. Other developments are the fresh-air mask. That is a mask with a length of hose attached to it running to the outside air, whereby the man breathes either of his own free will, by taking the air through the hose and exhausting it into the atmosphere around him, or the air may be pumped through the hose.

There are a great many such outfits on the market—a great many of you, I presume, are familiar with them. The matter of expense has often brought about the installation of masks without a blower, and if any of you men have used a mask with a blower on—where a man can work in perfect freedom and have a positive pressure of air inside the mask—there is little or no tendency to leak (if there is a tendency to leak, it is outside, and any fumes present would not get inside the mask), a man would have perfect air.

The workman can understand what he is doing for himself. If he is an ignorant man he can see there is a hose to the outside air and he can understand that air is being blown in through the mask; whereas, if you hand him a canister, he sees that he is depending on some one else, and he cannot understand it—he is not a chemist. All he knows is that he needs fresh air to live; that has been impressed on him for years and if he can see how the air gets into the hose it is a very simple thing to get him to work it. I have been converted to the blower in this work. I have experimented with it myself and I advise you to use it.

DR. SAYERS: There are some conditions in tanks which make it impossible to use an absorbent mask; at times some of the tanks do not contain enough oxygen for a man to get by on, in case of hydrogen sulphide, and a fellow could not use a mask. There must be agents to cause the air to show what you have there so you will know what you are doing.

MAN CAN BREATHE THROUGH 125 FEET OF HOSE

CHAIRMAN BONSB: The question of protection is making rapid strides. I am going to call on a man who has done an extremely large amount of work on the development of the air-hose type of mask. I want Mr. Patton of our general engineering department to give us some of his findings.

MR. DAVID A. PATTON (Standard Oil Company of New Jersey): We have tried the canister mask, both in the laboratory and also practically in the field. It is passe to speak of the canister as a help to the man who has suffered from breathing gasoline fumes or from those of crude oils. Other experiments and cases have resulted in fatalities and accidents, in which the man has been gassed to the extent of making him unconscious. We have had several such cases, but it only needed one to convince us that the canister type of mask was not the mask we wanted to develop for use against petroleum vapors. Therefore, we turned our attention to the development of a mask that would give us as near as possible absolute protection at all times; in other words, giving a man to breathe that which he breathes all the time—air. If a man can breathe pure air all the time, under all conditions and circumstances, he will live.

Briefly, we determined that a face piece, consisting essentially of an entire covering for the face must be used, because you find in a large number of cases the so-called "pure gas" from gasoline fumes, which radiate beyond a certain percentage of concentration. We felt that the face should be fully protected by an enclosed rubber piece, which would be impermeable to gas fumes. Then, for the further protection of the man, we have developed a strong, leather harness, passing over the shoulders and buttoning under the armpits, with a hook on the rear and an attachment for a rope, so that, with the harness on, when a man gets in a tight place—where he cannot get out himself—he can be pulled out by the rope which is attached before he goes down.

The hose leading to the fresh air is constructed of such material that the oil cannot penetrate it or the fumes get to the man. Flexible lengths should be used, because, oftentimes, a man will get the hose into all sorts of kinks in a tank or a tanker—he must have a flexible air hose in order to move around with safety. We have found, in connection with the hose, that a man can breathe safely, easily and very naturally through 125 feet of three-quarter-inch hose, but we would prefer to use a minimum diameter of one-inch hose, because you can get enough air through 125 feet without the use of a blower. The blower is of assistance, it gives a little more air and adds to the comfort of wearing the mask. I have worn them under all conditions and I find that that is the case.

Briefly and roughly that describes our experience with a hose mask; it is not absolutely perfected, we are still working on it. There are a few things in connection with the breathing, inhalation and exhalation valves which we are developing, and which will probably alter our present mask.

WORK IN GAS ONLY BY MEN IN TEAMS

DR. SAYERS: The mask would probably be of service in a place where some hydrogen sulphide is coming off and there is plenty of oxygen.

MR. PATTON: Dr. Sayers mentioned that in some tanks it was impossible to use or think of using a canister mask because of the lack of oxygen. It occurred to me that in gauging a tank, where a man goes on top and opens the hatch, and the fumes come out, there would be enough protection in the surrounding air for a man to use a canister mask.

DR. SAYERS: I don't think so. There may be cases where you can do it, but if there happens to be a very high hydrogen sulphide content in the gas, and it comes out and hits him in the face, he is gone.

MR. SEAGRAVES: Is it Mr. Patton's idea to have a man watch the man working in the tank? Do you think that would be necessary? Would you permit a man to go into a tank with, say, seventy-five feet of hose dangling out in the outside air with no one watching him or no one holding the end of the line leading from the safety belt?

MR. PATTON: The refinery ruling is that no man, the man who gauges the tank or anyone else engaged in any work that brings him in contact with the lethal components of the gas, shall do that work unless he is accompanied by another man. That will be incorporated in the specifications for the use of the gas mask I am talking about.

MR. SEAGRAVES: I think the second man might just as well be blowing air.

MR. COX (The Texas Company): One point that suggests itself, following Mr. Seagraves' remarks about selling canisters as a protection from gasoline fumes. A good many other companies are in the same position Mr. Seagraves was, and I think a warning should be sent to all the manufacturers of canister masks that they should not sell them or recommend them as a protection against oil or petroleum fumes.

CHAIRMAN BONSB: That is an excellent suggestion. If the canisters are sold with the idea of being used in an atmosphere containing pure gasoline fumes, in that case, theoretically, they would be all right, but the trouble is this, there are so many components that may cause trouble that they should not be used. This is a tremendous problem. It is not solved by any means, but a lot of us have done work on it.

MR. BRONSON: How and when can you tell that danger exists for the man who goes into the tank? When must a man wear his mask when he goes up to gauge a tank?

CHEMICAL AND ANIMAL TESTS FOR GAS

DR. SAYERS: I think we will have to do a little investigating in the matter of testing. That has not been fully developed, because it is a question whether we will give a chemical test or an animal test of some kind. I think a chemical detector is what we are going to have. You will find, if your men are educated, they will want a chemical detector, but if they are uneducated they will want an animal test—because if the animal is not working they will not work.

MR. BERGHOFF (Ford Motor, Blast Furnace): Doctor, have you any serious objection to using compressed air in the ordinary mask, as has been discussed here?

DR. SAYERS: I have seen that work very well. I see no objection to the use of a small face mask where you have a high sulphur content and carbon dioxide.

CHAIRMAN BONSBIB: The Chairman would like to go on record against the use of compressed air for the reason that he doesn't know, at this time, of an absolute fool-proof compression valve.

MR. BERGHOFF: We use a small valve and it works all right. I have heard it said, though, that the oil in the compressor may burn and produce carbon monoxide; in that way it may become dangerous. I don't know whether there is anything to that or not.

DR. SAYERS: I think there may be something to it. If there was oxygen it would occur.

J. A. JAMES (New Jersey Zinc Company): We have been troubled for quite a number of years by carbon monoxide gas and, of course, we want to protect the men in every possible way, with every known apparatus that would prevent a man from being injured by coming in contact with carbon monoxide gas.

Three years ago we put in an air-line gas mask and tried in several ways to find just what we could do with that type of mask. We made a very severe test—a three-foot gas line became uncoupled, taking the head out, and we put the head back again, tightening up the bolts. It took twenty minutes for two men to do that job. I watched the work and asked the men if they felt the effects of gas during the time they were working. They said, "Not in the least." They changed their clothes and went right back to work as though nothing had happened. In another test a chloride acid line had been losing acid for five days and six men were trying to get that line fixed up, but they could not do it on account of the fumes coming away from it. We used the air-hose mask on it. We use a fifty-foot hose. We have had no occasion to use a longer one.

CHAIRMAN BONSBIB: They breathed all right?

MR. JAMES: Yes. They were on that job two hours. One of the men said he could stay in there all day with the mask on. We use the air-line gas mask whenever we have a dangerous job to perform. We would not attempt to use a pump or compressed air, because an un-experienced man might pump too hard and strong.

CHAIRMAN BONSBIB: You can use relief valves?

MR. JAMES: We have relief and check valves.

CHAIRMAN BONSBIB: I am going to ask the Nominating Committee to report.

REPORT OF NOMINATING COMMITTEE

MR. WINSLOW: The Nominating Committee respectfully presents for consideration the following names as officers of the Petroleum Section for the coming year:

Chairman—Roy S. Bonsib, Standard Oil Company of New Jersey.
Secretary—V. R. Currie, The Texas Company.

Vice Chairman, Manufacturers Division—E. J. Senne, The Vacuum Oil and Refining Company.

Vice Chairman, Pipe Line Division—Mr. Von Thurman, Tulsa, Okla.

Vice Chairman, Manufacturers' Division—E. J. Senne, The Vacuum Oil Company, New York.

Vice Chairman, Marketing Division—E. C. Esterly. (It was moved and seconded that the Secretary cast the ballot for the nominees as reported by the Nominating Committee, and the motion, upon being put to a vote, unanimously prevailed.)

PLAN OF WORK FOR COMING YEAR

CHAIRMAN BONSB: I would like to ask two questions: *First*: How many sessions shall we have next year? Shall we have a round-table discussion? At the last meeting, the members decided that they wanted short papers read and discussed. How many sessions do you think we ought to have? All those in favor of having three sessions next year, the first to start off with a luncheon, stand. (Members stand.) It is unanimous. *Second*: Shall we ask everyone to send in suggestions, leave it to the Council to work out, leave it to the Chairman, or have a Program Committee?

MR. TRIMS: If suggestions are sent to a Program Committee they can, with the approval of the Council, work out a program for next year.

CHAIRMAN BONSB: I will take the liberty of appointing as a Program Committee men who are in New York and can get together with the Chairman, if that meets with the approval of the Section. I would like to name Mr. Senne of the Vacuum Oil Company as chairman, Mr. Patton of the Standard and Mr. Cox of the Texas Company. The Chairman will serve ex-officio. This will enable us to get together and work on the program, but we want everybody to send in ideas.

There is one other matter: Shall we have a committee to see that bulletins are issued regularly?

MR. CURRIE: We have been trying to get one or two bulletins in *The National Safety News* every month. We must secure material and need the co-operation of the different companies and members in order to do that. I will be very glad to assemble any suggestions for bulletins sent to me and forward same to national headquarters. One thing I do want: All the companies that are getting out their own bulletins, please send me a copy, if they are willing to have them published. Those not getting out bulletins please send me suggestions and we will have the photographs taken.

CHAIRMAN BONSB: What is our quota of bulletins?

MR. CURRIE: One or two a month.

CHAIRMAN BONSB: How many men will make it their business to send a photograph or make suggestions for a bulletin? Mr. Wallace will you send one next month? Mr. Cox, you send one the following month, and Mr. Beaghen you send one after that.

MR. WALLACE: Cannot we have more than one bulletin a month?

CHAIRMAN BONSB: Sure; let's get out a lot of them.

ROUND-TABLE DISCUSSION

CHAIRMAN BONSH: Let us now take up hazards in the combustion of fuel oil and their prevention. Fuel oil is getting a worse reputation than it deserves. If it is properly handled by experienced men the chances of injury are very small.

The flash point of fuel oil, of course, varies very widely. I have heard the definition given that fuel oil was anything that would burn. The flash point varies anywhere from 90 up to 200 or 300. The greatest hazard, I believe, comes from flare-backs. I will take the liberty of calling on Mr. Cooke of the Standard Oil Company of Louisiana to tell us what is being done to prevent injuries from flare-backs.

MR. COOKE: We had one quite serious accident in a temporary boiler-house—a cheaply gotten-up arrangement. The boilers had a brick front with a firebox furnace. We had an elevated fuel tank and the fuel line came out near the bottom of it. Some sediment, we think, got in and stopped up the line, causing the flame to go out; then the oil came in and caused an explosion which blew out all the front bricks and caused the furnace to swing around. The burner lighted and the flame was directly on the fireman; it was almost a miracle that he did not die from his injuries—he had almost the full force of the flame against his side.

We have had a few accidents from flare-backs around the stills, but none have been very serious. Instead of having the valve of the fuel and steam lines right up in the front of the firebox we are putting them a little to one side; this makes it possible for the man to regulate his flame without getting right in front of the furnace.

Another thing that might cause a little trouble is the fuel line in the pressure stills—the thing is to put the valve to one side. That permits us to blow off the fuel line, at least to clear the burner. If too much oil is blown into the hot furnace it is very likely to cause an explosion. We are now putting the valve in such a position that only a little oil will be thrown into the furnace.

PROPER PLACING OF REGULATING VALVE

CHAIRMAN BONSH: The location of the valve is very important; in many places the valve is directly in front. It is not only safer but more efficient to have the valve to one side.

MR. SENNE: We have had some experience with flarebacks from fuel oil burners and one of our plant superintendents has devised a very efficient shield. No doubt all of the engineers here understand the principle of feeding the oil through a small orifice in front of the boiler, with the regulating valve in front. It is customary for the fireman to keep pretty close watch on the way the burners are feeding, and it is apparent that the fuel oil is not always uniform. We have found there may be some moisture in the fuel oil coming through the feed line and that it will cause the flame to go out from one or two jets; this is not always noticed by the fireman. So it is necessary for the fireman, from time to time, to look through the peephole to see whether the burners are working and if he notices one is out he turns on a little more oil.

This results in an accumulation of oil and gas and the moment he turns on an extra supply it flares out into his face.

We have had two such accidents, I am sorry to say, but we think we have overcome the hazard by arranging a steel shield directly in front of the boiler. In the center of the shield is a small wire glass, through which the fireman looks while he is operating the valve. Even if a flareback does occur it hits the shield and is diverted. I have brought a blue print of this device and it can be shown on the blackboard, if necessary. I think we have overcome the hazard of burning a man's face by putting on the shield.

MR. BEAGHEN: At Bayway, when a furnace fire goes out temporarily the fireman turns a certain amount of steam into the fire box to chase away the gases accumulating there. It seems to me that if your firemen are properly instructed to always draw a full head of steam through their oil burners in the firebox before they turn on the second amount of oil, that flarebacks will be almost entirely prevented.

GUARDING AGAINST FLAREBACKS

CHAIRMAN BONSBIE: This is very interesting. Most flarebacks are due to turning on oil and expecting it to light in a hot furnace—a very bad practice and quite dangerous. The practice of throwing a lighted piece of waste into the firebox should be stopped. The best arrangement I have ever seen is a piece of welded four-inch pipe, containing gas or fuel oil, with a quarter-inch round iron rod about four feet long, on the end of which is a piece of asbestos—then you always have a torch with which to light your fire. This is one of the most effective things I have ever seen to prevent injuries due to flarebacks. The next best thing is the suggestion made by Mr. Cooke. The suggestion made by Mr. Senne is a piece of sheet metal—isn't it?

MR. SENNE: No, it fits over the two feed pipes, with a slot cut in the middle for a piece of wire glass, 8x10 inches. (Goes to blackboard.) This comes out on a bevel, here is your line, and there is your valve (indicating). The orifice opening into your boiler is about here; the man looks through that to see whether the fire is burning. Here is a valve. In case of a flareback when he turns the valve, the flame strikes this steel and is diverted.

MR. COOKE: What is the size of the shield?

MR. SENNE: About 3 by 2 feet. We have found it very efficient in actual practice.

MR. MILLMAN: With the valve moved over to the side, is it possible for a man to operate the valve and at the same time look into the furnace?

MR. COOKE: The operator finds no objection to having the valve to one side. We have a number of stills equipped in that way.

MR. TIMMS: We have a by-pass on our gas burners and if they get plugged up you don't have to shut your boiler down.

CHAIRMAN BONSBIE: The by-pass is a good arrangement; I think they are being used quite generally. The Standard company, at their Bayonne plant, have instructions painted on the walls at frequent intervals for

the men to read. There is no excuse for taking any other means for lighting the fires.

CAREFUL INSTRUCTIONS FOR NEW MEN

In instructing a new man in the fireroom, in handling fuel oil, don't assume that the man knows everything about it, even if he is an experienced man. Maybe he has been broken in wrong and has formed bad habits. Be very careful in instructing him just exactly how you want the work done.

DR. SAYERS: Do you give your instructions first or do you ask questions in advance?

CHAIRMAN BONSH: It depends on whether or not he is a so-called experienced man. If he is a new man you will have to instruct him first and then ask questions.

DR. SAYERS: In one plant they give a new man printed instructions and the foreman is supposed to see that he reads them. The safety engineer goes around afterward and asks the man questions to see if he understands the work.

CHAIRMAN BONSH: I know of one plant where the foreman signs a slip, saying: "I have instructed such-and-such a man." The next slip reads: "I received instructions on such-and-such a subject and understand it thoroughly." This is signed by the man. A man will not sign his name unless he thinks he knows the subject of the slip.

DR. SAYERS: Does the safety engineer go around afterward and send in a slip saying he has questioned the man?

CHAIRMAN BONSH: At that particular plant they did not have a safety engineer. This plan is not in use with the company I am connected with, although I am in favor of it.

MR. WINSLOW: We had two accidents in our plant, due to the changing of fuel oil in our boilers. The men had been accustomed to adjusting their burners for a certain grade of oil. The oil was changed one night and the next day, when the men came on duty and started to adjust their burners the oil acted differently and the fire went out on one of the burners. In trying to adjust the valve on one of the furnaces a slug of oil was shot into the boilers and the extra oil flared back and burned the man. He was relieved and in fifteen minutes the same thing occurred to another man. If there is any change in the gravity or the action of the oil the men operating the burners should know it. The laboratory should explain to the man in charge of the boilers exactly the kind of oil that is being used and he, in turn, should notify the men adjusting the valves that there had been a change and to be very careful until they find out how it is working.

MR. TIMMS: Men should always use a torch when lighting burners, no matter what the gravity of the oil may be.

FOAM AND STEAM AS FIRE EXTINGUISHERS

CHAIRMAN BONSH: You see, gentlemen, there is a solution for all of these questions.

MR. BERGHOFF: What is the best method of extinguishing a fire in a tank?

MR. BEAGHEN: Steam is very valuable. In putting out a fire the minute you cut away the oxygen supply the fire automatically goes out. At Bayway we do it with the foam line and we have our own foam system. Our pumphouses are on the outskirts of the refineries and the lines, except the laterals, are also on the outskirts. When we have any trouble we resort to foam instead of steam, because we do not get steam in on the line from the tank. We might have a bursted line, due to someone putting steam in the line too quickly, but you don't have to worry about the foam. You simply pump the two solutions through the main lines, and from the main lines through the laterals to the tanks; you can get foam to your tank long before you could get steam through the main line.

MR. BERGHOFF: May I ask whether you have trouble with the foam system, or whether you change your solutions?

MR. BEAGHEN: Absolutely none; we have a very careful system. Every pump in the refinery is turned over once a day and properly oiled. One man attends to that and if he finds a defect it is reported and taken care of by the maintenance department. All of our foam pumps are inspected, at least every six weeks, and we have not had any trouble with them.

MR. BERGHOFF: Do you renew the supply every year?

MR. BEAGHEN: No; we agitate it and try to keep the volume up around $7\frac{1}{2}$ or 8. If we find a decrease we boost our solution accordingly and in that way we are always on the safe side.

MR. QUESNEL: In our plant we have also an installation consisting of two 40,000-gallon pumps, but we do not depend on steam except in case of a severe fire; then we use steam. In case of an ordinary fire our first preventive would be the use of fomide; it is connected with the tanks by automatic heads and if the tank should catch fire these heads would blow off immediately and start the pump.

MR. BERGHOFF: How do you ground your fuel tanks? We drive three-quarter inch pipes into the ground and connect them with a copper strip about one and a quarter or one and a sixteenth inch thick. I would like to know whether that compares with the general practice and whether you consider that safe against ignition by lightning. I think we have five pipes, all connected to five tanks; two of 80,000 and three of 100,000 gallon.

MR. TIMMS: At Bayway our tanks are grounded, due to the fact that the tanks are underground. In that way we are pretty well protected.

TANKS LOST BY LIGHTNING

MR. BERGHOFF: Do you know of any steel covered tanks that have been blown up by lightning?

MR. DOWLING: I know of one company that lost fourteen tanks; they were all of steel. One of them was struck by lightning; this started a fire, due to gas coming off the tank.

MR. COX: Did they have regulation steel roofs, supported with steel supports?

MR. DAWLING: Yes.

MR. COX: With ventilators on top?

MR. DOWLING: No ventilators.

CHAIRMAN BONSB: That was probably the cause.

MR. BERGHOFF: Do you recommend having manholes clamped down tight or having them loose—just keeping them down on the gasket?

CHAIRMAN BONSB: The bureau requires that they be clamped. Personally, I don't approve of that.

MR. QUESNEL: It is pretty hard to keep them clamped.

MR. TIMMS: You must have a release valve, otherwise you will have a collapsed roof, due to temperature condition.

MR. BERGHOFF: You can have a release valve. If fumes from the manhole should catch fire, would there be danger of explosion?

CHAIRMAN BONSB: As long as the gauze is there, the fumes from the inside will never catch fire; the gauze keeps the flame from the inside.

MR. BERGHOFF: If it had no gauze would it make a difference?

MR. SENNE: All of the companies install gauze.

CHAIRMAN BONSB: I think it would catch fire quickly if you did not have the gauze there.

At the last meeting we decided to have a discussion on the question of best methods of conducting a safety meeting, in order to maintain interest and get the message across. That is something everyone is interested in—getting the man on the job interested in the safety cause. You can keep on talking safety, but if you do not get the man interested your investment is not worth any great amount.

METHODS FOR HOLDING MEN TO SAFETY WORK

MR. QUESNEL: At a great many of our meetings we have held demonstrations; we allow the men to do this and it brings out points they are interested in. It also shows each man not doing things the proper way how to do them.

CHAIRMAN BONSB: I had reference to the conducting of safety committee meetings. Do your men do this outside of working hours, outside of the plant, or in the plant outside of working hours?

MR. QUESNEL: Inside of working hours.

CHAIRMAN BONSB: Outside of working hours is the way most do it. Tell us what you do, Mr. Currie.

MR. CURRIE: In conducting a safety meeting or a safety campaign we endeavor to get to all the men during the week.

CHAIRMAN BONSB: Do the families of the men attend?

MR. CURRIE: They did at one meeting held in a theatre. We had a little play and speeches during the week. We had two or three entertainments at the plant. The principal thing we did was to use a great deal of publicity.

CHAIRMAN BONSB: What form did your publicity take?

SECRETARY CURRIE: We used bulletins. We even got out a daily newspaper.

CHAIRMAN BONSBIB: The thing that I have been especially interested in during the past year is the conducting of a large number of meetings, and one of the important things is the closing punch. What is the best closing punch? When the people leave they must take something with them they are going to remember.

SECRETARY CURRIE: In our week's campaign the closing incident was a banquet with 200 or 250 foremen present. We had one or two good speakers and little talks were made by some of the men.

TAKING THE MESSAGE HOME

CHAIRMAN BONSBIB: What is the most effective means of closing a safety meeting? I have found that if you can get the president or general manager to talk at the start, telling the men that the company believes in safety, that shows the men where the company stands. That carries the interest through the meeting, but it is important to deliver a final message. We can all give that some thought.

MR. E. G. QUESNEL: I think the success of a meeting depends on the popularity of the speaker. It is not always what a man says that counts, but it is how he says it. If you get a man that is well liked and respected in the community he can make the meeting just as impressive as he likes and the audience always leaves with a pleasant recollection.

BUILD UP SECTION THIS YEAR

MR. SENNE: The Council is doing excellent work and we ought to help them get more companies interested in safety work. I think we should have a publicity committee and spread the gospel of safety.

MR. STEFFEN: I believe, through proper publicity, we can get most of the oil companies to join our Section. I would like to see this accomplished.

CHAIRMAN BONSBIB: A great many oil companies still think they do not have to go into safety work; that it is not necessary. They think accidents are a matter of course, that safety is all right in other industries, but it won't work in oil, because it is so new. We have not been in the work long enough and we have not done enough work, but if we can get all the companies to join our Section we will make great progress. The National Safety Council is a co-operative organization and is doing a wonderful work.

SECRETARY CURRIE: I would suggest that we combine the publicity committee with the membership committee. I feel that through publicity, and with the co-operation of the members that we now have in the Section, a method could be devised of giving service through national headquarters, and by that means increase the membership. The bulletins service, together with the information that we can get from the library and from headquarters, should be of great benefit. I would offer as a motion that we authorize the Chairman to appoint a Publicity and Membership Committee. (The motion, upon being put to a vote, unanimously prevailed.)

CHAIRMAN BONSBIB: Dr. Sayers has just made a suggestion that the refineries, I think, would be interested in: That the Bureau of Mines

gives its service free upon request of the general manager of the plant. All that desire that service get in touch with the doctor.

DR. SAYERS: The director of the Bureau of Mines, Mr. J. J. Parker of Pittsburgh, attends to that. The service does not cost you anything and it comes to you as part of our work. We are glad to send it to anyone that wants it.

The Section then adjourned.

Plant Publications

August 29, 1922

E. ELLIS FRAMPTON, Chairman

Editor "Hammermill Bond," Hammermill Paper Company, Erie, Pa.

TUESDAY MORNING SESSION

CHAIRMAN FRAMPTON: I wish to introduce as our first speaker Mr. J. W. McClelland, editor of "Square D Tales," Square D Company, Detroit, Mich.

SHALL WE SCATTER OR CONCENTRATE SAFETY NEWS?

J. W. McCLELLAND, EDITOR, "SQUARE D TALES," SQUARE D COMPANY,
DETROIT, MICH.

Many of the so-called differences of opinion as to the amount of safety news which should be used in a house organ and whether it should be scattered or concentrated is, perhaps, due largely to the difference of conditions which exist in our plants and not so much a disagreement on fundamentals.

You can imagine the result of an attempt to standardize on the amount of space and kind of material to be used in employees' house organs. It would be somewhat like a physician prescribing the same amount and kind of medicine for all cases of illness. Standardized methods may be applied by a company in building tractors and threshing machines, but nothing would be gained by specifying that all house organs devote the same number of columns and use the same illustrations in their safety pages. By way of further illustration, we are pretty well agreed, I think, that the present plan of selecting each month the *National Safety News* bulletins most suitable to the needs in your respective plants is an advantage over the former plan of having a supply sent you each month of every bulletin printed, many of which had no particular bearing on the hazards in your plant. Is it not, therefore, reasonable to expect that the amount of space and kind of material will vary in plant magazines?

The number and class of workmen, their attitude toward safety, hazards of the industry, amount of safety equipment, the need of safety instruction and various other conditions must be considered in determining the amount of space as well as the kind of material used in that space.

It is true that two plants of 6,000 and 500 workers respectively and manufacturing different products have many parallel conditions from the safety standpoint. The plant employing 6,000, however, may have a large percentage of semi-skilled and unskilled workers, old buildings, crowded machinery and equipment, by nature a hazardous industry and other unfavorable conditions. On the other hand, in the plant employing 500, the majority of which are skilled workers, the buildings modern, having ample space and the industry not a particularly hazardous one, the safety problems are quite different.

In the plant first named, conditions would seem to justify devoting a considerable portion of the employees' publication to safety news. In the latter, where it is understood that the management and employees are sold on the idea of safety, less space, perhaps, would be required to meet the needs.

BREVITY AND PUNCH NECESSARY FEATURES

Bearing in mind that brevity and punch are necessary features of the good safety story, it is also well to remember that sometimes, to develop an idea properly, it cannot, to the best advantage, be compressed into a half-dozen lines. The basis for many a good safety story is never developed on account of this common tendency to compress and to save space. It is my impression that safety news should not dominate the plant paper, for there can be too much of any one kind of news. We don't want bread alone, neither do we want all our news to be safety news. In determining a fair balance, good judgment and an adequate sense of proportion must be used.

There are editors, although the number is rapidly decreasing, who might be said to take safety fits. Their fits, however, are not so frequent or protracted that they take on any color of monotony. At irregular intervals the slogan "Universal Safety" reminds them that it is time to administer another dose of safety to their readers, just to assure them that, like the eighteenth amendment, the subject has not been entirely dropped or forgotten.

Certainly there is sufficient material, whether of a local source or from outside the plant, that is worthy of space and that can be made interesting to the readers if presented in the right manner. The resourceful editor need never be at a loss for good safety material and devoting space to safety regularly should be the policy of every editor of a plant magazine, for continuity is a prime essential—it is like rolling a barrel up a hill. If you stop, now and then, and let the barrel roll to the bottom, you will make no progress. No matter how much time you may spend altogether on pushing the barrel up the hill, if you do not keep at it you will ultimately be just where you started. Some editors think that there are advantages in having definite safety pages and practically all agree that there should be a tendency toward constancy rather than intermittent or spasmodic flashes of safety news.

Many editors favor the confining of safety news to safety pages, but personally, in addition to the safety pages, I favor a distribution of safety material throughout the publication. A little safety article here and

there between "personals" and other human-interest items will often be absorbed unconsciously by employee-readers. The attention-arresting value of the appeal in the brief, scattered items may not be as great as the lengthy, illustrated articles and perhaps at first are given only a fleeting glance but, if it is a message which literally hits the reader between the eyes, he will look again and digest the message. We know in practical life that, amid the roar of a passing train, a conversation can be carried on or that in a plant where a hundred riveting hammers are pounding the low-spoken word can be distinctly heard.

SAFETY SHOULD TAKE ON CHARACTER OF MAJOR OPERATION

Occasional special safety numbers have their merit, particularly at times when safety campaigns are being conducted. Through the plant magazine, the safety campaign should take on the earmarks of a major operation. Usually, however, it requires constant hammering and persistent effort, issue after issue, to retain the interest and enthusiasm created through the campaign.

Generally, the amount of safety education absorbed varies directly with the frequency, amount and quality presented. The magazine without a definite policy cannot be highly successful. The same is true of your safety pages and a constant and persistent campaign must be conducted to realize the greatest returns.

Safety has been defined as "freedom from danger or evil." Employees who do not enjoy this freedom are in bondage. Safety to employees means freedom from the bondage of accidents and their resulting loss in time and suffering. The employees' magazine devoting space to safety can help bring about this freedom and help idealize and actualize the spirit of "Do unto others as you would be done by." In doing so it will also create a means of friendship, respect and mutual helpfulness between employer and employee, which is the great objective of every worth-while organization.

DISCUSSION

CHAIRMAN FRAMPTON: Tell us whether you think it better to have a safety page every issue or once a month or once a year, or whether it should be all on one page or scatter the items all around. I am sure that Mr. McClelland will forgive you if you disagree with him.

SPENCER HORD (Editor, Eastman Kodak Company, Rochester, N. Y.): I am distinctly in favor of safety stories in every issue, but I do not believe in using the heading, "Safety Page," for this reason: People who are sold on safety will read it if you use the heading, but the careless person, the person you desire to reach, will skip it and read something else.

MISS EDNA E. COYLE (Editor, *The Staley Journal*, A. E. Staley Manufacturing Company, Decatur, Ill.): I believe you should put safety news in different places and not use a single page. Sometimes you slip it over on the fellow that does not like to read safety news and he will read it and get something from it. I believe in having it every month.

STOCK HEADINGS DISAPPROVED

MR. J. W. McCLELLAND: I do not believe it is necessary to use the heading, "Safety First," "Universal Safety," or any other slogan. The idea I wished to convey was that you should set apart a definite amount of space, say page 16 or 35, for this purpose—it doesn't make any difference and it does not necessarily require a heading of that kind to designate it, but that it is set apart for a special purpose.

MR. J. R. DE LA TORRE BUENO (General Chemical Company, New York City): How do you secure material for the safety page?

MR. McCLELLAND: The delegates present are safety engineers or editors and understand, I think, that the safety committeemen can always give you a lead for a story. Perhaps you are fortunate enough not to have accidents. Our plant is small, particularly the one in Detroit, but we have no difficulty in securing material; as a matter of fact, I always have occasion to hold over a considerable amount of material which I cannot put in the current issue.

CHAIRMAN FRAMPTON: The delegates will have an opportunity this afternoon to discuss general problems, such as the securing of interesting safety and other news.

GETTING ACROSS THE SAFETY MESSAGE

FRED A. ROBINSON, EMPLOYMENT SECRETARY, KIMBERLY-CLARK COMPANY, NIAGARA FALLS, N. Y.

The makeup of safety matter which works to the best advantage, we found, in the case of cartoons; these we place in the column belonging to the department making the contribution. One cartoon to an issue for each mill seems to be sufficient and the interest shown will be surprising, especially when the cartoons are drawn by an individual in the department in whose column it is printed. Cartoons take big with us. For instance we had a man saw off the plank on which he was sitting, thus letting him fall to the floor. This was drawn to show a man, with the features of the man who had the accident, sitting on a branch of a tree and sawing off the branch. The cartoon also showed a bird, on the opposite branch, weeping very bitterly because it seemed to know what was about to happen. The fact that most employees knew who the cartoon was supposed to represent helped to get the idea across very strongly.

In another case we were having numerous accidents, due to fingers being caught in the supercalender stack. A reproduction of this, as faithful as possible, was made by one of the mill hands, showing a man sitting on the running board with the paddle, which is supposed to be used to put paper through the roll, in his left hand and his right hand all smashed and bleeding. This got across very nicely. It was the talk of the whole plant for some time after the publication had been delivered.

We have run a series of "who's who" articles, each containing a picture of the foreman who had made an exceptionally good no-accident run; we gave the record of the department. These took very well; we ran one in each issue. They made each foreman want to keep his depart-

ment up above the average and the results obtained were satisfactory.

We run editorials on safety under each mill section, but most of these are gotten up by departmental heads or subforemen who have taken a great interest in the safety movement. Some foremen are hard-boiled and difficult to convert to safety ideas, but we finally land them. An article by one of the last mentioned persons is of more value in getting across the message than all the editorials the management could write.

X-RAY OF FRACTURE ACCIDENTS MAKE GOOD SUBJECTS

Photographs of accidents or hazardous places about the mill are run to help fill in when other material is scarce. The most interesting photograph, and the one which carries the biggest, is an x-ray of a fracture accident in the mill. Local cartoons and pictures are of more interest to employees than the general ones distributed by insurance companies, because the men are familiar with every local detail. However, I think the lessons printed on the general bulletins of the Council are a success and hit the mark.

Proper publication, through the plant paper and bulletin board, made Fire Prevention Day at our Falls mill a big success. We arranged with every foreman and subforeman to make an examination of all fire equipment and fire hazards and turn in a written report of his findings. When the inspections started everyone, from the foreman down, seemed to be on his toes, looking for fire hazards. As a result, things were cleaned up and moved to proper places which had not been touched for a long time.

We often run a "no-accident campaign." When these are started, if it is a case of one mill challenging another, the challenge and all the important correspondence regarding the contest is written up in the plant paper. In this way all employees of all the plants are kept in touch with the safety doings of the other fellow. Some hard slams are thrown, in this paper, between foremen on accident-prevention work, because each man feels that his department is as safe as the other.

Ideas for various headings will come regularly if the service man or the editor of the paper is well acquainted with the men in the plant, especially those who have taken the safety spirit to heart. You will find, in talking to your men, your best safety recommendations come from them, because they are working on and around the jobs all the while and know where the hazard lies in each case; whereas an inspector would probably pass up a hazard, not knowing that it was there; employees know from working with the machinery that this lever or that lever had been built wrong or placed in a dangerous position.

It is my feeling, in all this work, that a light vein carries better than a serious one; it does not pay to make a man feel so serious that he will become downhearted and so fearful of the place in which he is working that he will want to change to a safer mill. It is not proper to publish articles which tend to make fun of the safety movement or of the medical department.

STEVE CHANGED HIS MIND

The following article came to my attention and we may want to discuss it at this time: "Steve Miller and a pile of meters got mixed up

a few days ago and Steve came out second best with a bruised finger. The next day he persuaded Bob that blood poison had made its appearance and he must see the company's special doctor at once. As soon as Bob could give him the necessary instructions Steve left for medical treatment.

"Arriving at the office and finding the doctor in, but busy, Steve made himself as comfortable as possible in a large leather chair and a copy of one of the latest magazines to await his turn. Echoes from the operating room caught Steve's ear and, casting his eye about, soon found his gaze fastened upon patients in the carving room. Steve saw one fellow separated from an ear and another from a couple of fingers. Steve looked for his sore finger and not being able to tell which hand it was on did not want the doctor to guess at it. Then, it was really too late to await his turn, Steve went home all-together and now his hand is perfectly well."

If we publish that kind of articles in our safety column, you can see what it will do. Someone will get hold of it and drive the story home to a hard-boiled man who is hard to convince that safety is the right thing, and then you will get the results you have worked for so long.

DISCUSSION

MR. J. D. CHAMBERLAIN (Manager, Welfare Department, Safe Cabinet Company, Marietta, Ohio): The speaker touched a very interesting point on the proposition of getting the hard-boiled man to read something. I have used this plan very successfully over and over again. If a man is half-sold on any particular phase of the business, and you know he is only half-sold, if you can get him to write an article he can't tell you he is not sold; he will tell you he is thoroughly sold on it. There is nothing that lines up an individual as quickly and as firmly as dedicating himself publicly to a proposition. It is a splendid way to line up the men.

MR. V. R. CURRIE (The Texas Company, Houston, Texas): A peculiar experience we had shows that a hard-boiled man can be brought over under certain conditions. Inadvertently we placed one bulletin upside down on our board—that was the first time we heard from the hard-boiled man that we had been catering to for years. That may give you a thought for safety.

CHAIRMAN FRAMPTON: If you have a foreman who has not taken kindly to safety work but who makes a good record in accident prevention (whether it is his fault or not), feature that in the magazine. He will oftentimes take it for a real credit and be an advocate for safety ever after. That is wishing something on him.

CONVERTING THE HARD-BOILED WORKMAN

MR. H. L. GADDIS (Great Lakes Engineering Works, Detroit, Mich.): A hard-boiled man in our plant was after safety for years. Eventually he got it. He was not going to the "fool doctors"—running to the plant about it—but three or four nights later his wife telephoned to the factory to send a doctor to see him. When the plant surgeon went to his home

and found he had a good start of erysipelas; that man wanted assistance. A day or two later I called and said: "Mac, it isn't fun, is it?" He answered: "Mr. Gaddis, it isn't at all. I am beginning to think there is something in this stuff you have been passing around." Four or five days later, at his house, I said: "Mac, I believe you are going to get well, but my! you took an awful chance. It won't be any fault of yours if we do pull you through." Two weeks later, in the dispensary, he said: "Mr. Gaddis, I will do anything I can to help you keep the other fellow from getting in the shape I am in. If you care to you may take photographs of my back, not my face, showing the way you had to cut me up to pull me through. Go to it!" We took the photographs and put them on the safety page; we put the owner's name as Mac.

CHAIRMAN FRAMPTON: We will now have our third subject, a little talk by Mr. Wallis.

HOW THE SAFETY COUNCIL CAN HELP THE PLANT EDITOR

GEORGE EARL WALLIS. EDITOR, NATIONAL SAFETY NEWS

The title of the subject assigned to me is a slight misnomer; I am not going to *tell* you how the National Safety Council can help the plant editor, but *ask* you how the National Safety Council can help the plant editor. I have a feeling in common with the editors of employee publications and have a full appreciation of their problems. I know plant safety stories go much better than what might be termed "canned stuff." I know, however, that at times the plant publication editor is at a loss to know what to do and he has to keep the interest of his employee-readers up to standard. The National Safety Council has had that problem under advisement for the last two or three months and as a starter we have started a plant cartoon service. Frank E. Redmond—probably many of you know his former publication—is now on the staff and has worked up a series of cartoons, samples of which we have sent to such of our members as we know have plant publications. We sent out 300 copies of the sample cartoons, about three weeks ago, and have received about 100 responses asking for the service. I would be very glad to know from those who have not received the cartoons what they think of such a service.

I might list some of the things we have available in the Council's Library and Information Bureau that would give you hints to help you in getting new ideas. Plant magazines come to my desk every month, probably, that many of you do not receive; in that way we get numerous ideas on safety publicity. It has occurred to me that inasmuch as we are not able to use much of this matter in *The National Safety News*, because of limited space, those ideas could be handed to plant magazine editors who need and want them and to safety men acting as editors. We are carrying, in *The National Safety News*, at the present time a page "Here and There with the Safety Men." This was started with the idea of publishing a few of these suggestions. You

probably have noticed, if you have looked through the magazine, that occasionally we carry editorials and safety talks taken from magazines in all parts of the country. We hope and intend to enlarge this section so as to carry more ideas without the necessity of your writing in for them.

HUNDREDS OF PHOTOGRAPHS AVAILABLE

These are a few of the things on which we can give you information. In the library of the National Safety Council there are hundreds of photographs of accidents that have occurred, accidents that are being prevented, pictures that have been staged or acted out for the occasion. Sometimes they can be used quite effectively in illustrating a story you may have in mind. I suggest that you write to the Council or to myself; we can probably unearth a photograph that you could use. We have clippings, pamphlets, and other material that come in from all over the country, all over the world, in fact. This data is available and may be borrowed; after you are through with it, it can be returned. At one time we tried the loaning of cuts, but we did not have any luck in getting them back, so we prefer loaning the photographs. The cuts, of course, are available for your use at any time and you may reprint as you will.

The National Safety Council is getting out a new slogan booklet, more or less of a symposium of the kinds now extant. It will soon be available for your use.

The Council appreciates the safety emblem carried on many mast heads.

MR. V. R. CURRIE (The Texas Company, Houston, Texas): I don't know whether other editors have the same problems to meet that we have, but we get out a little magazine and at the present time we are endeavoring to carry the news to twenty-nine different plants. Material does not reach our office until about the twenty-fifth of each month and we never know until the very last minute, or until almost time to go to press, just how much copy we are going to get from the different plants or what additional matter we will have to provide. Up to recently we were using quotations and other light material as fillers. Probably the Council could furnish us little articles, anywhere from ten to possibly fifty or one hundred words, that we could use in this manner.

LOCAL SAFETY STORIES ARE BEST

MR. WALLIS: There is no objection to using any material that has already been sent out. We are so busy and we have been so short-handed in the past six months that we have not had time to write many articles. However, we receive thousands of new ideas, new talks by safety men which embody new ideas, new viewpoints, and we would be glad to pass them on. We are not able to use them in *The National Safety News* because, as you know, it goes to men in a supervising capacity. If you could use such notes we would be glad to have you do so, and if you and others in the same predicament would care to take advantage of our service, I am sure we could arrange to get out some kind of service that might be of help to you.

CHAIRMAN FRAMPTON: Some other question?

MR. McCLELLAND: Mr. Wallis, could you make available for us copies of short articles to be used in connection with our bulletin service?

MR. WALLIS: For the plant magazine it would be better for the safety man to work out his own story, adapting it to his circumstances. The best story is the one that is told in a picture that does not need text.

CHAIRMAN FRAMPTON: Mr. Wallis would appreciate having you write to him in respect to the services the National Safety Council can render you for your plant publication.

The Section then adjourned.

TUESDAY AFTERNOON SESSION

EDITORIAL PROBLEMS

CHAIRMAN FRAMPTON: I wish to introduce to you Mr. A. C. Werner. I realize that bringing Mr. Werner here is like carrying coals to Newcastle, but Mr. Werner, I am sure, will justify the freight charges.

A. C. WERNER (Industrial Relations Manager, Pierce-Arrow Motor Car Company, Buffalo, N. Y.): Our old friend, Noah Webster, said that the purpose of preachments is one of moral uplift. Morals, as such, are pretty well covered by the Ten Commandments which, in turn, are very well spread by various religious organizations. To my mind, there is no place in the plant magazine for preachments as such. However, if we take uplift in the sense of interesting the employees along sane lines, in subjects of benefit to them, that is another matter. Preachments, to my mind, should be used sparingly and then, if possible, be handled as news. Personals, on the other hand, are the real reason for a plant magazine, together with an occasional statement of company policies—the plant magazine is an excellent bulletin board. Let me make it clear exactly what I mean by personals. I mean just the plain news, such as vacations, fishing trips, deer hunts, new homes, Americanization classes, promotions, deaths, births, future plans and so on.

FEW REALIZE THE VALUE OF NEWS

Too few of us realize the value of news and, worse than that, realize news when we see it. I would like to recommend for editorial reading a story by Richard Connell in the *Saturday Evening Post*, a few weeks back, called "A Nose for News." Every editor can read it with profit.

What does the average employee get out of a squib asking what "Pearl White of the blueprint room did last Thursday night at nine-thirty?" Nothing; because it isn't news. Even educational and inspirational matter should be handled as news. Pictures printed should illustrate your personals and not merely fill space. Editors are not paid to fill space, they must show some real reason for their existence or get off the payroll. They must make happiness and goodwill a by-product of industry. Cartoons are effective, especially if mobilized—say on one page.

Historical articles showing the background of plant and product are excellent and should be put into the mouth of some oldtimer who is well

known to most of the employees, such as Old Bill Jones, who remembers back some twenty-five years ago. There should be a decided lack of "Don'ts." Put your ideas in the affirmative, in a way that will help without arousing resentment or antagonism.

"Don'ts," as such, savor too much of paternalism, which is obsolete. That is particularly true of safety. A regular safety story—not always in the same place—makes an example of some infraction. That is the best cure for carelessness. The employees will ridicule the offender; he is cured by his fellow workers. I believe your plant surgeon can do a great deal of good on a medical page by writing timely articles on seasonal ills. An editor has to be more or less of a bolshevik in that he must not pay too much attention to the executives; he must edit his publication for all the employees and not for the executives.

NONSENSE IS SOMETIMES EFFECTIVE

As to percentages of various subject matter, that is governed entirely by local conditions. It is pretty hard for anyone who is editing a magazine to say how much or what he shall have; that is governed entirely by local conditions, but I do think it is better to cut down the size of your edition than to publish a lot of drivel that is not news. I used to carry that even to the joke page; I pretended that the stories, no matter where I got them, and the jokes, were told me by someone in the factory. I printed the names. To be sure, it was nonsense, but some nonsense is good, and better if made personal.

Educational and inspirational matter should be printed so the worker will feel that he has discovered the point himself. He likes to feel that he is clever, and some of them are.

Stay away from advertising your own products in your shop paper. That is for the house advertising organ and there is a difference between that and the plant magazine—a plant magazine or paper is for the employees and not for the trade. In the points I jotted down perhaps I have assumed the attitude of an expert, but remember that an expert is merely an ordinary man away from home.

CHAIRMAN FRAMPTON: Mr. Werner has made some very good points. Many of you, no doubt, are acquainted with the plant paper which he operated for a considerable period of time. I always felt in looking at *The Arrow* that it was so well balanced that it had a lesson and a message for all of us. It was accomplished by so dividing the matter as to get a balance that was at once symmetrical to the eye and pleasing and instructive to the intellect.

MR. BUENO: What Mr. Werner has said brings up the whole philosophy of the subject. A plant magazine is fundamentally an educational proposition and it has to be placed on a rational basis. It is not just a little country newspaper, to tell whether Bill had three twins or four or any such nonsense as that, and the sooner we get that out of our minds the better off we will be, because no company is going to spend money just to spread small-town gossip, and gossip is taking up space that should be used for the more important lessons. Those lessons, as Mr. Werner says, have to be insinuated; you cannot preach. A man in church,

on a Sunday feels kind of lonesome. The ladies are all there, but he has very few men to keep him company, because men, as a general rule, do not want to be preached to—they know life. If you have any preachments to make for heaven's sake go slow. It must not be done if you are to meet with success.

FIRST THING READ IS THE HEADLINE

A plant publication or an employees' magazine, as I prefer to call it, is really a newspaper; we ought to handle it as a newspaper. We likewise ought to read the newspapers. The first thing you read in the newspaper is the headline. The headline is supposed to tell what is in the article, but it does not, it tells what the editor wants you to think is in the article. The first paragraph tells the story in brief. When you have read those two you have the story, in brief. That is one of the tricks of writing for these publications. Have a good snappy headline, telling a brief story. I once read a book called "The Art of Writing," by Quiller-Couch, and I recommend it to all editors. It is very fine and it tells you many ways of putting the message across. One of the things the author said was this: "When you are writing anything, write your heart out. After that go over it and murder your thoughts." In other words, the finer the writing the more you draw a pencil through it.

One very good way of arresting interest is to say something highly contentious, and say it wrong; then everyone will set you right. I was talking to a man the other day and he said: "If a poor baker was run down by an automobile, that is not news, but if John D. Rockefeller walks down Nassau street, that is news." That is a good thing to remember, too.

The question of executives is a very keen one. If you want to question your executives, have your exit properly prepared beforehand.

The plant publication is not to advertise the plant product! Well, it is and it isn't, because every time you talk about the plant—in fact, every time you talk about anybody—you are advertising, and every time you say anything you are advertising your product. In other words, you are revealing men's motives and ideas; you are setting forth the workings of his mind, the workings of material things, and you can't help it. That is a good thing for every editor to remember—that he is advertising himself every minute of the time; we, as safety men, of course appreciate that. There are cases, however, in which one can advertise his products and, I think, ought to do so. You can't advertise steel billets, but in corporations such as the one I am connected with, we make specialties at isolated plants, and I discovered, to my great chagrin, that out of our 4,000 or so employees about 25 per cent knew that we made certain specialties. We had never advertised it. I ran an advertisement about the special products—one of them is a product for household consumption—and we got an awful lot of customers. There is, of course, a practical side to everything.

KEEP IN TOUCH WITH POLICY OF COMPANY

MR. J. L. BOARDAN (Safety Engineer, Anaconda Copper Mines, Butte, Mont.): I think the plant magazine department should keep close enough

to its executive to know at all times the policy of the company and I think, in most cases, that a practical exposition of his reasons for wanting to run a certain thing will win the executive over if he is right; I do not believe plant editors are always right. If they were, the chances are that they would be executives in short order.

What steps do editors take to determine whether a joke taken from some other paper is of any real value? There are many jokes which might strike me as funny, or you as funny, but which really are not funny at all unless you happen to be in the right humor. That is one of the things that is troubling me so much that I haven't put many in the paper. I like a good joke, but I want to be very sure I am right.

CHAIRMAN FRAMPTON: I think the answer to the question of a joke is that good jokes, like good Indians, are dead, and if you get one of the jokes which strikes you as funny it is probably one of the two jokes that Noah took into the ark. After all, jokes are just the same as people; a joke that strikes me as good may not seem funny to another person, although, through my sense of humor, I thought that it was a splendid joke at the time. And one time a joke is very funny and at another time a joke is very bad.

MR. BRODY (Maxwell-Chalmers): About two months ago we decided to turn out a little paper and we had considerable controversy, but finally decided to go ahead with the paper. In other words, to try it out. It had to be run on a dollar and cents basis. On the face of it it looked to be a very small thing. It did not say: "You fellows are a dandy bunch of men; you have been working a long time and we want to give you a little paper as a bonus." No sir, that was not the idea. The paper cost so much, the labor turnover cost so much per man that in order to publish it we had to save so many men. Having worked in the shops, I thought I had a slant on the fellows, and what I find to be wanted in our shop is a "low brow" paper.

KEEP TO NEWSY STYLE WHEN WRITING FOR WORKERS

If you make statements for the paper and want them to go across they have got to be "low brow." You don't start off each article "Due to the inclemency of the weather certain conditions are existing at various plants," because as they run down to "Due to the inclemency" bang! They don't go any further.

If you stick to the statement that it is a "low brow" paper and the men want that type of publication, sometimes you will find that the executives will drop out and leave it more to the fellows in the shop to express their own ideas, which, in a good many cases, are quite as good as those of the executives. An executive would not be one unless he had a better idea on a certain subject than another man. Therefore, his idea, expressed in his own words, is very valuable, but in a good many cases it is not fully understood because of the way he expresses it. If you take the stuff the executive wishes put in and talk it over with another fellow in the shop and say: "Look here, so and so wants this put in; what do you think of it?" The fellow will read the story over and he will say that it should be redrafted. He will redraft it

and then he will say, "It is all right now, we will start off." Then, if you take down, practically, as near as you can remember, what he said, he will go right back and tell you the whole thing in his own words. He does not mean to do that, but he is giving you the natural reaction—it is the same thing transposed into his own thoughts. If you take the words that he used and rewrite them and sign it by the executive sometimes you get a story which goes across a little bit better.

CHAIRMAN FRAMPTON: The next paper is by Mr. Ernest Augustus.

KEEPING YOUR PLANT PAPER FROM GOING STALE

ERNEST AUGUSTUS, EDITOR, "MEAD CO-OPERATION," MEAD PULP & PAPER CO.,
CHILlicothe, OHIO

The primary purpose of any plant paper is to foster a spirit of good will and co-operation between the employees of the plant and the management or executive end of the business. To accomplish the greatest possible good and to carry out this purpose, one of the first essentials is that the paper be read by all the workers in the plant. In order that this may be the case it is necessary that the publication be so edited that it will be looked forward to and read with interest by the greater proportion of the employees. Unless this is the case something is wrong with the publication and, nine chances out of ten, the underlying cause can be attributed directly to staleness.

The live, wide-awake editor of any successful plant paper will be constantly on the lookout for new ideas which he can incorporate in his publication and thus prevent its growing stale; he will employ various methods in keeping his paper fresh and up-to-date.

What I shall say is based largely upon my own experience in getting out and editing *Mead Co-Operation*—a forty-eight-page, magazine-style plant publication; issued monthly to its employees by the Mead Pulp and Paper Company at Chillicothe, Ohio. For the most part the various points which I shall mention are my own ideas on the subject.

Inasmuch as all of my experience has had to do with the more commonly known magazine-style publication what I shall say will apply particularly to this form of plant paper. Much of what I shall try to bring out may be equally well applied to the less commonly seen newspaper-style publication.

MUST HAVE A DEFINITE PLANT POLICY

Without question, the first essential to be considered in editing any worthwhile and successful industrial paper is to determine upon a definite plant policy. The quicker this is done the sooner is the success of the paper assured and the more unlikely is it to become stale. A wavering and constantly changing policy or attitude on the part of the company and the editor is one of the surest ways to breed distrust and staleness in the minds of the workers and the readers.

Once a policy has been adopted, everything published in the magazine should bear a positive and clearly understood relationship to that policy;

nothing should be permitted to appear in the printed pages which cannot be linked up in some manner with it.

The next most important thing is the matter of its general attractiveness and the appeal made by it to the esthetic tastes of those working in the plant. It should be attractive and made up in such a way that it makes an appeal to the sense of beauty.

First impressions are generally the most lasting and for this reason it is very important that the matter of a cover be given considerable thought and attention. An attractive and constantly changing series of covers is a valuable asset.

In determining upon your covers, choose subjects and designs which will attract the reader's attention and interest immediately upon his seeing it and arouse in him a desire to investigate further and determine for himself if the inside is as good as the cover would lead him to believe. Usually, if the cover is attractive and different each issue and printed in more than one color on a good quality cover stock, the worker's interest is maintained and he naturally expects to find something worth while and of interest on the inside. In this way he is instinctively led to investigate further and you are more likely to put across your message and have your publication read.

Seasonal covers, of a photographic or wash-drawing nature, are the most attractive and carry with them the greatest appeal—there is no end of subjects which an editor can readily procure at small expense. Pictures of familiar and near-by landscapes and things generally known by the majority of the workers are especially appropriate.

In the case of purely photographic covers, with little or no art-work involved, it is not necessary that more than one color of ink be used to make it attractive, provided you get away from the conventional black and white, provided you secure the expert advice of a first-class printer in making your choice of color. Change the color as frequently as possible and occasionally use more than one color to add variety and to hold the interest of the reader.

GOOD PAPER AND READABLE TYPE FACE ESSENTIAL

Regardless of what the cover subject is to be, make sure that it is printed on a good quality paper—nothing so cheapens the appearance and attractiveness of any publication as a poor grade of paper. This point applies equally well to the whole magazine. Unless the magazine is printed in clear, uniform and easy-to-read type, with all halftones and line drawings standing out clearly and distinctly, a certain proportion of the appeal is bound to be lost. If a poor paper has been used, if there is variety in the size and style of type and if illustrations and drawings are mottled and indistinct, there is certain to be a lack of interest on the part of those to whom the publication is issued and sooner or later this lack of interest will develop into staleness.

While on the subject of illustrations, do not overlook the fact that a plentiful scattering of pictures and drawings all through the printed pages will accomplish a great deal in helping to keep the paper fresh

and of interest to all. Through the liberal use of illustrations the reader is unconsciously led to note much which otherwise he might pass by.

Everybody likes to look at pictures and especially is this true when they are of persons, places and things the reader knows something about—this is inborn in us and has come down through the ages. The first written language was a series of pictures and even today it is a very popular way of telling a story. It has been truthfully said that more can be told in one picture than might be said with a thousand words. For this reason illustrations are one of the best mediums which can be employed in putting across your message and keeping your plant paper fresh and of interest to all. A questionnaire recently sent out in our plant disclosed the fact that 70 per cent of our readers demanded more pictures, although we were already using a considerable number in each issue.

Cartoons are also of considerable value in holding interest and attention, particularly when well drawn and portray some humorous incident or happening or have a direct bearing on an individual or group of individuals in the plant. Do not use many cartoons, however, unless they are fairly well drawn—preferably by an artist in the plant or by someone generally known to the majority of the workers—and unless they picture some happening generally known by more than a comparatively limited number of the employees.

Very rarely do we find an editor who experiences any difficulty in getting pictures and cartoons for his publication, once he has started the practice of using them generously and making it generally known to the workers that he wants them. Quite to the contrary, he frequently finds himself receiving more pictures from the employees than he can use. The same is true regarding subjects for good cartoons. If once educated to the habit, the men in the shop will find no end of things which can be pictured in cartoon, and the average editor will experience some difficulty in choosing what to use and what not to use.

A GOOD CAMERA VALUABLE TO THE EDITOR

By arming himself with a Graflex, or any good camera, the editor can find hundreds of subjects to "shoot" which will prove of interest to his readers. I have made it a practice to take frequent trips through the plant, carrying a Graflex, and many excellent ideas have been suggested for photographs. At the same time I have collected a great deal of real news which is used to advantage later on in the magazine.

Do not be too choicy in making your selection of photographs. What to you may seem of little interest to some of your readers may mean a great deal—especially if it is a picture of someone or something in whom or which they are interested or which they know about in a general way. Pictures of employees, their families and children, their homes, vacation trips, fishing parties, plant outings, unusual pieces of machinery and equipment about the plant, men at work in the shop, etc., are particularly appropriate and should be used whenever the opportunity presents itself.

Next in importance, after you have selected attractive covers and provided for a generous scattering of illustrations through the printed

pages, comes the matter of news. By news I mean the printed matter which is intended to convey the message to the worker and for which the paper is issued. Unless the message and the policies of the company are put in the form of news it is very doubtful if the plant paper is accomplishing any real good.

Like illustrations, everybody is interested in news. News is of two kinds: It either tells something that has happened or something that is going to happen, and this is of double interest to the worker when the particular thing or happening concerns himself and his fellow-workers or the plans and policies of the plant in which he is employed.

Sam Wingfield, editor of *Curtis Folks*, writing on the subject of "Putting It Across" in the July issue of the *Blue Pencil*, has the following to say concerning the importance of news: "It is a powerful way of putting the message across and there are few sermons indeed that cannot be preached as a news story. One of the problems faced by every industrial editor is that of selling the management to employees. News offers a wonderful opportunity to do this." (Digressing from my subject for a moment I might say that the editor of any industrial paper who carefully peruses the pages of the *Blue Pencil* each month will be wonderfully benefited. This splendid little magazine, edited by Bert Barnes, is full of good ideas and can be used to advantage in keeping any employees' publication up to standard.)

AVOID STILTED OR PREACHING ATTITUDE

There are few sermons indeed which cannot be preached as a news story. Bear this in mind as you prepare your copy for each issue, and instead of employing a stilted and preaching attitude, get into the habit of writing your copy in a simple, easygoing, breezy newspaper style. Instead of making blunt assertions and stating cold facts learn to recognize the news value of a story or an editorial and then write it up from the standpoint of news. The sooner you are able to recognize what is news and write it as a news story the sooner is your plant paper going to win the hearty support of the workers and the longer is it going to take that paper to grow stale.

In this connection it might be well to give a word of caution about editorials. Do not depend upon putting across your message through the editorial route entirely. Be sparing in their use and make sure that all editorial matter carries with it some news value. Make sure also that each editorial bears some clearly understood relationship to the policies of the company. The timeliness of editorials should be readily recognized and understood; particularly so when of the scissors-and-paste-pot variety. Keep your eyes and ears open and take advantage of every opportunity which presents itself for getting a good story, one of the right kind will accomplish worlds more good than a poorly handled editorial. Many a good news story, which might well have carried a vital message along with it, has been allowed to pass unmentioned and unnoticed, simply because the editor failed to recognize its true value.

An excellent way to acquaint yourself with what the workers really like to find in their paper is by way of the questionnaire method. In this way, I have found by experience, the editor can ascertain what the workers in the plant want and what they like best. In our plant, somewhat less than a year ago, we sent out a questionnaire containing sixty-six questions. More than 45 per cent of our employees answered it and the information and enlightenment which we obtained would furnish material for an excellent paper on the subject.

Another equally effective method of keeping in touch with your readers and learning what they want in their paper—probably productive of even better results—is for the editor to acquaint himself with as many employees in the plant as possible. Take advantage of every opportunity and spare minutes afforded you to get out in the plant and talk to the men. Find what they like and what they dislike; try to discover if there is anything in your paper which they particularly dislike or in which they are not interested. After you have done this try to give them more of what they like. Unless you can find other means of overcoming the objectionable and little-read features discontinue them entirely. Give your workers what they want and you will have no difficulties in holding their interest.

WORKERS WANT FACTS AND LOGICAL STORIES

Unless you keep in fairly close touch with the men you have no means of knowing their likes and dislikes and very shortly you are filling the pages of your magazine with material which is not read and which is accomplishing nothing in the way of benefit to the worker or to the company.

Do not get the mistaken impression that the average plant worker wants to read only light, humorous stuff, giving no thought to more serious things. Such was not the case in our plant, as revealed by answers received to the questionnaire. The replies showed, to our surprise, that special articles of a business nature carried the greatest appeal, with plant gossip, jokes and funny happenings coming second on the list. Stories by and about company officials and executives were also shown to have a wide appeal. This illustrates the point that the average worker appreciates something of a more worth while nature. Therefore, instead of using your own judgment about what most interests your readers find out from the readers themselves and you cannot go wrong.

One important point to be considered in this respect, regardless of the general nature of your subject, is that all articles should be short and to the point, without being blunt and abrupt. A sure way to breed lack of interest and staleness is to fill the pages of your paper with long, rambling articles. The average reader does not like to read long discourses on any subject and it is important that you keep down the length of your articles—preferably one or two pages; shorter if possible. If a reader sees that an article is short, he is more likely to read it; if it is long, he will pass it by for the time being, intending to come back

to it later on. Nine chances out of ten he forgets it and eventually the paper is cast aside.

Mention has already been made of resorting to the scissors-and-paste-pot editorial method. The same holds good all the way through the publication. It is not advisable to resort too frequently to this means if you want your paper to be original and accomplish the greatest good. Clipped material cannot carry with it the same appeal as that made by original copy coming from someone generally known and respected by the workers in the shop.

The frequent use of names all through the printed pages is another excellent way to maintain interest. A paper filled with live news of the plant, of employees, their activities and interests is one in which not only the man of the shop but those at home and outside of the plant are interested.

KEEP THE PLANT SPIRIT AWAKE

An industrial magazine is only another form of the once popular country weekly, which everybody perused with intense interest. Every newspaper man realizes the importance of using names. Every cub reporter has had the editor impress this fact indelibly upon his mind. "Get a man's name into any publication and you have made that magazine, newspaper, sheet or leaflet of greater interest and importance to that man," says a writer on the subject of shop publicity. The editor who takes an interest in what every employee in the plant is doing and gives the worker an opportunity for representation in the shop publication through frequent use of his name is earning that man's interest in the publication and is following one of the rules for keeping his plant paper from going stale.

In determining upon your make-up and contents for each issue be sure that you have a careful balance of material so that an appeal is made in some portion of your paper to each of the various classes of workers; have something of interest for every employee in the plant.

The average worker likes something in addition to light reading matter. Some do not care for heavy stuff and for these the editor must provide something to hold their interest; eventually this class of worker may be trained and educated to appreciate more worth while things. Make sure that you have a carefully chosen balance in make-up in order that your publication may appeal to all employees in the plant.

Don't preach when writing copy and editorials—talk to the worker in his own language about the things in which he is most likely to be interested. Talk to him from the viewpoint of the man in the shop, rather than from your own or that of the higher-ups in the management. To get this viewpoint talk to the men and get their ideas on important subjects. If the preaching attitude is avoided and the language of the workers used you will accomplish far better results.

Avoid mentioning salaried officials and "white-collared guys from the office" too frequently. There is an inherent tendency for the worker in the plant to look with more or less contempt upon the office-worker, and too frequent mention of this class in the pages of your paper will help

to strengthen this feeling of dislike. Divide the space devoted to each in proportion to the numbers of each employed in the plant, giving the advantage to the shop worker.

VARY DEPARTMENTS AND FEATURES

Still another thing to be avoided is the use of too many standard page and departmental headings. Change your headings frequently, so that the reader does not become accustomed to seeing the same thing each time he reads a new issue of the paper. Avoid placing all heavy material in one particular portion and all light stuff in another—intersperse the light with the heavy. Get away from the habit of placing the various departmental and standard subjects on the same page each issue. Change them around so that the reader must do a little searching before he finds that for which he is looking. In this way he may be led to read things which otherwise he would have passed by. The idea of something a little different in each issue is an excellent one and keeps alive that element of the unknown and surprise so necessary in maintaining interest. Just as soon as this manifests itself the worker develops a new interest and is curious to learn what new things he may expect. Therefore, avoid sameness in all things pertaining to your plant paper; hold something back each issue, giving the reader only an inkling of what he may expect in forthcoming issues. Follow-up stories is one of the ways in which this may be accomplished.

I need only mention that the frequent use of syndicated material is one of the sure ways of making your paper grow stale. The successful plant paper will steer shy of all such space-fillers and use only material which is original and of some particular interest to the men of that plant. Syndicated material should be used only on special and infrequent occasions and then only when it is exceptionally good and applicable to some particular matter you are trying to bring to the attention of your readers. The larger proportion of all syndicated material reacts in the same way as a multigraphed letter to the average business man—it is seldom if ever read and rarely makes a lasting impression. Just as soon as the workers make the discovery that you are trying to fill them up with a lot of material written by some fellow wholly unknown to them, and foreign to conditions prevailing in the plant, they lose interest and the whole purpose of your publication is wasted.

CONFORM TO PUBLICATION DATE

A definite publication date is important. Determine upon what date your paper is to come out each issue and then conform strictly to schedule. The workers will expect their paper on that date and look forward to it with expectation and anticipation. If the paper is several days late in reaching them much of this enthusiasm has been lost and their confidence and trust in you has been shaken and repetitions will completely undermine their good will. See to it that your paper does not come out a single time behind schedule. Instead, it is well to have it come out a day or two ahead of schedule, for by so doing you are injecting the required element of agreeable surprise and strengthening the interest and confidence of your readers.

Last but not least, I wish to mention the advantage of mailing your paper to the homes of the workers; this is by far the best method of distributing your publication. By doing so you not only increase the efficiency and productiveness of the worker, but at the same time you are putting across your message to a larger number of readers. You not only reach the man in the shop but the members of his family and in this way they learn the policies of the company and the activities taking place within it—which indirectly affects their general welfare and comfort.

The more readers you have the more likely is your plant paper to accomplish the purposes for which it is striving. Obtain the good will and confidence of the wife and other members of the household and you are pretty sure to experience little difficulty in reaching the right spot with the husband, the father, the brother or the sister. Therefore, if you would have your plant paper accomplish the greatest possible good, make sure that it reaches the homes of the workers where all members of the household may enjoy reading its pages and living in the atmosphere of the plant.

DISCUSSION

MR. HORD: May I add one thought more: Find out what questions are being asked by employees, what they want to know? About a year ago Mr. Richardson received an anonymous letter from one of our workers, asking why he and other employees were being laid off. The letter demanded an answer, even though it was written anonymously. That gave me an opportunity of telling the workers who really should know, something about political economy, some of the reasons for the slump in business, just why they were laid off and other things about the corporation.

Find out what your people are thinking about and answer their questions. Every month, every week, every day, if you keep your ear close to the ground, you will find them studying some vital issue and all the time thinking. If you work hard and explain things to them, if you show them that hard times are the results of general conditions and not the fault of grasping corporations, as a great many imagine to be the case; if you explain that to them so that they can understand it you will not only make friends but you hold their interest in your magazine. Do that and it will not grow stale.

MR. BOARDMAN: I refuse to believe that the American workman is a "low brow." Even if it should be granted that he is, of what value is your employees' magazine if we have to make ourselves "low brows" in order to interest him? I had occasion to teach the English language to a class of Finlanders and I found it a very, very difficult proposition. They called my attention to mistakes I had overlooked myself in the English used in our newspapers. Imagine the position of those men trying to learn English. We, as representatives of the language, you might say, get all balled up. We do not want to say to employees: "Gentlemen, you are 'low brows' and in order to get to you I am a 'low brow' too." It is the duty of the editor of the employees' magazine to use good English, just as it is to use good paper for his publication.

KEEP PAPER INTERESTING AND INSTRUCTIVE

MR. BUENO: No "low brow" cares to be told he is a "low brow," he hates to be found out. I am accused of running a "high brow" publication and my argument was just exactly the same as that of the last speaker. The president of the Pennsylvania railroad was once a working man and the head officials of many other corporations started just where he did—they are not "low brows." People may use poor grammar and poor diction when speaking, but when writing they do much better; when reading they detect the other fellow's errors very quickly.

We have a medical director and he writes our medical page, but I always go over it with a blue pencil. One day he took exception to this and I said: "Well, doctor, you can't expect people to understand this stuff." "Why," he said, "that is perfectly plain." I answered: "Yes, to a medical student it is perfectly plain."

The other day I saw a paper issued by the Amalgamated Cloak and Suit Workers' Union of New York City, a highly socialistic organization. There were excerpts from Marx and other socialistic and economic writers, couched in highly technical language. The editor of the paper is addressing thousands of ordinary ignorant Italians and Jews, but his stuff is written in highbrow language and he gets it across. We are bound to use the same language and put it across if we can.

MR. BRODY: There are fellows in the shops who can write stuff that would surprise you. I would not dare use poor English in our paper but I do use English that is easily understood and for that reason I referred to it as "loose." The men in the shop wish to be called machinists or sweepers or exactly what they are; they do not wish to be classified as writers or identified with a type of work which requires more education and a little higher intellect than they are usually credited with having. On the other hand, a great majority of them would not want you to go into the shop and say, "Here, you bunch of rough necks!" There are other groups who would not notice you unless you spoke their language.

WHEN AND HOW TO USE CONTINUED ARTICLES

MR. THOMAS (Morgan & Wright): I am interested in learning whether the plant publications of the editors here run largely to magazines or newspapers. We print one newspaper for the four plants, confining the news and personal items to the plants where they are of particular interest.

MR. McCLELLAND: I would like to ask Mr. Augustus a question: In order to keep the paper from going stale, what is his opinion of running articles of an educational nature over a period of three or four issues? Would you sacrifice clearness and detail of the subject you are covering in order to get it in one issue or would you continue it over several issues?

MR. AUGUSTUS: I never tried to continue an article from one issue to another and do not care for the system. I want to read an article or story all at one time and I think the man in the plant would prefer to do the same. It is all right if you wish to cover a general subject to take

up one phase of it in one issue and another in the next, making each installment separate articles instead of using it as a continued story. In writing about the plant you take first one department and then another; that is all right.

MR. CROESUS (Massachusetts Products Company): I can tell you of something that had a great influence in keeping our paper from going stale. We get many articles from our employees—maybe from a superintendent, a foreman or one of the men at a bench or at a machine. The article may run one, two or three issues. We feel this to be instructive, the men in the plant enjoy it because it is written by one of them, the influence has been excellent and it has done a great deal to keep our paper alive. The last article we had was on foundry work and was written by a foundry superintendent. Not 75 per cent of the employees in the factory know anything about foundry work, they don't work there. They clamored for the second issue and wanted it continued; that is the policy I have adopted. If it is possible to get extended stories from the men at the bench and on the machine we do so. Our next story will come from one of our engineers who has been in the oil-well business for forty years. The way they dug for oil forty-five years ago was somewhat different from what it is today. The story will be instructive not only to our men but to our executives, who possibly do not know all about the product they manufacture. We find the system quite successful in our magazine.

MR. H. R. ZIMMERMAN (National Cash Register Company): Don't you think it would be well for all of us to try to conceive of ourselves in the more exalted light of diplomats, rather than as editors, because of the old notion that the editor was a man who formulates public opinion? The factory magazine editor might be likened to the rudder on a boat—he is submerged. In proportion to your understanding the sincere reactions of men you can count on their deep, sincere sense of justice, whether in a college man or one whose education terminated with the eighth grade, if you let him know you are on the square. Try to get his best work for your paper, free of all camouflage; let him know that something which gives the boss a glimpse into the aspirations of can't go wrong.

CHAIRMAN FRAMPTON: We will now have the last paper of the program. It is by Miss Edna E. Coyle.

DIFFERENT WAYS OF GETTING THERE—A STUDY OF EIGHT REPRESENTATIVE PUBLICATIONS

EDNA E. COYLE, EDITOR, THE STALEY JOURNAL, A. E. STALEY MANUFACTURING
COMPANY, DECATUR, ILL.

That something which binds more closely together a large group of employees by giving each an insight into the other's interests in life; that something which gives the boss a glimpse into the aspirations of the dirtiest laborer in the plant, which acquaints him with the fact that Bill of the machine shop is buying a home for his wife and five children.

or that Sam, in another department, is interested in the culture of roses. or the breeding of dogs (in which the boss also is interested); that something through which the employees are able to laugh with one another; that something which strengthens their confidence in the company by increasing their knowledge of the business; that something which teaches safety lessons; that something which teaches employees the value of doing things well and of pride in their various departments; that something which recognizes faithful service and loyalty—that something which does all these things is, to my mind, a successful plant publication.

In spite of the fact that Robert E. Ramsay, author of "Effective House Organs," says that the field for the internal or employee house organ (or plant publications, as we choose to call them today) has hardly been touched at all, there are several such publications throughout the country which may be said to have "arrived"—that is, they are successful. Perhaps the individual or individuals who started them had only a hazy idea at first of what they would accomplish or to what extent the publication would be developed, but they acted upon their visionary ideas until they achieved something which has become an almost indispensable part of the organization. I do not believe you will find many firms who have operated successful plant publications who will say that the publication does not pay them or that they wish to discontinue it.

In my study of eight representative plant publications this afternoon I do not pretend to name the best—only eight worthy of study—some which I consider come under the successful class. The eight chosen represent a wide range of industrial activities.

THE N. C. R. NEWS

A snappy little publication, averaging about fifty pages, is the *N. C. R. News*, edited and printed by the employees of the National Cash Register Company of Dayton, Ohio.

The editor, H. C. Zimmerman, has made a chart in which he outlines the benefits of the publication. He tells that, for the employees, the magazine promotes health, urges safety first, makes the employee feel he is a part of the organization, increases his knowledge of the business, encourages home study, cheers the sick and stimulates thought because the employees are invited to write for it.

It benefits the employees' families in many ways and to the company it reveals the human side of industry, provides a medium in which to explain the company's policies, decreases labor turnover, helps to sell the product, makes satisfied users, increases departmental co-operation, develops future employees in the home, calls the attention of the executives to capable employees and strengthens co-operation. Surely a publication which accomplishes all these things is successful and something the company will wish to continue.

Each picture appearing in the *N. C. R. News* has a meaning all its own. I mean by that that it serves some definite purpose in teaching lessons in safety, thrift or some such subject. The editor evidently does not believe in wasting money on pictures which have no definite value. For instance, in a recent number there appeared the picture of the man

who blows the whistle each day and under it the caption, "If the man who blows the whistle can be on time day after day it seems there can be little excuse for us being late."

A gardening message is put across by the use of a posed photograph in which one of the employees is shown sitting, talking to two lads, telling them different reasons why they should raise a garden. An article by an employee on "What Landscape Gardening Does for Me" is illustrated with pictures of what he has accomplished. Pictures of classes in the N. C. R. community hall, where the women are learning to become skilled housewives, are used to advantage.

Employees are given the opportunity to write articles on such subjects as "Your Boy and My Boy," "Making Good Where You Are" and "Paying Rent Will Never Get You a Home." One has every reason to believe that this publication is a success because it ties up everything in it so closely with the vital interests of the workers.

It maintains a sports section and editorial page; it caters to the women's tastes with a woman's page, edited each month by two women chosen from among the employees; it has a bargain counter where the workers may insert advertisements and it uses plenty of cartoons and pictures to brighten its pages.

The publication is 6 by 9 inches and the copy is set two columns to the page in eight point leaded type, with the exception of an occasional double column spread to provide emphasis.

The cover designs are varied, usually appearing in two colors on No. 1 enamel cover stock. For the most part they are photographs or drawings which have some direct bearing on the company's or employees' interests.

NEW YORK CENTRAL LINES MAGAZINE

Just imagine the varied interests of a family of 150,000 persons and you have some idea of the task which confronts the editor of the *New York Central Lines*, published by the New York Central Railroad and devoted to the interests of the railroad workers, their families and home communities and to securing the best service to the public. But the editor seems to be "getting there" by using a great variety of news. To accommodate such a family this magazine necessarily must be rather pretentious, but by so doing it does not lose its personal appeal.

The editor says that contributions are welcome, and perhaps in this one thing lies a great measure of the publication's success. The night trick operator in some little junction along the line sees that notice and feels that he has just as much interest in the magazine as some of the "higher ups." Whenever he knows some news of general interest he isn't going to hesitate about sending it in.

General articles, of interest to everyone, are used, such as a chapter from Chauncey M. Depew's book, "My Memories of Eighty Years," in which he tells of his fifty-six years with the New York Central Railroad, but this does not mean that the personal touch is crowded out. In the same issue Sam Bickford, master mechanic of the electrical equipment,

finds himself pictured in sport togs and an accompanying article tells how he boosted himself from a fireman to his present position.

Members of the Kent street (Rochester) freight force have a laugh over a picture of themselves and also a picture of the freight force at the same place in 1885. The styles have changed and no women are shown in the older picture, but eighteen appear in the present-day group.

This publication also has an agriculture and stock department, traffic department, fiction, editorials, the home circle, illustrated fashions, a children's page, notes and pictures of the drama, library news, sports news and a roll of honor where credit is given those who contribute valuable safety or economy suggestions. There is a seasoning of jokes and poems throughout and notes concerning births, marriages and deaths among the employees and officials. It seems to me that the editor, Pitt P. Hand, is going after things in the right way to give the enormous New York Central Lines' family what it wants and at the same time to serve the best interests of his company.

The magazine is 7½ by 10 inches in size and contains about 100 pages, twenty-five or thirty of them being devoted to advertising. Eight-point type is used in the general set up and is used in three columns on S. and S. C. paper.

The cover designs, on general subjects, are printed on coated stock. Photographs are used. A cover on a recent number was the picture of a new type of locomotive and the lead article that month described that wonderful piece of machinery.

MEAD CO-OPERATION

You have just heard Mr. Augustus tell how to keep a plant paper from going stale, so you know without me telling you that he edits a live publication and that he has put his finger on a number of things needed to make a successful plant publication. His little booklet, *Mead Co-Operation*, published by and for the employees of the Mead Pulp & Paper Company of Chillicothe, Ohio, averages about fifty pages and is 6 by 9 inches in size. The type used is eight point leaded, with a little six point for variety. It is set two columns and printed on machine-finished paper. The cover is of heavy enamel paper. The cover designs usually are pen and ink sketches on timely subjects in two colors.

I notice in this magazine that the policies of the company are definitely outlined. At the time of a wage reduction the announcement appeared in the publication, with an explanation of the cost of living investigation made by the mill council. In an article on "Wages and Cost of Living" there was a plain statement of facts and figures so that the workers were not left in the dark as to why a wage reduction was necessary. Everywhere in the publication there is a certain frankness in criticising conditions about the plant which need correcting, but, on the other hand, the publication also gives credit where credit is due. One way of doing this is the prize system for suggestions in economy, safety, etc.

The firm is a member of the National Safety Council and Safety First is stressed. One page of each issue is devoted to a report of accidents

happening during the month. This curt statement appears on that page: "The less said on this page the better." First-page editorials give a certain strength and dignity to the publication.

Articles of general interest are used, a recent one being on "How Magazine Illustrations Are Made." Health articles, athletics, a woman's page, a poem now and then, prize contests for children, absentee reports, production records, reports of mill council meetings, pictures of employees and their families, cartoons, plant gossip, etc., make up a delightful menu, varied enough to tickle the palate of every reader.

A. W. EMPLOYEES' BOOSTER

Another plant publication serves a fine medium for teaching lessons in Americanization. This is the *A. W. Employees' Booster*, published for the employees of the American Woolen Company of Lawrence, Mass., and edited by Howard O. Frye. The name of the publication is sufficient indication of the purpose it is intended to serve. It is helping to carry out the desire of the president, William M. Wood, who said in a recent address: "My dream and hope is for a mutually helpful and happy body of united men and women."

The publication has to reach a widely scattered number of mills and must contain something to attract each group. Evidently many foreigners are employed, since so much concerning Americanization is used. Staunch Americans and loyal employees are made by the use of such things as the photograph in the June issue, of a graduating class in Americanization and an account of the program in which the foreign-born participated. In another number these new citizens read an article on "Notable Immigrants" and in still another they have brought forcibly before them, by the use of a full-page photograph, the difference made in a person who has become fully Americanized.

News reports from the various mills are used under page headings; these usually include a picture of the mill represented. Editorials, articles of thrift, prize contests for designing problems and puzzles, safety articles, a woman's department, cartoons and numerous illustrations make up the further content of this publication. News from the sales department in New York City is given a place and a suggestion sheet is provided for the readers.

The booklet is an attractive size, 7½ by 10 inches. Leaded ten point, eight point and other sized types are used and the text is set two columns, printed on enamel stock. The cover designs are suggestive of the firm's business—the photograph of a fine dog, "The Guardian of the Flock"; a sheep ranch in the foothills of the Andes mountains, the wool industry in Australia, etc., being some of the cover subjects used in one or two colors on No. 2 enamel stock.

CURTIS FOLKS

The "folksiness" of *Curtis Folks* is what appealed to me when I looked at the copies of the publication issued monthly by the Curtis Publishing Company for its employees. I've always liked the word "folks" and immediately felt friendly toward the magazine. As soon as one sees the cover of this 9 by 12-inch magazine he feels sure there is something good

inside. And Sam G. Wingfield, the editor, has made it human from "kiver to kiver." The cover designs are in one color, the posed photograph being used with success. They are not the cold affairs one might imagine, for they are on warm, human subjects.

The editor takes advantage of his publication to acquaint the employees with the different branches of work in the establishment. The girl who runs the comptometer all day and the man who bales the cuttings of waste paper from the bindery probably never realized there was such a person as an advertising censor in the place until they read in the July issue that sparkling article entitled "Censored." It was an interview with John T. Earl, the man in charge of the advertising copy service for the Curtis publications. These two learned that it is his duty to look out for suggestive illustrations, misleading statements, unauthorized portraits, violations of copyright and dozens of other things.

Another article describes the making of an engraving and is illustrated with photographs of the various processes. "Clean-Up Week" was brought forcibly to the minds of the workers in one issue by the use of a full page of striking photographs showing untidy and hazardous spots about the plant.

There also is news of births, marriages and deaths; jokes on individuals, safety suggestions, editorials, news of the employees' benefit association, etc. The paper used is S. and S. C., with self-cover. No advertisements appear. The type is eight point on a ten point slug and eight point solid and is set in both two and three columns.

THE HERCULES MIXER

The *Hercules Mixer*, published monthly in the interest of all members of the Hercules Powder Company, has a big mission to perform, for it reaches individuals in forty-six different plants, scattered from coast to coast.

The editor, Harvey Roberts, Jr., seems to accomplish the feat of making his publication readable to these folks of varied tastes without losing the personal touch so necessary in a successful plant publication.

When one opens one of the magazines and finds a full-page photograph of a man, either the head of one of the plants or manager of a branch office, smiling at him, he can't help but be further interested. These heads of plants are introduced to members of the Hercules family in this manner, a biographical sketch accompanying the picture.

Throughout one notices the unusually fine cuts, which show up excellently on the super-calendered paper. There are cartoons and numerous illustrations, both of a serious and humorous nature, to enliven the pages. I notice that this magazine, as well as some of the others, occasionally uses one or two page spreads of cartoons, thus getting across jokes on a number of persons without eating up space with separate cartoons. The branch offices send in news notes and pictures, but these are not segregated so specifically as the plant news in the *A. W. Employees' Booster*. Happenings in the home office, athletics, book reviews and special feature articles are used. The editorials are set three columns by way of contrast to the remainder of the copy.

No advertisements are used with the exception of the Hercules Company's ad on the back cover. The front cover usually appears with a one-color photograph set in a solid background of some color, the photographic insets representing something pertaining to the powder industry. Enamel cover stock is used. Twelve and eight point type is used on the supercalendered paper.

THE MORSE DRY DOCK DIAL

With Bert Barnes, editor of that helpful magazine, *The Blue Pencil*, as editor of *The Morse Dry Dock Dial*, that publication is just what one would expect it to be—attractive, well put together and delightfully balanced as to material and illustrations.

This is a monthly publication, devoted to the activities of the employees' association of the Morse Dry Dock and Repair Company of Brooklyn, N. Y., and to the interests of the company. It serves a double purpose, being an external-internal house organ.

It has an inviting exterior. It is 9 by 12 inches in size and the cover designs usually present nautical pictures in one or two colors on heavy enamel book. The publication contains sixteen pages of clear ten point type on heavy enamel book. It is clean looking, well arranged and easy to read.

"Our Viewpoint from the Masthead" is the clever title appearing over the editorials. The editorials are keen and to the point. Short editorials are used on the inside cover.

General articles of value to those concerned in ships and shipping appear, generously illustrated, and shipping notes, gathered here and there, are used. Though the publication caters to persons outside the firm it does not neglect the employees' interests. For them it has articles concerning old timers in the plant, baby pictures, affairs of the home are discussed, under the heading of "The Office Cat—Scratches and Purrs" there are news items and jokes concerning the workers, and "Yard Chips—Picked Up by the Old Scout," is another entertaining feature. Unusually good cartoons and jokes give sparkle to the pages. Mr. Barnes has solved the problem of a combination house organ successfully.

THE STALEY JOURNAL

Flinging modesty and reserve to the winds, I am going to ask you to let me talk for a little while about the publication I know most about, *The Staley Journal*. I can better describe its methods of "getting there" than those of any similar publication. I believe it is a successful representative publication, not through any effort of mine, for I am its fourth editor and am merely trying to keep up the standard established by my predecessors.

This publication was started in June, 1917, a four-page affair, and was edited by our safety director, not so much as a journalistic venture, as with the idea of preaching Safety First. However, from the first it contained a few pictures of employees and news items. During the war months it gave news of our boys at the front.

It was started when there were few precedents in internal house organs and none available with the exception of certain advertising house

organs. The *Journal* has grown from a four-page affair to forty-four pages and still it isn't large enough to accommodate all the news turned in each month. The management considers it its best medium for keeping happy, loyal employees and of advertising, indirectly, its products.

Our aim is to satisfy every taste among the workers. We usually have a lead article on some general topic concerning the plant or the employes, or some development in the city which directly concerns them. We have used several articles regarding the new city dam because it created a fine lake, on which the company's new clubhouse is located, and because a number of the employees own homes along the lake shore.

We have an article each month by our plant physician and we use safety suggestions, though they are not concentrated under any one particular heading. Our editorial page was inaugurated only a few months ago, but we feel it is an essential part of the magazine. Recently we started a page for the salesmen and branch offices, which is proving popular. Each month's issue contains some technical article on such subjects as "Candy-Making," "Chlorides in Warp Sizing," "Vitamines," with which our buyers are concerned. Plant talk, roasts and household pages take up a large part of the space and we usually sidetrack other things in order to get in as many names of the employees as possible—they love to see their names in print. Only recently I had the task of securing pictures of fifty of the men for use in one issue. It was like pulling teeth to get some of them to "pose," but finally it was accomplished and you've never seen a prouder bunch of fellows than they were when the *Journal* was out. We had to order an extra number of magazines that month. Since our second issue we have had a page feature, a message from "The Man in the Moon," containing helpful philosophy, quaintly expressed by a Scotchman who is our assistant general superintendent and daily feels the pulse of the big plant.

A GOOD BUSINESS GETTER

A remarkable thing about this publication is the fact that practically no advertising for our company is carried in it, but through its intimate tone and the subjects of general interest it carries it is widely read throughout the entire country and we have a large foreign mailing list. It is sent to nearly all bakers, starch and glucose users, wholesale grocers, etc. For a year or two we had sort of a blind mailing list—that is, we did not know whether or not the *Journal* was going to folks who were interested in it. We checked up on it with two sets of inquiries, during the last few months, and found that more than half the number responded, asking us to continue to send the *Journal*. Men thousands of miles away have become interested in the publication and without any effort on our part for that result it has been a good business getter. One firm wrote: "Any firm that does so much for its employees deserves our business," and they gave it to us.

The employees eagerly await each issue and nearly every worker feels interested enough in it to contribute items of news, jokes on his fellow-workers and pictures.

The difficulty is not in getting news, but of having the space in which to place it. The *Journal's* policy in its jokes is to laugh *with* each other, not *at* one another, and it is not often that the workers try to "put one over" on the editor in this matter.

Our publication is 6 by 9 inches and is printed on coated paper. Duofold enamel cover stock is used. We find that the readers appreciate the good quality of paper used and it is a satisfaction to have the cuts show up so nicely. We are using two colors in our cover designs at present, but we have used three, four and five colors. The type used is eight point, with six point cut lines.

The Staley Company is entirely "sold" on its house organ idea. That is what every editor wants to do—make his publication successful—sell it to the employee and to the boss.

EACH EDITOR HAS PARTICULAR "HUNCH"

We find in this study of eight representative plant publications that the different editors have various ways of "getting there," although I cannot see that they vary much in the classes of news used. Each editor has his own particular "hunch" as to how to put an idea across—and some methods, perhaps, are more effective than others—though it's hard to say. The editorial holds an important place in each of the publications I have described and it is one of the best mediums for getting constructive ideas before the readers.

Safety is another item stressed, practically every one of the eight publications using safety messages. Some editors prefer to have the safety news under a definite head while others scatter safety notes here and there throughout the magazine. I noticed with interest that with the exception of one or two the publications used a woman's page.

Each editor seems thoroughly convinced of the value of cartoons and photographs, though they have different ideas on the grouping of them. Page layouts of both are used in most of the publications, saving space and cutting down on engraving expense. Each publication has some jokes, poems and fillers. They vary somewhat in size and cover designs, this being due no doubt to the widely separated types of business represented.

Although they differ in some points, all of them seem to accomplish the same result—that of reaching the persons they are planning to interest. And if the editor is giving them something beneficial and something for them to laugh over, thereby creating such a demand for the publication that there is a general clamor for next month's issue, then it seems to me he has a reasonably successful publication. I believe all these I have described have those essentials.

DISCUSSION

MR. B. R. DONALDSON (*Ford News*, Ford Motor Company): We have had a great deal of difficulty with personals. We find ourselves forced to adopt a newspaper-type of magazine, and we try to make it just what the name implies—a Ford newspaper. We reach 110,000 employees, and if we endeavored to run personals—our birth list, for instance—it would look like a monthly telephone directory. At first we tried running cards

of thanks, but we found it took a whole page to run just the cards that came in from various departments. You will agree that we have problems and that they cannot be solved by fundamentals laid down by any one editor.

The articles that get across—perhaps my viewpoint is biased because we put out a newspaper—are those giving the news. A story headed "Safety Article" will go unread by a great many employees, but if you disguise it you are quite apt to get it across. In a coming issue we will tell how 48,000 men at the Highland Park plant worked one year without a fatality—that is the basis for a good safety item disguised by a news heading. We will sandwich in other safety items.

METHODS FOR SUCCESSFUL DISTRIBUTION

MR. THOMAS: I would like to hear ideas on distribution. I am editor of a little four-page paper called *Factory Feathers*, it appears twice a month, and I want to secure a wider distribution.

MR. BRODY: The best way to get distribution is to send the paper by mail, but that runs into money and a great many concerns do not like to spend that much money to get the paper before the public. We send our paper to the departments and the clerks distribute the copies when the men get their checks, sending back the unused papers to give us a check on the interest shown. The paper comes twice a month and most of our employees appear to be interested. Copies are also placed in a box at the factory entrance and some men get their papers there. The publication is not forced on anyone. When you see your employees going out of the plant with the paper in their pockets you can be pretty sure it is going across.

MR. KRUSE (Douglas Paper Company): There is one thought that we have lost sight of: It is to the interest of the New York Central to see that its paper gets proper distribution, as it carries advertisements and circulation is the basis of advertising. I am the managing editor of a small paper that goes to seven or eight hundred of our employees. No advertising goes in it and consequently the matter of expense is very important. *The New York Central Lines* can hardly be judged with a paper such as that edited by Mr. Augustus. At this Congress four persons have told me that, in their judgment, the *Mead Corporation* is the finest plant publication they have seen. That is a bullet I would be glad to send to its target because I think it deserves it, yet we have to remember that plant publications fall into two classifications—a magazine such as the *New York Central* gets out is almost professional, as it advertises medicine and watches and everything else and the matter of the expense of distribution is not so important as it is to me, because I can't send mine through the mail because it costs too much money. You gentlemen probably have the same proposition.

ADVERTISING MATTER CROWDS NEWS FEATURES

MISS COYLE: Our magazine used a few ads when I first went there, but they don't now because the money we got from them did not amount to enough and they crowded out the news we desired to print. We distribute our paper by messengers in the plant and if extra copies are

desired they can be had at my office. We secured our lists from the foremen and reach about 800 employees. Formerly we distributed the *Journal* at the gate but too many were wasted, the superintendent thought, so we adopted the present method. Many of our men are young fellows and change addresses too often for us to use a mailing list successfully.

MR. AUGUSTUS: The best method is to mail the magazines, even though it costs postage; I think you save money in the end. We figured it out, from a financial standpoint. We used to tie them up in bundles and give them to the foremen to distribute to the men. A great number of the men would take the magazine—we have workmen coming in on three tricks and we gave the papers out on pay day—when they went on duty. They would go to their machines and maybe they would go to work and maybe they would sit down and read the magazine; maybe after they got to work and the machine was running in good shape they would sit down and read the magazine. We figured it up that every minute lost on one of our big paper machines amounted to \$5.00 without counting the time of the men thus being wasted. From a financial standpoint we think it is cheaper, even though we pay postage, to mail the paper to the man's home. Besides, unless you have a magazine that just fits into a man's pocket, if you give it to him at the plant, he doubles it up and when he gets home it is creased and wrinkled and does not look as nice as if it came in an envelope. You also want to put the message across to his family and through this means influence him to do better work and co-operate more closely with the management of the company. We send out 935 magazines a month and the postage, addressographing, envelopes and all only costs about \$25 a month.

SOMETIMES ECONOMICAL TO USE MAILS

MR. BUENO: I am onto the curves of the printer. When looking for estimates I want a page price with the stock additional. I pay \$3.75 for a 5 by 7½ page. I print about 3,000 copies and it costs us between \$375.00 and \$435.00 a month. Here is a little thought for editors: It is not so much the ink you put on the paper as the paper you put the ink on. Good ink will look rotten when used on poor paper and that is why it is always well to use good stock.

Where you have 900 or so copies you can mail them out and it does not mean very much, but when you get out 3,000 copies and the postage costs 4 cents a copy and the envelope costs about a cent and your addressograph plates and addressing and so on costs about another cent, making 6 cents per copy, \$180 a month, or \$2,160 a year, it amounts to something. When an executive looks at a postage bill of \$2,160 the editor is asked: "Are you crazy?" You can use \$2,160 very advantageously for special articles, illustrations or one thing and another, possibly a fancy cover.

We distribute our paper this way: To some far out plants, like the one at San Francisco—by the way, we have plants scattered all over the country—it is cheaper to mail the paper individually, because parcel post or express charges would be very heavy, prohibitive, in fact.

Our circulation is about 80 per cent of the people we have. In other words, about 20 per cent do not give a whoop and would not care whether

they got it or not. Our plant manager tells me he has watched carefully what happens when the magazine is handed out—he has never seen one thrown away or left lying around a plant; he has seen the men take them home. I have found if your magazine is of sufficient interest the men will take it home and if they take it home the families cry for it and raise Cain if they don't get it. I have gotten that from the men themselves.

MISS COYLE: Our magazines are not given out until about 5 o'clock and the foremen are not permitted to distribute them until the men are going home in the evening. They do not lose time.

(The editors elected Mr. Ernest Augustus and Miss Edna E. Coyle as the 1923 Program Committee.)

The Section then adjourned.

Public Safety Section

August 30 and 31, 1922

DAVID VAN SCHAAK, Chairman

Vice-President in Charge of Public Safety, National Safety Council; Aetna Life Insurance Company, Hartford, Conn.

C. W. PRICE, Vice-Chairman

Price-Rasmussen Corporation, Chicago, Ill.

LOUIS G. DeARMAND, Vice-Chairman

Commissioner of Public Safety, Davenport, Iowa.

CARL L. SMITH, Secretary

Manager, St. Louis Safety Council, St. Louis, Mo.

FRED M. ROSSELAND, Acting Secretary

WEDNESDAY AFTERNOON SESSION

CHAIRMAN VAN SCHAAK: The past year has been one of real accomplishment for the Public Safety Section, although the opportunities for work of value in the public safety field are so numerous and of such wide variety that even the considerable amount that has been done seems but too little when measured against the entire task which has lain before us.

I am not going to take up your time with a lengthy description of the activities of the Section during the year, but I do want to refer briefly, in general terms, to what has been done by the Public Safety Division at the Council's headquarters and through other means.

The plan of an extensive service for local Councils has been developed by the Public Safety Division during the year, and a substantial beginning made toward the rendering of this service. Charts have been prepared on "Organization", "Activities" and "Financing" of local Councils, a monthly news-letter with valuable enclosures has been sent to all locals, a monograph on "Safe Drivers' Clubs" has been prepared and distributed, aid has been given in the organization of several new local Councils, correspondence has been carried on with all locals, a number of them have been visited, and many inquiries for advice and information in conducting public safety work, and upon the organization and management of locals.

have been carefully followed up. Copies of our public safety material have been furnished widely to State and municipal authorities and every school superintendent in cities of 20,000 or more population in the country has received a copy of the pamphlet containing Dr. Payne's address at the Boston Congress on "Safety Education in the Schools." The reports of the Section's Statistics Committee and Elevator Hazards Committee, presented at the Boston Congress, have been printed and distributed.

COURSE IN SAFETY FOR ELEVATOR OPERATORS

The Elevator Hazards Committee during the past year has followed up its comprehensive report on elevator hazards, submitted at the 1921 meeting of this Section, by preparing a "Course in Safety for Elevator Operators," consisting of six lessons, to be used in schools conducted by locals for men engaged in handling elevators, with particular reference to the operator.

The first lesson covers the qualifications of a good operator and describes the several types of hydraulic, electric and belt driven elevators; the second takes up controlling devices and automatic limit stops; the third, cable devices and emergency switches; the fourth, car safety devices and emergency exits; the fifth, landing doors and landings; the sixth, car doors and gates and emergency car brakes. Each lesson is supplemented by a comprehensive set of questions on the lesson, to be used in examining those who have taken the course.

The elevator is the greatest of common carriers and the safety of the public using it is so largely dependent upon the elevator operator that the course developed by this committee is a real contribution to public safety. While it is primarily designed for use in schools conducted by local Councils, I am sure you will agree with me that it should be given as wide distribution as possible so that it may reach the maximum number of elevator operators.

One of the most important features of the year's work in public safety has been the holding of two conferences of the Public Safety Section's officers and committee officers with local Council secretaries. These have made possible a general exchange of information and views and they have helped materially to inspire and co-ordinate public safety activities in all cities where the Council has locals.

The Section has also done several important things in the line of preparatory work. One is the simplification and revision of its public accident report forms, upon which work was begun several years ago. Another is a careful survey of the public accident hazard field and preparation of a list of general specifications for thirty-two public safety bulletins designed to fill the long felt need for such publicity. A third is the gathering of very valuable statistical information on automobile accident fatalities. A fourth, and one of great importance, is the plan which the Traffic Hazards Committee has in mind to secure the co-operation of State administrators of motor vehicle laws in promoting State-wide control of traffic accidents, in addition to the more concentrated influence upon traffic which may be furthered by the activities of local Councils in

communities of sufficient size to put such Councils upon a permanent basis.

PUBLIC SAFETY DIVISION TO HAVE BROADER SCOPE

While I think we may look back with reasonable satisfaction upon the work done by the Public Safety Division at headquarters during the year, in which work that division has had the active co-operation of the Public Safety Section, it is to be hoped that the Council may soon see its way clear to enabling that division to function more broadly, besides acting as a clearing-house for public safety information and promotion. There is urgent need of a number of things in the way of direct service to local Councils and therefore to the public safety movement. The financial operations of local Safety Councils should be carefully studied and a monograph prepared giving the best methods.

A booklet should be developed and printed, telling in detail how to organize a local Council without a salaried secretary-manager, and a similar booklet telling how to organize a local Safety Council with a paid secretary-manager. Each of these booklets should show just what work a local Council should do to be assured of success, and should include sample letters, programs and similar matter. The charts on financing, organization and public safety activities of local Councils, developed from the questionnaires sent to salaried secretary-managers, should be carefully revised, and monographs should be prepared on chauffeurs' schools and other local Council activities in public safety which have proved to be of benefit when properly conducted. The incorporation of safety education in the regular curricula of public and parochial schools and the acquainting of teachers with the advantages of this phase of school work should be furthered in a more systematic way and on a wider scale than has heretofore been possible.

The doing of these things and the necessary extension of the Council's public safety work in other, and equally, if not more important, ways depends, as do most things in this world which should be done, upon finances. The crying need of the Public Safety Section and of the Council's Public Safety Division is the development of some form of public safety membership which will produce regularly a revenue sufficient to enable the Council to maintain its proper place in the public safety field. Only a small portion of the Council's general revenue can be devoted to public safety work, for the Council financially is an industrial safety organization, and it would not be right to spend upon public safety work any considerable amount of the dues paid by industrial safety members. There are various possibilities in the way of public safety memberships and it is to be hoped that some definite plan may soon be worked out which can assure to the Council a reasonable amount of revenue for public safety purposes.

FINANCING PUBLIC SAFETY WORK

Pending development of a public safety membership plan, it is encouraging, however, to know that the Public Safety Section will probably be able soon to begin financing some of its more important work. This early development will be made possible by the co-operation of the National

Bureau of Casualty and Surety Underwriters, which recently voted to enter upon an automobile accident-prevention campaign and appropriated a substantial sum, \$60,000, to carry on the work. It is both a compliment and a well-deserved recognition of the Council's public safety efforts that the Executive Committee of the Bureau recommended to the trustees of this fund that approximately half of it be expended through the National Safety Council. The trustees have not yet decided upon the amount to be expended through the Council, nor has there been any joint conference to determine in what specific ways the money shall be spent. Action both by the trustees and by a joint conference may be expected, however, within the next few weeks, and the result should be a decided impetus to the public safety work of the Council during the coming year.

Aside from this possibility of support for its work, one of the most important outside developments of the year has been the beginning of work under the auspices of the American Engineering Standards Committee upon a code for traffic safety, in the sponsorship of which the National Safety Council is associated with the Bureau of Standards and the American Association of State Highway Officials. Steps are now being taken to organize the sectional committee which, under the rule of the American Engineering Standards Committee, will develop this code. The conference which was held to pass upon the desirability of such a code recommended that the scope of the work should include the following:

1. The use of colored lights on all highway vehicles.
2. Their use on all signals along highways and at curbs, both permanent and temporary.
3. Their use for highway crossing signals for steam and electric railways.
4. A co-ordinated relation of color, form, position and number of signals.
5. A co-ordinated relation to systems of flashing, moving or other similar lights.
6. Colors for non-luminous as distinguished from luminous signals.
7. Recommendations on the use of colors for emergency exit signals.
8. Methods of specifying or defining colors for signal purposes.
9. Any other closely related matters which, in the opinion of the sectional committee, form a part of the subject to be considered.

MANY PROMINENT MEN INTERESTED IN CAMPAIGN

The conference also passed a resolution declaring that it was its sense that in carrying out its recommendations any sectional committee which took up the standardization of colors for signals should endeavor to co-ordinate such standardization with existing standards for traffic purposes, such as used in water and aerial navigation and on steam and electric railways. The development of this code cannot fail to be of great influence in promoting traffic safety.

Another outside development of importance in the public safety field is the beginning of a public safety movement in New York City under the auspices of the Safety Institute of America, with Judge Elbert H.

Gary as chairman of the Institute's Public Safety Committee. I have termed this an outside development because this public safety activity is not carried on directly under the auspices of the National Safety Council, but it will nevertheless command the sympathy and co-operation of many men who are active in the National Safety Council, and of the Council itself so far as it may be possible to render assistance. It is also of particular interest to this Section because of the fact that our Vice Chairman during the past year, Mr. C. W. Price, who for so many years was prominent in the Council's work, is associated with the conduct of the campaign in New York, as is also Mr. W. R. Rasmussen, who became so favorably known to members of the National Safety Council through his work as Secretary of the Pittsburgh Local Council and subsequently as Field Secretary for the national body.

I am afraid I have already intruded too much upon the time set aside for this meeting, so, while there are many interesting matters upon which I might touch, I will close by saying that the need for the stimulation and co-ordination of organized public safety work throughout the country is becoming more and more evident and that the opportunities are really unlimited, except for such restrictions as may be due to lack of necessary funds. While the Council began as an industrial safety organization it has gradually and naturally come to be looked upon as the national center for public safety work also, and with sufficient financial support obtainable, whether through some membership plan or from other sources, I think it no exaggeration to predict that before many years the Council's public safety activities will be on a par with its industrial ones if, indeed, they are not even more notable.

I will ask Mr. Smith to briefly summarize his report as Secretary.

REPORT OF SECRETARY

MR. SMITH: I have no definite report to make but Mr. Rosseland, Chief of the Public Safety Section, has prepared facts and figures and I would like to give way to him.

FRED M. ROSSELAND (Chief of the Public Safety Section, National Safety Council): We have heard our Chairman's report and also his report to the entire membership at the Monday meeting and, at the same meeting, the report of Mr. Charles B. Scott, Vice-President in charge of Local Councils, so that an analysis by me of the tendencies in public safety work, or a discourse on the broad aspects of the work, will be superfluous, but I think you will be interested in some of the details of the work of the Section as conducted by the division in the headquarter's staff.

I think we all agree that the organization and development of local Safety Councils is an important part of public safety work and for that reason much of my report will be given over to the details of such work. Also, that the work of the Education Section is bound up in the public safety movement.

Very soon after the Boston Congress, a conference was held in St. Louis by Vice-Presidents Van Schaack and Scott with the officers of the Education Section, General Manager Cameron and myself, at which a

carefully prepared report of the Education Section, presenting a review of the work that had been done and plans for the future were considered; as a result of that session definite steps to expedite the work of the Section were taken. The next significant development was the holding of the first quarterly conference of the officers and committee officers of the Public Safety Section with local Council secretary-managers. This was a two-day session in Chicago and proved to be decidedly valuable. The second of the quarterly conferences of the Section and committee officers with local Council secretaries was held in Detroit, also a two-day session. At these meetings not only were the broad, general policies of the movement discussed and developed, but some of the more intimate details of the actual conduct of the work agreed upon. The conferences were probably even more valuable to the secretaries, for they are the ones who are actually giving all of their time to the work.

A study has been made of safe drivers' clubs, their experiences analyzed and the result presented in a special report.

Carefully prepared questionnaires were sent to all local Council secretaries and the replies analyzed and tabulated in four charts on organization, financing, public safety and industrial safety activities.

A copy of the report of the Elevator Hazards Committee, presented to the Tenth Annual Safety Congress, was mailed to all insurance company and insurance agency members, also to the mayors of all cities of 50,000 population or more. The report of the Statistics Committee of this Section, presented to the Congress in Boston last year, was also mailed to insurance company and agency members, as well as to all police chiefs in cities of 50,000 or more population. The pamphlet containing Dr. Payne's address on school safety instruction, presented to the Boston Congress, was sent to local Council secretaries and to school superintendents in cities of 20,000 or more population.

MANY ACTIVITIES AND THEIR RESULTS

Seventy-five new stereopticon slides have been added to our library and some new public safety motion picture films to our list of motion pictures.

Much publicity on public safety has been sent to the various magazines and newspapers. Timely warnings to guard against accidents which may result in drowning, Fourth of July burns and explosions and similar seasonal precautions have been sent out and widely copied.

Members of the headquarter's staff have made a number of visits to Councils to advise with them on local problems, usually in connection with public safety work or its financing.

All local Councils are co-operating in the National Grade Crossing Accident Prevention Campaign.

Since we last met together there has been a distinct improvement in the local Council situation generally and the Councils are on a firmer basis than ever before. Two local Councils suspended operation during the year and in both instances resulted in an increase in accidents in the communities, thus proving clearly that the Council work was an important factor in the control of public accidents. In one case—that of the Syracuse

Safety Council—it is interesting to learn that the influence of the Council evidently lasted several months after it suspended operation, for automobile accidents decreased the first two or three months, then began to rise, compared with the corresponding period last year.

It is gratifying to report that three local Councils have revived. In one instance (Buffalo Safety Council) this was unquestionably the result of successful work done in the past, progress of which was noted by influential business men. Buffalo Safety Council has been reorganized as a Safety Bureau of the Buffalo Chamber of Commerce and its former secretary engaged as manager. The refinancing of Kansas City Safety Council is also noteworthy.

More and more local Councils are devoting their attention to public safety work, and in the better financed ones experts are engaged to work in the industrial safety field also.

As is to be expected, the more successfully community safety is conducted by the local Councils with salaried secretary-managers, the latter can, practically without exception, report a reduction in the total number of accidents in the communities they serve, although in some instances a reduction has not been obtained in the number of automobile accidents.

Reports of local Councils show increased financial support, increased numbers of committee and general meetings, increases in staffs, increases in the number of persons reached directly by the work, increases in safety literature posted or distributed, and increases in local interest in the work of Safety Councils. Over \$200,000 was expended during the past year in maintaining local Councils with salaried managers—all locally financed! There was an appreciable increase over the previous year.

IMPORTANT PROGRAM FOR COMING YEAR

Incomplete reports for the year ending July 31, 1922, give new evidence that our plan is fundamentally right. From our experience, I would suggest the following as an important part of the program for the Public Safety Section during the coming year:

1. The development and distribution of additional public safety material, including safety posters.
2. The development and operation of an accurate public-accident reporting area, comparable to the registration area organized by the Federal government.
3. Active co-operation with the Education Section in the promotion of the teaching of safety—preferably according to the Council's plan—in every school in every city, village and township in the country.
4. An intensive study of data provided from the public-accident reporting area, to the end that scientific analysis may be made and an appropriate remedy developed.
5. The organization of as many local Safety Councils as possible—whether operated by voluntary workers or with a salaried staff, but giving preference to the latter wherever it is possible to finance it.
6. The development of a standardized program of activities for local Councils.

7. A general opposition to "no-accident weeks" unless conducted by a local Council or used as an introduction for Councils. It is clearly developed that the money and time expended in a "no-accident week" which is not to be followed by a local, is practically wasted and that the same amount of money spent on local Council work will carry the organization six or eight months, during which time definite programs of activity of even greater value than the "no-accident week" might be conducted.

We have every reason to be optimistic and encouraged to redouble our efforts to promote public safety. The general public is interested as never before. Business conditions have improved and, to quote a local Council secretary, "There is no such thing as not being able to get the money to finance local work—the money can be had! It is there and will be forthcoming." At the same time let us be conservative in our optimism and avoid the loss of time, money and lives which may result when a community safety organization is launched without wise, intelligent planning, based on the experience of the National Safety Council, and without a complete program covering all phases of organization work. Let us not be deceived by publicity which has nothing back of it and, furthermore, let us not be ambitious in undertaking too large a job for the amount of money we have raised. Experience shows that the tendency of local Councils is not to enlarge the territory they serve but, rather, to lessen it slightly, so that even more intensive work may be given. If we scatter too much we will surely fail. Let us concentrate and plan wisely, for whether we insist on it or not the public demands results if continued support is to be secured.

APPOINTMENT OF NOMINATING COMMITTEE

CHAIRMAN VAN SCHAAK: That we may have officers for the coming year. I will now appoint, as the Nominating Committee, Messrs. C. Howard Stewart, Louis G. DeArmand and Mr. A. H. Lintz.

I have the privilege of introducing to you Mr. G. A. Walters.

PREVENTING AUTOMOBILE ACCIDENTS BY REGULATION AND EDUCATION

G. A. WALTERS, DEPUTY COMMISSIONER OF POLICE, DETROIT, MICH.

I am going to talk upon the subject of accident prevention by traffic regulation and education. As a member of the police organization of the City of Detroit I know that is of tremendous value in helping the official functioning of any one of the police organizations; it is just the sort of thing that we have done and are doing in connection with any safety work and it is so highly essential that we have educational methods, methods of getting information to the public, so that we will be sustained by public sentiment. That is highly important in connection with the work of any police organization.

More consideration and thoughtfulness on the part of motorists would result in saving thousands of lives annually in America. Courtesy can be developed only by constructive methods—especially in large cities it is necessary that all useful organizations join with public officials in advocating greater courtesy in street travel.

ASSISTANCE OF CONSTRUCTIVE AGENCIES

In the city of Detroit we have 150,000 automobiles almost daily using its 1,500 miles of streets with over 10,000 intersections, and it is necessary to supplement the official functioning of the police and the courts with educational methods. We have only about 100 traffic officers, showing how impossible it is to physically control—to effectively regulate—traffic. Therefore, we must have the assistance of constructive agencies and that includes the Detroit Automobile Club, the Federation of Women's Clubs, the Detroit Safety Council and upward of 100 other organizations. It is through the help of these various groups that Detroit has been successful in its public safety work. The Board of Education has a splendid program that they are carrying out in the schools, and the other agencies I have mentioned are doing all in their power to prevent accidents.

We have found it necessary, in addition to the work of traffic officers, to have an examination of motor vehicle drivers before approving a license; we had considerable difficulty getting a law enacted, but it has worked out very satisfactorily in Detroit and throughout Michigan.

A school of instruction is conducted incident to such examination. As many as 200 applicants have applied in a single day for licenses; they are instructed by traffic officers and taught what the laws and regulations are. The first question on the list is whether or not they have read the traffic ordinances and laws of the State of Michigan.

In addition to having an examination of all owner drivers there is now an annual examination of all chauffeurs operating in the city of Detroit; that is provided for by the State law. Recommendations for revocation or suspension of a driver's licenses, after conviction for any one of fifteen regulations comprising reckless driving, also for driving while drunk, or leaving the scene of an accident without giving name and offering assistance—these are the principal things for which a license can be suspended for the maximum period of one year.

RECKLESS DRIVERS ARE RESTRAINED

The Accident Investigation Bureau is a Detroit innovation and it handles accidents in which any person is injured or killed just the same as a detective bureau handles the investigation of cases in which there has been a burglary or other crime committed. That is to say, as distinguished from former methods, where accidents were made the basis of a complaint in court, these accidents which the Accident Investigation Bureau investigates are not made the basis of a complaint in court unless they occur within the view of the traffic officer. We now investigate reports, whether an officer was a witness to it or not, to ascertain whether it was due to the carelessness of the operator of the vehicle, and, if we find that he was violating any one of the provisions of the traffic laws, that is taken as evidence of carelessness on his part. Thorough investigation is made of all traffic accidents and a charge of reckless driving is made if the facts warrant such a proceeding.

I wish thought would be given that particular proposition. Few of the delegates present realize the importance of having investigations

of that kind and bureaus established. If they are established you will find them of vital usefulness in restraining reckless drivers. Heretofore recklessness has been made the basis of civil cases, which become a matter of financial adjustment between the parties, as if it was a matter of private concern, when, as a matter of fact, public safety is really the paramount issue. A police organization can see to it that the public interest is looked after in that respect.

We are using a system of warning notices for minor violations, requiring the driver to appear at traffic headquarters in lieu of going to court. This is done rather than taking up the court's time, which should be given to more serious cases, especially if you have as many serious cases as we have in the city of Detroit.

The department has served 15,000 warning notices since the first of this year on persons who have violated minor sections of the traffic ordinances. This method has also saved the citizen the inconvenience of being taken to court when the violation was not, in a sense, a danger to life or property; that has been appreciated. Only twelve second-time violators have been discovered out of the 15,000 served with notices.

THE IMPOUNDING SYSTEM IS EFFECTIVE

Detroit has an impounding system, with graduating penalties for parking in a manner or place that adds a hazard. This system includes an alternative method of tagging cars—requiring payment of a fee—or a court appearance, if preferred. That is another proceeding used for the control of traffic without the necessity of bringing violators to court. For overtime parking a violator can go to traffic headquarters and pay a fee of \$1.00 for the first, \$3.00 for a second and \$5.00 for a third or subsequent violation. If the violators feel they are unfairly treated they have the option of having their cases tried in court.

The Detroit Police Department has an educational division, holding several meetings daily; it uses public halls, including schools equipped with auditoriums. Motion pictures, showing principal types of accidents, are used.

Large quantities of literature, warning of the dangers of the street, are distributed. Leaflets showing accident pictures involving children are freely distributed and a short talk is given to emphasize the pictured message.

As a matter of fact the city charter, adopted by Detroit a few years ago, makes it the duty of the police to utilize educational publicity to reduce accidents. The city charter includes the provision that it is to establish a public safety bureau in the police department, and defines as a duty of the police organization to endeavor, through educational publicity among the citizens, to reduce the number of street traffic accidents.

Commissioner Inches, and other officials of the department, has had the earnest co-operation of the Detroit Automobile Club, the Federation of Women's Clubs, the Detroit Safety Council, the Board of Education, the Board of Commerce and all city departments concerned, including public works, recreation, lighting, street railway, fire, the common council, and

the Hon. James Couzens, mayor, whose continuous safety activities are an inspiring example to everyone.

UNITED EFFORTS OF PUBLIC SPIRITED CITIZENS

The Hon. Charles Bartlett of the Traffic Court, whose jail sentences for speeders has placed him nationally in the public eye, is a powerful influence for safer streets. Other judges also administer adequate sentences in serious cases.

The Hon. Frank Cody, Superintendent of Schools, and his associates see to it that public and home safety is taught in the schools.

A text book by Miss Harriet E. Beard, supervisor of safety, is effectively used. The instructors in the Catholic and other parochial schools are earnestly teaching their children the rules of safety.

Detroit has a citizens police reserve, with Robert K. Davis, special deputy commissioner, in charge, and several hundred citizens, using their automobiles, actively work with the police, dealing with traffic-law violators as well as other matters.

The Detroit Safety Council, Captain Jack Robbins in charge, as a part of the Detroit Board of Commerce, is doing a splendid work both with the industrial plants and in public safety; the school for chauffeurs last winter was a real achievement.

Safety engineers in Detroit plants are earnestly working for public as well as industrial safety and the same applies to steam railway employees and to the Department of Street Railways in the city of Detroit.

Representatives of these groups meet every Friday noon at the Detroit Athletic Club. New ideas and improvements are constantly advanced and carried out, whenever feasible, consistent with available public funds.

Police organizations should interest and set an example for the other constructive groups in a community—in that way a large helpful organization is developed.

In this city the Automobile Club is an outstanding organization; many of the city's foremost citizens are members and they have the public interest at heart—this is clearly shown by the manner in which they co-operate with the police department, courts and traffic prosecutor. The club helped this department to secure up-to-date laws and ordinances and in innumerable ways is performing valuable public service. In joining the club each of its 15,000 members signed an agreement to obey the traffic laws and ordinances. The club also assists the police in prosecuting automobile thieves, and through its efforts Michigan has now a good certificate-of-title law which is reducing auto thefts.

At least once a-year we have an intensified campaign for accident prevention and all the rest of the year safety work is carried on.

The picture theatres are utilized to show movies, produced by the Ford Motor Company and the Metropolitan Motion Picture Company, with Maurice Caplan working with the police department.

LAW ENFORCEMENT THROUGH EDUCATIONAL METHODS

We find it is absolutely necessary to have an energized public sentiment in favor of law enforcement and this can be accomplished only

by the use of educational methods, with the assistance of the press to give favorable publicity to constructive activities.

It will be noted, in our plan for public safety work, that a specific task has been assigned to each organization—fraternal, social or religious—in the city. We go to their meetings with motion pictures, speakers and music, keeping the people interested in the conservation of human life. We have found a welcome at all kinds of meetings and always have an interested audience. Our subject, "The Conservation of Human Life," is well received at all sorts of gatherings.

Our citizens' complaint cards are available in every drug store—a box is placed there for this purpose. A good many people use the cards for private purposes, but we have so arranged the text there is little space for the writing of personal memoranda; the cards are really serving a useful purpose, and we receive an average of about 20 a day.

Any citizen who has had to jump for his life on account of a reckless motor driver is willing to step into a drug store and mail a complaint card. This is followed up by a letter, if it is not a serious matter; if it is a serious matter an officer goes out to see the party, or we send for the man to come in. Very practical results are obtained, upon a larger scale than we could have if we relied on our own officers.

Every effort should be made to make the people feel that safer streets is their own problem, and while traffic laws may occasionally inconvenience the individual they are in the interest of all. Traffic regulations are not a set of rules devised by some police officer for the purpose of harassing the public, they are the will of the people—their own laws—and should be sustained for the good of the entire community.

DISCUSSION

CHAIRMAN VAN SCHAAK: I am sure I voice the sentiments of all present, Commissioner Walters, when I extend thanks for your interesting address.

MR. BRADLEY (Milwaukee Police Department): I would like information as to why traffic going north and south, coming east and west, makes the right turn and gets into the traffic stream?

MR. WALTERS: We have debated the advisability of discontinuing making right-hand turns to join travel but we find that drivers make these turns with sufficient precautions and accidents have not occurred. Many of our streets are narrow and without continuous movement of travel we would have serious congestion.

MR. BRADLEY: Are people loath to appear and make complaint?

MR. WALTERS: Our method is not to have them appear as complaining witnesses. Our officers investigate violations, analyze the cases and if it is a serious proposition citizens are generally willing to appear. Our method is an educational one and citizens are not often required to go to court.

MR. KING: How do you check the five-minute parking rule?

MR. WALTERS: Our thought is to make the space for cars in front of business places available for as many customers as is possible, and so long as the person is engaged in shopping we do not limit them strictly to

the five-minute period; the officer uses his best judgment. Our rule is limited to the hours that travel is very congested.

MR. KING: That would make it from 8 to 4:30.

MR. WALTERS: Yes. The parking problem is not a police proposition until the streets become congested—it is really a problem of the business interests. The question of whether one vehicle or ten should occupy a space for ten hours is a matter that does not concern the police department, but seems to have been wished on the organization.

CHAIRMAN VAN SCHAAK: We are fortunate in having as the next speaker one of the distinguished statisticians of the country. He has given very careful consideration to the development of accident report forms. It is my privilege to introduce to you Dr. Louis I. Dublin.

TREND OF PUBLIC ACCIDENTS IN THE UNITED STATES

**REPORT OF THE COMMITTEE ON PUBLIC ACCIDENT STATISTICS,
LOUIS I. DUBLIN, CHAIRMAN**

The frequency of accidents continues to be one of the outstanding problems of the country whether we approach it from the point of view of public health, public safety or even of public morals. The fact that 76,000 lives were snuffed out by so-called "accidents" in continental United States during 1920 is a challenge to every intelligent citizen who has any pride at all in the place which his country assumes among the advanced civilizations of the world. A due regard for the sanctity of life, the length as well as the breadth of life, is one of the distinguishing marks of real achievement in the ordering of human affairs. Does any one of us fully appreciate what it means to have, in this country, nearly 37,000 accidental deaths in excess of what we would have if the accident experience of England and Wales were to prevail here?

Is it anything to be proud of that our country stands first in the number of citizens which it permits to be killed by reason of burns, railway accidents, automobile accidents and falls? These accident figures for the United States are an indictment in cold numbers of our national conscience! Let us not boast of our national achievements in finance, manufacture, agriculture, civic progress, until we have cut down materially the measure of our indifference to the loss of life from suppressible hazards! The accident record of the United States should be emphasized and re-emphasized until every available facility is geared to the accident prevention movement.

Your Committee on Public Accident Statistics has considered that its first and most important function is to outline ways and means of collecting the information which will bring home to the American population the plain facts regarding the prevalence of this important group of accidents. The American people should know how many accidents happen, and where and under what conditions they occur. The committee, accordingly, has prepared a series of forms for use in reporting public accidents uniformly all over the country. In its work during the past year the committee had but to bring to completion the work of its late Chairman, Dr. Frederick S. Crum. The forms which he planned have

been carefully revised in the direction of brevity and simplification of treatment by local agencies and in the office of the National Safety Council. They are ready for general use by police and safety departments of American cities. It is now necessary for the Council to grant approval for the printing and distribution of the forms.

FORMS ARE NOW AVAILABLE

The Council should also work effectively to secure adoption of the forms by the police authorities of American states and cities. Your Committee recommends that the forms be supplied to local officials at cost and that an arrangement be made in the office of the National Safety Council, Public Safety Section, for the periodic receipt of the completed documents from local authorities and for such tabulation and publication of combined and comparative results as may seem useful in initiating and guiding practicable local effort in the prevention of public accidents. The ends to be served by this reporting system are such that the widest possible distribution of the forms should be made as soon as possible and the preparation and publication of reports begun.

Five forms have been drafted and approved by this committee. Each form is in two parts: The first, a preliminary, condensed form for the use of the police or safety officer reporting the accident; the second, a somewhat more detailed schedule for the use of court and headquarters clerks in abstracting the more complete statements obtained in court proceedings up to the disposition of the case. The latter form is to be used in preparing statistics for local purposes, a carbon copy being sent to the National Safety Council for use in publishing comparative statistics for the cities included in the Council's Registration Area for Public Accidents.

The forms cover the following types of accidents: (1) Highway vehicular accidents, (2) highway non-vehicular accidents, (3) general accidents, (4) buildings and structures accidents, (5) elevator accidents. Each form requires the statement of: General description of the accident, cause (fault of operator, mechanism, street conditions, etc.), time of occurrence, weather conditions, persons injured and severity of injury, disposition, property damage and court proceedings in the case. The proposed forms are shown in another section of this report.

The committee proposes to issue at a later date certain suggestions to local officials for the tabulation of their statistics for local consumption.

THE ACCIDENT RECORD OF 1920

In accordance with its practice in past years, the committee offers certain statements from the latest available accident statistics. This data is included in this report because it would not be available elsewhere in such concise form to the members of the Council and to the press. Statistics of fatal accidents have just become available for the United States for the year 1920. On the basis of this information your committee conservatively estimates that there occurred close to 76,000 fatal accidents in the United States during 1920. This is an increase of about 400 over the estimated number of accidents for the year 1919. The accident death rate for 1920 was 71.4 per 100,000, as compared with 72.0 in 1919. Hazard conditions for the American population did not improve,

therefore, sufficiently to offset the increase in the number of the population exposed to the risk of fatal injury. The 1920 record, however, shows approximately 3,300 fewer fatal accidents than occurred in the year 1911. There has been some improvement, therefore, in the accident record of the decade. The slackening in the downward tendency of the accident toll in 1920, as compared with 1919, is the chief point of interest for this meeting at the present time. The reason for the failure of the United States to show any sharp downward movement of the fatal accident death rate in 1920 may be seen from a consideration of the facts for certain of the specific types of accident.

THE AUTOMOBILE ACCIDENT RECORD FOR 1920

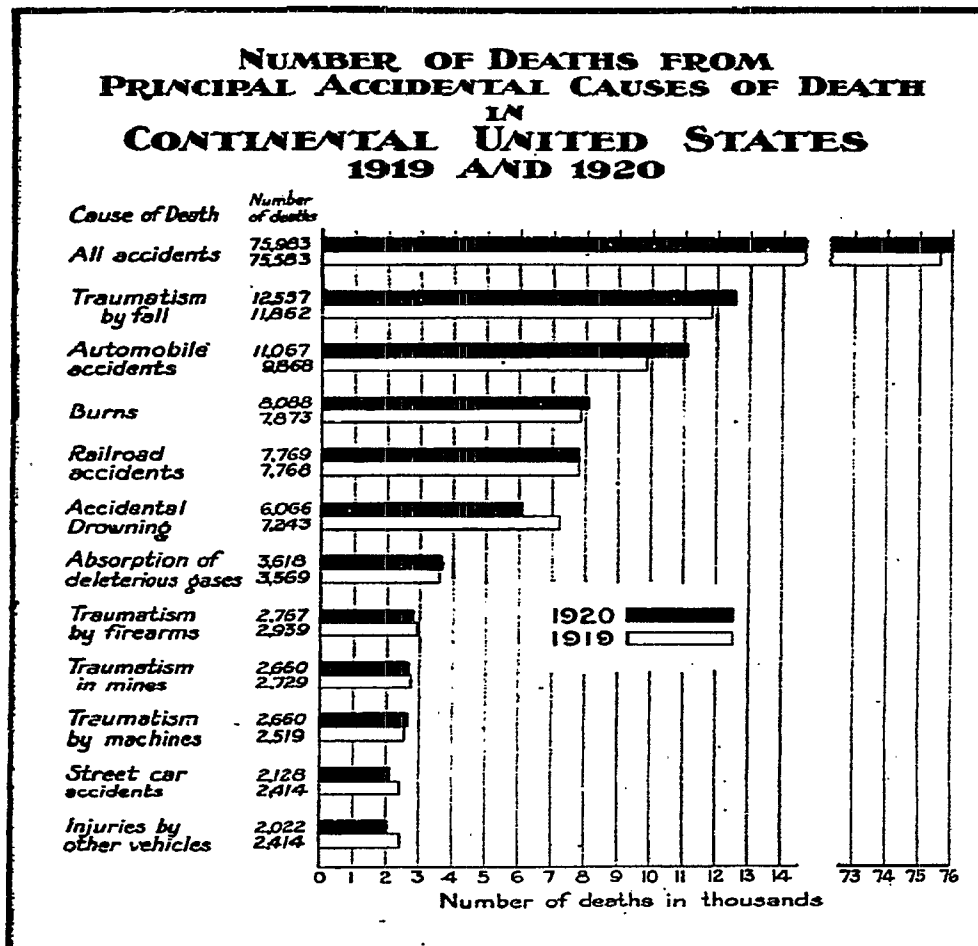
The automobile seems to be responsible for this unfavorable aspect of the 1920 record. In that year there were in continental United States 1,200 more deaths from automobile accidents and injuries than occurred during 1919, and more than 9,000 automobile accident fatalities in excess of the record of the year 1911! The vital importance of securing information on the conditions under which automobile accidents and injuries occur is shown by this simple statement from the accident record of the year. Some practicable means *must* be found for checking the enormous annual increment in the number of valuable lives destroyed by this menace to the safety of the public. Deaths from automobile accidents are now second in importance in point of life wastage only to accidental falls. In 1920 there was an average of 212 deaths per week, or 30 per day, from automobile accidents and injuries in the United States. It is only a question of a few years, under prevailing conditions, until automobile accidents and injuries will rank first in the list of causes of fatal accidents. (The traffic accident record of American cities for 1921 is shown in a later section of this report.)

FALLS, BURNS AND MACHINERY ACCIDENTS

There were about 700 more deaths from accidental falls in 1920 than in 1919, and about 200 more deaths from burns. The total number of fatalities from falls and from burns in the United States during 1920 was 12,557 and 8,088 respectively. Reckoned on a weekly basis, there were 240 deaths from falls and 155 deaths from burns. The daily record showed 34 deaths from falls and 22 from burns. Machinery accidents also showed an increase in the number of fatalities in 1920. The record for that year was 2,660 deaths, as compared with 2,519 deaths in 1919 and 1,967 in 1911. (The industrial accident factor in the total mortality experience is discussed in a later section of this report.) Surely, the accident prevention work allied with workmen's compensation insurance, plus the multiform activities in elevator, steam boiler and other machine inspection activity, should have ere this produced a marked drop in the number of deaths from this particular group of causes in the American population!

We should not be satisfied with slight declines in the death rates for any of these specific causes. What is of essential importance in our national economy is that there has been increased destruction of the lives of American citizens by reason of the risks to which they are exposed in

CHART I

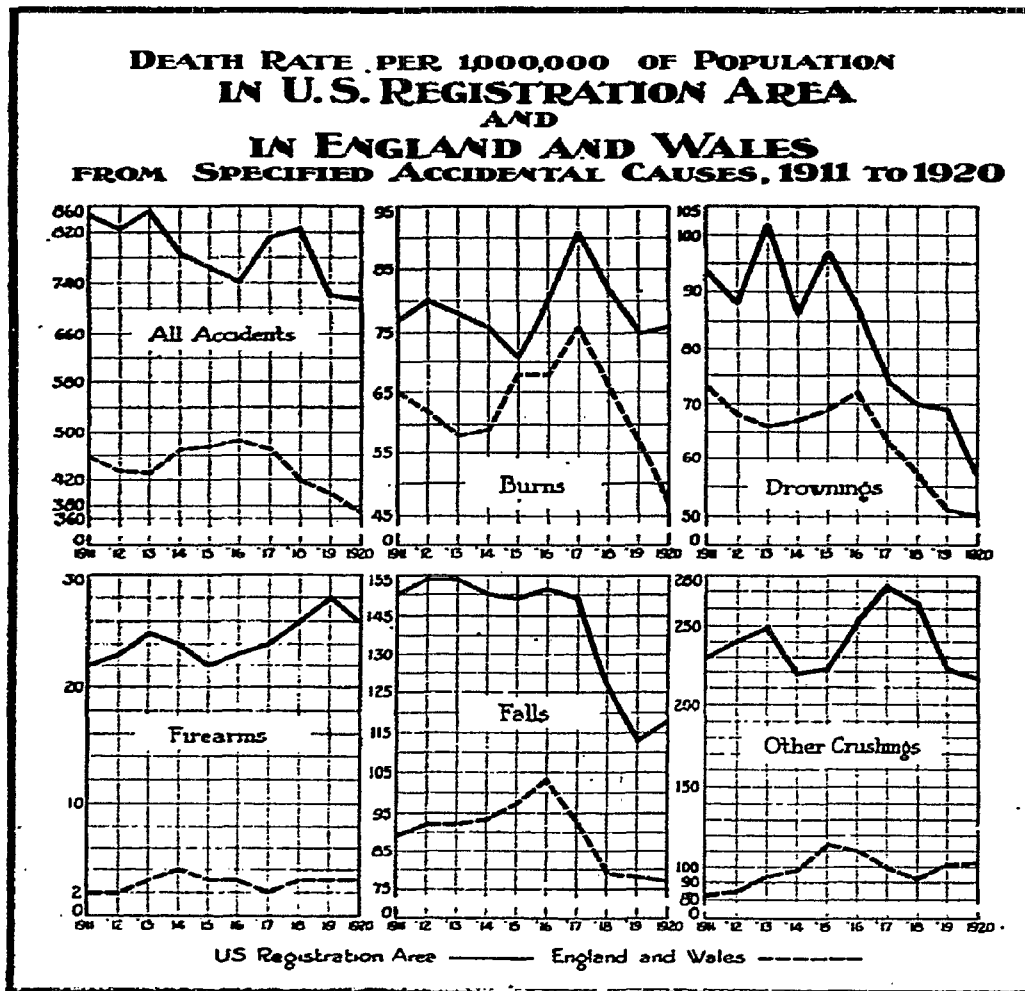


the use of public and domestic facilities and in the course of their employment in industry. The safety movement should keep pace not only with the growth of the United States in population but should so intensify its effort that the toll from fatalities will be materially diminished.

RAILROAD ACCIDENTS

The number of deaths from railroad accidents showed no decline in the United States during 1920. There were 7,769 such deaths in that year. Some progress has been made during the decade, however, because in 1911 there were recorded 12,178 deaths. The aim of the safety movement in the railway field should be to extend to a greater part of the

CHART II



American population those measures which produced such a fall in the total number of fatalities between 1911 and 1919. The lack of any substantial progress during the year 1920 should act as a stimulant for the development of safety work in this particular field.

(Some statistics on railroad accidents, compiled from Interstate Commerce Commission sources, are shown in Appendix, Table 10.)

OTHER VEHICULAR ACCIDENTS

There was a wholesome decline in the number of deaths due to street car accidents and injuries. In 1920 there were 2,128 deaths, as compared with 2,414 in 1919. Injuries by wagons, bicycles and motorcycles showed

a decrease of practically 400 during 1920. The total for the year was 2,022 fatalities from this cause. (Tables 1 and 2 in the Appendix give the fatal accident record of the years 1920, 1919 and 1911 on an aggregate, a weekly and a daily basis.)

INTERNATIONAL COMPARISONS

Comparison of the figures for accident fatalities in the United States with those prevailing in England and Wales will have a sobering influence upon those persons who think that we are living up to our opportunities and responsibilities for accident prevention. In proportion to population, the United States reports nearly twice as many accidental deaths as the population of England and Wales. The mortality from falls, transportation and vehicular accidents and burns is very heavily in excess of that prevailing in the older country. In Table 3 in the Appendix, and in Chart II, we show the comparative facts for accident mortality in the United States and in England and Wales for each of the years in the decade 1911-1920.

The first comparison should be made of the death rates from "other crushings" in the United States and in England and Wales. This title includes the transportation accidents.

DEATH RATE PER 1,000,000 OF POPULATION IN ENGLAND AND WALES AND IN UNITED STATES REGISTRATION AREA, 1920.

SPECIFIED TRANSPORTATION AND OTHER CRUSHING ACCIDENTS

Crushing Accidents	United States Registration Area, 1920	England and Wales, 1920
Total crushings	225	102
Railroad accidents	73	18
Automobile accidents	104	43
Street car accidents	20	5
Other vehicular accidents..	19	27
Aeroplane accidents	2	1
Other crushings not specified above	6	8

The railroad accident death rate of the United States is more than four times that for England and Wales! Automobile accidents in the United States show more than twice the death rate of England and Wales! Four times the number of fatal street car accidents and injuries! The public-accident hazard of the United States certainly deserves the most minute study, in order that these records of the two countries may be made to approach each other even in the remotest way. Let the local officials, to whom the Council has suggested the plan for uniform public accident reporting, view these **disparaging figures!** Every facility for securing the facts which will lead to **effective public safety work** should be put into operation immediately.

A glance at Table 3, in the Appendix, will also show another glaring fact which reflects no credit upon the American valuation of safety of the person. The death rate from the reckless "accidental" use of firearms is more than eight times as high in the United States as it is in England and Wales! Add to that comparison another fact: The homicide death-

rate in 1920 was 71 per 1,000,000 of population in the United States and only 8 per 1,000,000 in England and Wales. Nearly nine times as many murders occur in our country as in England, where there is a really high regard for those principles of public order which, in practice, lead to an infinitely smaller loss of life from homicidal impulse than prevails in this country. The time is ripe for an inventory of the American state of mind which tolerates the manslaughter misnamed "accidents." We are also ready for a set of good reasons why homicide is permitted to contribute so liberally to life-waste in the United States!

In making this comparison of deaths from accidents in the United States and England it should be recalled that, because of the profound effect of war conditions upon the population of the older country, much more disturbance in the accident death rate was expected than actually occurred. If England and Wales had not had to contend with these adverse conditions during the years 1914 to 1918 the comparison with the accident experience of the United States would have been more disparaging. It remains for American students to study this comparative record closely and to endeavor, as soon as practicable, to reduce the accident death rate of the United States to a figure where it will compare more favorably with that recorded for the older country.

AGE DISTRIBUTION OF FATAL ACCIDENTS IN THE UNITED STATES DURING 1920

The burden of accident mortality continues to fall chiefly upon children and upon the active working ages of life, depending largely upon the type of accidents. Children under 5 years of age were represented in the total accident toll to the extent of 13 per cent of the deaths. The age division 15 to 24 years bore 14 per cent of the burden; the age group 25 to 34 years, 13 per cent; the age period 35 to 44 years, 12 per cent, and the division 45 to 54 years, 10 per cent of all the deaths from accidents during the year 1920. Deaths of children represent very largely the casualties from burns, the absorption of deleterious gases and automobile accidents. One-third of fatal automobile accidents occur among children under 15 years of age.

The mortality from falls seems to be concentrated largely in the ages above 65 years, that from automobile accidents in the age division 5 to 9 years, from burns in the age group under 5 years, railroad accidents between 15 and 44 years, accidental drownings between 10 and 34 years, absorption of deleterious gases under 5 years and between 25 and 64 years. The mortality from gunshot wounds falls most heavily upon the age division 15 to 24 years, with heavy percentages on either side of this age class.

The facts showing the age distribution of the principal types of fatal accidents in the United States are given in Appendix Table 4.

SEX DISTRIBUTION OF FATAL ACCIDENTS

In Table 5, in the Appendix, we present our estimate of the sex distribution of fatal accidents in the United States. Some details are also given for the specific types of accident. In 1920 nearly three-fourths of the accidental deaths in the United States occurred among males. The

only specific group for which there is a heavier proportion of females is the title "burns." The heavier death rate among females no doubt results from the exposure of this group to accidental burns in domestic life.

FATAL ACCIDENTS AMONG THE WAGE-WORKING POPULATION OF THE UNITED STATES

The Committee has available also some figures for a group of 14,000,000 wage earners, and members of their families, insured in the Industrial Department of the Metropolitan Life Insurance Company. In Table 6, of the Appendix, we show figures comparing the accident mortality rates of this group with those for the general population. We show also supplementary calculations of the percentage of decline in mortality between 1911 and 1920 and of the underlying trend of the death rate for both groups.

The prevention of accident mortality seems to have been more effective among the industrial population than among the general population of the United States. We found for the group of industrial people a decline of 1.3 deaths per 100,000 per year for the decade and of 1.1 per 100,000 per year for the general population of the United States Registration Area. In order to make the figures of the general population comparable with those for the insured group the population data in this particular table have been computed on the basis of population and deaths in the age range 1 to 74 years. In making comparison of the improvement in accident mortality or otherwise, for the general population and for the industrial population, it would be better to confine attention entirely to the figure "uniform annual decrement" rather than to the figure showing the percentage of decline or increase for the single year 1920 over the single year 1911. "Uniform annual decrement" takes into account the tendency of the whole decade, whereas the percentage calculations are likely to be misleading because only two calendar years are represented in the calculation.

We find a greater downward tendency of accident mortality among the wageworking population than among the general population of the United States for the following specific accidental injuries: Accidental acute poisonings, conflagration, falls, street car accidents, injuries by animals, effects of heat and electricity. Where there has been an increasing tendency throughout the decade we find lesser increment for the insured wageworking population only for traumatism by machines. This may reflect the influence of safety work in connection with workmen's compensation insurance. The automobile accident death rate shows a greater upward trend for the wageworking population than for the general population of the United States Registration Area. The difference in the trend of the automobile accident death rate in the two groups is not great, however.

FATAL ACCIDENTS ACCORDING TO ORIGIN OF INJURY

An attack upon the accident mortality problem can be effective only when the specific hazards contributing to the total mortality are identified. This is difficult to determine from the fatal accident statistics usually

published. The Metropolitan Life Insurance Company has begun to prepare its accident statistics in such manner that the number and proportion of accidental deaths due to the several broad classes of exposure to risk will be identified. The figures available from the mortality experience of the first three months of 1922 are given in Table 7, in the Appendix. Here we show that for the first three months of this year the accidents reported among the insured wageworking population arose out of hazards in the use of public facilities in 32 per cent of the deaths, out of hazards incidental to domestic pursuits in 23 per cent, and in connection with occupational or industrial pursuits in 16 per cent of the deaths. If only the deaths at ages 15 years and above are considered we find that about 30 per cent of the deaths arise out of industrial or occupational causes. Table 7 also shows the proportion of deaths due to these principal sources of hazard for each of the important age groups. The public accident hazard factor is most powerful in the ages under 15, the domestic hazard at the ages above 55 years, and the industrial hazard at the age division 35 to 44 years.

When the final statistics for the year 1922 are available more details will be shown under the heading "public accidents." It will then be possible to give worthwhile information on the number of deaths which result from the use of transportation facilities, in particular steam and electric railways, the automobile, and pedestrian use of sidewalks, streets and highways. It is hoped that due emphasis upon the facts thus to be displayed will lead to a fuller appreciation on the part of the public of the several factors in American life which contribute to accident causation.

INDUSTRIAL FACTOR IN ACCIDENT MORTALITY

Some reliable information on the industrial or occupational factor in accident mortality is available from the records of the Industrial Department of the Metropolitan Life Insurance Company. The record covers the years 1912 to 1920. In that period 27,074 fatal accidents among white males, 15 years of age and over, were reported. The industrial or occupational hazard factor was responsible for 7,835 or 29 per cent of these deaths. When related to the number of policy-holders exposed to risk in this classification the death rate was 35.5 over the whole period 1912 to 1920.

Prior to the war the highest rate prevailed in the year 1913 (45.7); this was followed by a sharp drop to 27.5 in 1915, the lowest rate in the nine-year period. This marked decline in industrial accidents was probably due to the rapid extension of safety work in American industry as a consequence of the development of workmen's compensation legislation. But the gains were soon offset by the marked increase in industrial activity which followed the outbreak of the great war. The industrial accident death rate rose from the minimum of 27.5 in 1915 to 40.9 in 1918, an increase of nearly 50 per cent in three years. In 1919 a lower rate (32.1) was observed and in 1920 a slight rise to 34.9 was recorded. When the final figures for 1921 are available it will probably be found that a decrease occurred in consequence of lessened industrial activity during the whole of that year.

The several specific kinds of accidents show varying proportions of deaths of occupational origin. Thus 93 per cent of the accidents in mines and quarries were reported to be occupational in origin, 80 per cent of the deaths from traumatism by machines, 68 per cent of the mortality from "electricity," 38 per cent of railroad accidents, 28 per cent of fatal burns, and 24 per cent of the deaths from falls were reported to have arisen in the course of employment.

The table below gives the facts for the important titles in the fatal accident list:

NUMBER OF DEATHS FROM ALL ACCIDENTS; NUMBER AND PROPORTION ARISING FROM INDUSTRIAL CAUSES

White Males 15 Years of Age and Over

Metropolitan Life Insurance Company, Industrial Department, 1912-1929

TYPE OF ACCIDENT	Deaths, all forms of Accidents	Occupational Accidents	
		Deaths	Percentage of Total Accidents
Total Specified Causes.....	27,074	7,835	28.9
Conflagration	284	61	21.5
Burns	787	222	28.2
Absorption of deleterious gases.....	1,420	103	7.3
Accidental drowning	4,174	308	7.4
Traumatism by fall.....	4,826	1,164	24.1
Traumatism in mines and quarries...	966	899	93.1
Traumatism by machines.....	1,223	976	79.8
Railroad accidents and injuries.....	4,816	1,846	38.3
Street car accidents and injuries.....	1,325	238	18.0
Automobile accidents and injuries.....	2,546	224	8.8
Other vehicular accidents and injuries.....	1,331	471	35.4
Other crushing accidents and injuries.....	371	247	66.6
Injuries by animals.....	179	73	40.8
Electricity—lightning excepted.....	642	436	67.9
Fractures—cause not specified.....	568	12	2.1
Other external violence.....	1,616	555	34.3

The above figures may be useful in attempting to estimate the total number of industrial fatalities in the population of the United States. Various estimates have been made from time to time. Dr. Hoffman in 1915* estimated the number to be about 25,000. Other estimates have been even higher, depending upon the point of view of the investigators and the sources used in producing the figures. The Manly Report of the Commission on Industrial Relations in 1915 assumed the occurrence of 35,000 fatal accidents annually. These estimates are undoubtedly excessive. For even if we consider the more moderate estimate of Dr. Frederick L. Hoffman, this would require that about 64 per cent of all accidents occurring among males, ages 15 to 74, be industrial in origin. The Metropolitan figures, as given above, show that about 29 per cent of all accidents among white males were of this character. The records of the company are probably somewhat incomplete with reference to occupational accidents. There are some occupational deaths which cannot be recognized as such from the data on the claim papers. It is very improbable, however, that there are many such cases, in view of the fallacy of

*Bulletin 157, United States Bureau of Labor Statistics, page 6

the information. As an offset to this defect, fatal occupational accidents are of more frequent occurrence in this group of industrial policy-holders than in the general population. We have, therefore, considered the figure of 30 per cent as a good working basis for the calculation of the fatal industrial accidents in the country at large. In 1920 the total fatal accidents among males, ages 15 to 74, was approximately 39,000. If the coefficient of 30 per cent be applied, the number of industrial fatalities resulting would be 12,000. To this number should be added the few hundred industrial fatalities occurring among women. The number is difficult to estimate but it is undoubtedly small in comparison with the number occurring in the other sex. Five hundred such deaths would probably include them all. We would, therefore, suggest that 12,500 fatal industrial accidents is probably the best figure to use at the present time as a working basis for estimating the toll of fatalities in industry in the United States.

THE TRAFFIC ACCIDENT RECORD FOR THE YEAR 1921

Mr. Stellwagen of the Committee has contributed a survey of fatal traffic accidents in principal American cities for the year 1921. The detailed data are given in Tables 8 and 9, in the Appendix. In a group of fifty cities, having a population of practically 25,000,000, there occurred 5,600 deaths from various accidents incurred in the use of transportation facilities. The 1921 death rate for this group of transportation accidents was 226 per 1,000,000 of population and this is a decrease of about 5 per cent from the death rate recorded for the year 1920. This apparently favorable record for all traffic fatalities was contributed, however, by the record for street railway and steam railroad accidents. For the first group, there was a decrease of 24 per cent in the death rate in 1921 over the figures for 1920. For steam railroads, the death rate decreased 23 per cent. The death rate from wagon, bicycle and motorcycle accidents increased 7 per cent in 1921.

The important fact is that the automobile accident death rate of this group of cities increased 4 per cent in 1921 over the rate recorded for 1920. There was a total of 3,837 deaths from automobile accidents and injuries reported in these 50 cities during the year 1921, and this is an increase of 200 over the figure for 1920. If the automobile accident death rate of these cities is applied to the estimated midyear population of the United States for 1921 we calculate that there were in the United States last year approximately 11,624 deaths from this cause and this is an increase over the high figure of 11,067 recorded for the year 1920. It should be borne in mind, however, that this estimate for the whole country, based upon the automobile fatality rates of the cities, is likely to be excessive because the city death rate is higher than that for the whole population, including rural communities.

RECORDS OF INDIVIDUAL CITIES

The records of the individual cities are of interest. The record for each of the cities is shown in Table 8. The city of Los Angeles shows the highest automobile accident death rate, 291 per 1,000,000 of population.

This rate is higher than the figure recorded for 1920 (268 per 1,000,000 of population). Trenton, N. J., was next in order, with a death rate of 236 per 1,000,000, followed by Erie, Pa., with a rate of 216, Birmingham, Ala., with a rate of 215, and Passaic, N. J., with a rate of 214 per 1,000,000 of population. The lowest death rate from automobile accidents was recorded for New Bedford, Mass. The city with the next most favorable rate was Fall River, Mass., (83 per 1,000,000), followed by Hoboken, N. J., (88 per 1,000,000) and Louisville, Ky., (89 per 1,000,000).

Too much stress must not be placed upon the individual records of the respective cities. They are simply indications of the accident fatality situation in the particular city and the immediate environs. Cities with excellent hospital facilities often show high accident death rates because victims of automobile accidents are brought into these cities from the surrounding country. Such deaths are charged to the cities in which the victims die and it therefore happens that the recorded death rate does not always reflect conditions prevailing within a specified city. The data in Tables 8 and 9 were furnished by the health officers or registrars of the respective cities and may be considered fairly accurate. It is possible that there will be some change from the rates recorded in these two tables when the final results for the year 1921 are published by the Bureau of the Census.

CONCLUSIONS

Your Committee wishes to stress the following points particularly strongly in closing this report:

1. That the plan for recording public accidents in the principal cities of the United States be strenuously pushed until a representative number of cities are included in a "Registration Area for Public Accidents" established by the National Safety Council. Only by getting actual facts on the conditions under which public accidents occur will it be possible for the accident prevention movement to take those measures which are necessary for immediate suppressive action.

2. A Bureau on Public Accident Statistics should be established in the office of the National Safety Council for the purpose of building up the Registration Area for Public Accidents and for tabulating and publishing periodically the results of studies based upon the returns from the police and safety officers of cities. The work of adding first one, then another, of the cities and of preparing prompt comparative digests of data reported to the Council, is a job of first-class proportions and should be placed in the hands of a qualified statistician supported by adequate staff facilities. Only by fixing responsibility for the extension of the area and for getting out timely, result-bringing data and illustrations can the lamentable record of these United States be brought home to the communities whose present indifference is based upon profound ignorance of the real facts.

3. The Council should evolve through its local representatives a plan for intensive study by communities of their local data. Some means must be found for bringing the facts of public accident occurrence and prevention to the attention of individual communities and of cor-

porate bodies operating local public facilities. There is one best way of uniting local interests, the merging of local safety resources. That way should be found. Only by direct application of specific measures, based upon analyses of local situations, will it be possible to make much of an impression upon the public accident record.

4. A further extension of the safety programme in railway operation is necessary. There are still many thousands of miles of railway right-of-way and many tens of thousands of highway crossings that need to be properly safeguarded. The extension of the railway through American cities has been so rapid during the past three decades that it has not been possible to adopt those measures of elevation or depression of rights-of-way which ought to be undertaken if the prevailing number of fatalities is to be lessened.

5. There seems to be field for a great deal of improvement in the teaching and practice of industrial safety. The number of deaths from machinery accidents does not begin to show the amount of decrease which one would expect in a community thoroughly alive to its responsibility for accidents in industry. The workmen's compensation forces have undoubtedly effected the saving of many hundreds of lives during the past ten years. But this work needs to be supplemented by more industrial safety work than has been done in the past, and especially that type of work which is undertaken by employers on their own initiative in order to improve the accident record of their particular industry over and above that which results from the reflex effect of workmen's compensation insurance work.

6. Both press and pulpit need to be told of the disparaging comparison of the accident record of the United States and of England and Wales, and the safety message conveyed to every intelligent citizen of these United States in order that sufficient public support may be obtained for the safety work now being undertaken by police or other officials. The American population is sadly in need of a conscience with respect to accident prevention and only the united efforts of the forces which mold public opinion will bring this about.

TABLE I
Death Rates per 100,000 and Estimated Number of Fatal Accidents in the United States, 1919 and 1920 Compared with 1911.

Type of Accident	Death rate per 100,000, United States Registration Area			Estimated deaths in Continental United States†					
	1920	1919	1911	1920		1919		1911	
				Number	Per cent of total	Number	Per cent of total	Number	Per cent to total
Total accidents*	71.4	72.0	84.6	75983	100.0	75583	100.0	79252	100.0
Poisoning by food	1.1	1.0	.8	1171	1.5	1050	1.4	749	.9
Other acute poisonings	2.1	2.1	2.4	2235	2.9	2203	2.9	2248	2.8
Conflagration	1.2	1.1	1.5	1277	1.7	1155	1.5	1405	1.8
Burns	7.6	7.5	7.7	8098	10.6	7873	10.4	7213	9.1
Absorption of deleterious gases	3.4	3.4	3.6	3618	4.8	3569	4.7	3372	4.3
Accidental drowning	5.7	6.9	9.4	6066	8.0	7243	9.6	8806	11.1
Traumatism by firearms	2.6	2.8	2.2	2767	3.6	2939	3.9	2081	2.6
Traumatism by cutting or piercing instruments	11.8	11.3	15.0	12557	16.5	11862	15.7	14052	17.7
Traumatism by fall	2.5	2.6	3.8	2660	3.5	2729	3.6	3580	4.5
Traumatism in mines	1.1	1.1	.2	108	.1	105	.1	187	.2
Traumatism by machines	2.5	2.4	2.1	2660	3.5	2510	3.3	1967	2.5
Traumatism by other crushing:	22.4	22.2	22.0	23838	31.4	23305	30.8	21452	27.1
Railroad accidents	7.3	7.4	13.0	7760	10.2	7768	10.3	12178	15.4
Street car accidents	2.0	2.3	3.2	2128	2.8	2414	3.2	2898	3.8
Automobile accidents	10.4	9.4	2.2	11067	14.6	9868	13.1	2061	2.6
Injuries by other vehicles	1.0	2.3	3.8	2022	2.7	2414	3.2	3560	4.5
Acroplane accidents	.2	.2	...	213	.3	210	.3	...	...
Landslide; other crushing	.6	.7	.8	636	.8	735	1.0	749	.9
Injuries by animals	.7	.7	.9	745	1.0	735	1.0	843	1.1
Excessive cold	.2	.2	.3	213	.3	210	.3	281	.4
Effects of heat	.3	.6	5.3	319	.4	630	.8	4965	6.3
Lightning	.6	.5	.4	632	.7	525	.7	375	.5
Electricity	.9	.9	.9	968	1.3	945	1.3	843	1.1
Fractures—cause not specified	.6	.8	.6	630	.8	840	1.1	562	.7
Other external violence	4.9	4.7	4.2	5214	6.9	4934	6.5	3935	5.0

*Includes injuries where accidental, suicidal or homicidal nature of injury was not specified.

†Estimated midyear population of Continental United States: 1920, 106,418,177; 1919, 104,070,970; 1911, 93,078,765.

TABLE 2
Estimated Fatal Accidents per Week and per Day in Continental
United States, 1920

TYPE OF ACCIDENT	Deaths per	
	Week	Day
Total accidents.....	1453	208
Traumatism by fall.....	240	34
Automobile accidents.....	212	30
Burns.....	155	22
Railroad accidents.....	149	21
Accidental drowning.....	116	17
Absorption of deleterious gases.....	69	10
Traumatism by firearms.....	53	8
Traumatism in mines.....	51	7
Traumatism by machines.....	51	7
Street car accidents.....	41	6
Injuries by other vehicles.....	39	6
Effects of heat.....	6	1

TABLE 3
Death Rates per 1,000,000 of Population in United States Registration Area
and in England and Wales, from Specified Accidental Causes, 1911 to 1920

YEAR	UNITED STATES REGISTRATION AREA						ENGLAND AND WALES					
	All Accdts.	Burns	Drown- ing	Fire- arms	Falls	Other crush- ing	All Accdts.	Burns	Drown- ing	Fire- arms	Falls	Other crush- ing
1920...	714	76	57	26	118	225	369	47	50	3	77	102
1919...	720	75	69	28	113	222	399	57	51	3	78	101
1918...	825	82	70	26	127	264	419	66	57	3	79	92
1917...	812	91	74	24	148	273	470	76	63	2	93	99
1916...	842	80	87	23	151	252	484	68	72	3	103	110
1915...	763	71	97	22	148	222	475	68	69	3	97	115
1914...	785	76	86	24	150	219	469	59	67	4	93	97
1913...	853	78	102	25	154	248	430	58	66	3	92	94
1912...	824	80	88	23	154	240	434	62	68	2	92	85
1911...	846	77	94	22	150	229	457	65	73	2	89	83
†	-11.491	+182	-4.073	+467	-4.321	+176	-6.545	-642	-2.303	+061	-1.606	+1.661

†Uniform annual decrement (—) or increment (+) in decade, 1911 to 1920.

TABLE 4
Percentage Distribution, by Age, of Principal Types of Fatal Accidents in United
States, 1920

AGE PERIODS	All accidents	Trauma- tism by fall	Auto- mobile accidents	Burns	Railroad accidents	Acci- dental drown- ing	Absorp- tion of deleter- ious gases	Trauma- tism by firearms
All ages.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Under 5.....	13.1	5.7	7.9	44.4	1.9	10.1	27.6	5.8
5 to 9.....	7.3	2.8	16.8	12.8	2.7	10.9	1.8	10.0
10 to 14.....	5.4	2.0	8.5	3.6	2.9	14.2	1.8	18.2
15 to 24.....	13.6	4.9	13.0	6.8	19.0	28.9	7.7	33.7
25 to 34.....	12.8	5.9	12.7	6.5	20.1	13.2	10.4	13.2
35 to 44.....	11.7	6.6	10.4	6.5	18.3	9.2	11.7	9.7
45 to 54.....	10.1	7.4	10.1	5.1	14.3	6.8	12.0	5.2
55 to 64.....	8.4	9.0	9.3	4.8	10.8	3.8	10.9	2.3
65 to 74.....	7.6	15.6	7.3	4.0	7.0	1.9	8.9	1.5
75 and over.....	10.0	40.2	3.9	5.3	3.0	.9	7.3	.3

TABLE 5
Estimate of Sex Distribution of Fatal Accidents in Continental
United States, 1920

TYPE OF ACCIDENT	Estimate for Continental United States		
	Both Sexes	Males	Females
Total accidents.....	75,983	54,784	21,199
Burns (conflagration excepted).....	8,088	3,316	4,772
Absorption of deleterious gases.....	3,618	2,464	1,154
Accidental drowning.....	6,066	5,332	734
Traumatism by firearms.....	2,767	2,357	410
Traumatism by fall.....	12,557	6,555	6,002
Traumatism in mines.....	2,660	2,657	3
Traumatism by machines.....	2,680	2,562	98
Traumatism by other crushing:			
Railroad accidents.....	7,769	6,930	839
Street car accidents.....	2,128	1,605	523
Automobile accidents.....	11,067	8,311	2,756
Injuries by other vehicles.....	2,022	1,749	273
Effects of heat.....	319	227	92

TABLE 6
Tendencies of Accident Mortality in United States Registration Area* and
Among Wage-earners Insured in Metropolitan Life Insurance
Company, Industrial Department, 1911 to 1920

TYPE OF ACCIDENT	Death rate per 100,000				Percent. decline (-), or increase (+), 1920-1911		Uniform annual decrement or in- crement, 1920- 1911†	
	U. S. Reg. Area*		M. L. I. Co. Ind'l		U.S.Reg. Area*	M. L. I. Co.Ind'l	U.S.Reg. Area*	M. L. I. Co. Ind'l
	1920	1911	1920	1911				
Total accidents.....	63.7	76.7	59.6	77.4	-16.9	-23.0	-1.088	-1.303
Poisoning by food.....	.9	.7	.5	1.2	+28.6	-58.3	+.016	-.078
Other acute poisonings.....	1.9	2.2	2.0	2.2	-13.6	-9.1	-.047	-.066
Conflagration.....	1.1	1.3	.9	1.3	-15.4	-30.8	-.021	-.046
Burns (conflagration ex- cepted).....	7.0	7.3	8.1	8.8	-4.1	-8.0	.....	-.070
Absorption of deleterious gases.....	2.4	2.6	2.3	2.3	-7.7	.....	+.003	+.027
Accidental drowning.....	5.8	9.5	6.7	10.2	-38.9	-34.3	-.423	-.378
Traumatism by firearms....	2.6	2.3	2.3	1.7	+13.0	+35.3	+.036	+.047
Traumatism by cutting or piercing instruments.....	.2	.2	.1	.1	.....	.....	+.001	-.005
Traumatism by fall.....	7.1	10.8	7.3	13.2	-34.3	-44.7	-.448	-.627
Traumatism in mines.....	2.6	3.9	1.3	1.3	-33.3	.....	-.119	+.010
Traumatism in quarries....	.1	.2	.1	.1	-50.0	.....	-.015	+.001
Traumatism by machines....	2.5	2.2	1.7	1.8	+13.6	-5.6	+.055	+.013
Traumatism by other crush- ing.....	22.2	22.8	20.3	19.3	-2.6	+5.2	+.015	+.341
Railroad accidents.....	7.3	13.0	5.2	9.5	-43.8	-45.3	-.634	-.398
Street car accidents.....	1.9	3.2	1.3	3.6	-40.6	-50.0	-.106	-.152
Automobile accidents....	10.2	2.2	11.1	2.3	+373.6	+332.6	+.958	+1.096
Injuries by other vehicles.	1.9	3.7	1.8	3.1	.....	-41.9	-.203	-.158
Landslide; other crushing.	.8	.8	.5	.8	.....	-37.5	-.008	-.035
Injuries by animals.....	.7	.8	.2	.6	-12.5	-66.7	-.014	-.036
Effects of heat.....	.2	3.9	.2	6.7	-94.9	-97.0	-.202	-.392
Lightning.....	.5	.4	.1	.2	+25.0	-50.0	+.013	-.005
Electricity (lightning ex- cepted).....	1.0	.9	.9	.8	+11.1	+12.5	-.002	-.025
Other accidental violence...	5.0	4.6	4.6	5.6	+8.7	-17.9	+.079	-.042

*At ages 1 to 74 years; thus calculated to make rates comparable with those for insure group.

†The underlying tendency toward fall or rise in units of one death per 100,000 of population per year over the decade.

TABLE 7
Percentage of Accidents Arising from Specified Class of Hazard, Months
January to March, 1922
Experience of Metropolitan Life Insurance Company, Industrial Department

AGE PERIOD	All accidents	Public accidents	Domestic accidents	Industrial accidents	Miscellaneous and unspecified
All ages—1 and over....	100.0	32.1	23.3	15.8	28.8
Under 15.....	100.0	41.5	30.9	...	27.6
15 to 24.....	100.0	37.5	11.2	21.9	29.5
25 to 34.....	100.0	33.0	11.8	27.6	27.6
35 to 44.....	100.0	23.2	15.2	35.4	26.2
45 to 54.....	100.0	25.0	19.0	30.0	26.0
55 to 64.....	100.0	27.8	29.9	12.8	20.4
65 and over.....	100.0	21.7	34.4	7.5	36.3

TABLE 8
Automobile Fatalities in 50 American Cities, 1921 and 1920.
(Population 1921, 24,735,383)

CITY	Number of deaths*		Death rate per million population	
	1921	1920	1921	1920
Akron.....	35	41	152.0	190.2
Baltimore.....	106	97	141.8	130.6
Birmingham, Ala.....	40	25	214.9	138.5
Boston.....	104	90	137.3	119.7
Bridgeport.....	25	30	166.7	206.0
Brockton.....	13	15	192.1	224.7
Buffalo.....	79	103	152.0	201.5
Chicago.....	541	450	194.6	164.9
Cincinnati.....	80	56	198.3	138.9
Cleveland.....	154	153	185.3	189.1
Dallas.....	25	25	151.3	153.9
Dayton.....	16	24	101.2	155.4
Denver.....	40	38	152.0	147.0
Detroit.....	134	173	125.2	169.5
Elizabeth, N. J.....	9	6	90.8	62.0
Erie.....	21	17	215.5	179.4
Fall River.....	10	12	82.9	99.5
Grand Rapids.....	14	14	99.2	100.7
Hartford.....	21	41	145.7	292.7
Hoboken.....	6	9	88.1	132.2
Indianapolis.....	46	40	141.4	125.7
Jersey City.....	37	41	122.2	136.9
Kansas City, Mo.....	65	51	193.4	155.3
Lawrence.....	14	14	146.4	147.8
Los Angeles.....	178	158	291.0	267.8
Louisville.....	21	16	89.0	68.0
Lowell.....	19	8	167.0	70.7
Milwaukee.....	49	66	104.6	143.0
Minneapolis.....	48	42	122.2	109.2
Newark N.J.....	64	74	150.6	177.2
New Bedford.....	8	8	64.0	65.3
New Haven.....	19	33	113.8	201.3
New York.....	849	763	147.6	134.6
Omaha.....	28	38	142.0	194.9
Passaic.....	14	11	214.4	171.1
Philadelphia.....	254	246	136.2	134.0
Pittsburgh.....	111	96	186.1	162.5
Portland, Ore.....	27	31	101.9	118.9
Providence.....	39	35	162.7	146.8
Reading.....	15	25	137.5	230.3
Rochester.....	41	34	134.4	113.7
St. Louis.....	112	102	142.5	131.3
St. Paul.....	35	33	147.4	140.1
Salt Lake City.....	20	27	164.6	226.1
San Francisco.....	92	92	176.9	179.3
Springfield, Mass.....	23	19	169.5	144.3
Toledo.....	36	47	142.2	190.3
Trenton.....	29	14	236.2	116.2
Washington, D. C.....	55	43	121.1	97.1
Yonkers.....	16	11	154.8	108.6
Total.....	3,837	3,637	155.1	149.7

*Reported by health officers or registrars.

TABLE 9
Traffic Fatalities in 50 American Cities
(Rates Per Million Population)

VEHICLE	Number of deaths		Death rate per million population		Per cent increase (+) or decrease (—) 1921 rate over 1920
	1921	1920	1921	1920	
Automobile.....	3,337	3,637	155.1	149.7	+ 3.6
Street railway.....	601	772	24.3	31.8	—23.6
Steam railroad.....	841	1,077	34.0	44.3	—23.2
Other vehicles.....	321	293	13.0	12.1	+ 7.4
All vehicles.....	5,600	5,779	226.4	237.9	— 4.8

TABLE 10
Railroad Accidents in the United States
(Reports of Interstate Commerce Commission)

YEAR	Total number of accidents	FATAL RAILROAD ACCIDENTS			
		Passengers Killed*	All employees Killed*	Other persons Killed*	Total persons Killed*
1918.....	194,553	521	3,329	5,644	9,994
1919.....	169,848	310	2,454	4,716	7,480
1920.....	198,959	255	2,898	4,334	7,487
Percentage distribution of 1920 fatal accidents.....		3.4	38.7	57.9	100.0

*Includes deaths subsequent to 24 hours after accident occurred.

Form 1a

City of _____

**HIGHWAY VEHICULAR ACCIDENTS
PRELIMINARY REPORT**

This Report should be filled out at the time of the accident and the data transferred to the Detailed Highway Vehicular Accident Report within 24 hours.

Tell briefly what happened _____ Date _____ 192__ A M. ____ P.M.

CAUSE OF ACCIDENT

1. Was it the fault of the person injured; i. e., carelessness, disobeying law, physical defect, etc., etc.? ☐
2. Was it the driver's fault; i.e., was he incompetent, reckless, physically unfit, etc., etc.? ☐
3. Were bad street conditions responsible; i.e., broken pavements, obstructions, street lights out, etc., etc.? ☐
4. Was it caused by a defect in the vehicle; i.e., defective brakes, broken steering gear, etc.? ☐
5. Was it due to weather conditions; i.e., rain, snow, fog, etc., etc.? ☐
6. Was a traffic regulation broken; i.e., speeding, driving wrong side of street, improper turning, etc., etc.? ☐
7. If any other cause, what was it? _____

DESCRIPTION OF VEHICLES

(Describe accurately, such as, Touring Car, Motor Truck, Trolley Car, Etc., Etc.)

Give estimate of damage \$ _____

Details of Accident (Put down any information that will aid you in filling out the detailed report)

Signed _____ Name _____ (over) _____ Rank _____ Shield No. _____
(Front)

Place of occurrence _____ Post No. _____ Prec. No. _____

PERSONS KILLED OR INJURED

Name	Address	Age	Sex

DRIVER OR OPERATOR	Age	Sex	License No.	Indicate if owner or chauffeur	Indicate If:		
					Severely Injured	Slightly Injured	Killed
Name _____							
Address _____							
Name _____							
Address _____							
Vehicle License No. _____	Street Car No. _____						

WITNESSES

Name	Address

National Safety Council

(Back)

HIGHWAY NON-VEHICULAR ACCIDENTS PRELIMINARY REPORT

Form 2a

City of _____

This Report should be filled out at the time of the accident and the data transferred to the Detailed Highway Non-Vehicular Accident Report within 24 hours.

Date _____ 192 _____ A.M. _____ P.M.

WAS ACCIDENT
DUE TO A FALL?

 { From an elevation? ☐

 { By slipping or tripping (on street)? ☐

 { Into an excavation, etc.? ☐

Give details and exact cause of fall _____

Was injured hit by falling object? ☐

Explain _____

Bitten by dog? ☐ By other animal (kind) ☐

Any other cause _____

Place of occurrence _____

(Front)

Persons Killed or Injured	Age	Sex	Killed	Injured	
				Severely	Slightly
Name _____					
Address _____					
Name _____					
Address _____					
Name _____					
Address _____					

Person Responsible: _____

Address: _____

WITNESSES

Name	Address
_____	_____
_____	_____

Signed _____

Name

Rank

Shield No.

National Safety Council

GENERAL ACCIDENTS
RELIMINARY REPORT

Form 3a

City of _____

(Report on this blank only those accidents that cannot be reported on any other blank; for example, explosions, floods, race riots, public fights, aircraft accidents, etc., etc.)
This Report should be filled out at the time of the accident and the data transferred to the Detailed General Accident Report within 24 hours.

Date _____ 192 _____ A.M. _____ P.M.

Tell briefly what happened _____

_____Cause of accident _____

Place of occurrence _____

No. Killed: _____ Injured: _____ Estimated Damage: \$ _____

(Front)

Persons Killed or Injured (Use Additional Blanks if Necessary)	Age	Sex	Killed	Injured	
				Severely	Slightly
Name _____					
Address _____					
Name _____					
Address _____					
Name _____					
Address _____					

Person
Responsible:

Address: _____

WITNESSES

Name	Address
_____	_____
_____	_____

Signed _____

National Safety Council

Name

Rank

Shield No.

(Back)

**BUILDINGS & STRUCTURES ACCIDENTS
PRELIMINARY REPORT**

Form 4a

City of _____

This Report should be filled out at the time of the accident and the data transferred to the Detailed Buildings & Structures Accident Report within 24 hours.

NOTE: Use the Elevator Accident Report for all elevator accidents.

Date _____ 192____ A.M. _____ P.M.
 Fire (in public building) _____ ☐ Collapse _____ ☐ Panic _____ ☐
 Public Amusement Device (thrown out, collapse, etc.) _____ ☐
 Stairway _____ ☐ Escalator _____ ☐
 Other _____

Cause of accident _____

Place of occurrence _____

No. Killed: _____ Injured: _____ Estimated Damage: \$ _____

(Front)

Persons Killed or Injured	Age	Sex	Killed	Injured	
				Temporarily	Permanently
Name _____					
Address _____					
Name _____					
Address _____					
Name _____					
Address _____					

Property
Owner's Name: _____

Address: _____

WITNESSES

Name	Address
_____	_____
_____	_____

Signed _____

Name

Rank

Shield No.

National Safety Council

(Back)

ELEVATOR ACCIDENTS
PRELIMINARY REPORT

Form 5a

City of _____

This Report should be filled out at the time of the accident and the data transferred to the Detailed Elevator Accident Report within 24 hours.

Date _____ 192 _____ A.M. _____ P.M.

Tell briefly what happened _____

GIVE EXACT CAUSE OF ACCIDENT

Did cable break?... ☐ Overcrowding in car or at landing?..... ☐
 Was car started before gate was fully closed?.. ☐ Did injured slip or trip?..... ☐

Caught or crushed between car and landing or side of shaftway?..... ☐
 Did injured walk into shaftway thru open gate?..... ☐ Horseplay in car?..... ☐

Any other?.....

Was elevator for passengers?..... ☐ Freight?..... ☐

Did safety device fail?..... Which?.....

Place of occurrence.....

No. Killed:..... Injured:..... Estimated damage: \$.....

(Front)

Persons Killed or Injured	Age	Sex	Killed	Injured	
				Severely	Slightly
Name.....					
Address.....					
Name.....					
Address.....					
Name.....					
Address.....					
Name of Operator:.....	Address:.....				

WITNESSES

Name	Address

Signed _____ Name _____ Rank _____ Shield No. _____
 National Safety Council

(Back)

Form 1-b
192

HIGHWAY VEHICULAR ACCIDENT

Highway Vehicular Accidents. Final Report, Police Dept., City of _____ State _____ Date _____

1. Describe fully the nature of the accident.

2. Specify exact cause of the accident under each heading (a) to (e). See instructions.

(a) What fault of person injured? _____ (b) What fault of driver? _____

(c) What street conditions? (obstructions, etc.) _____ (d) What defect in vehicle? _____

(e) What weather conditions? _____ (f) Other cause? (specify) _____

3. Describe vehicles involved? _____ 4. Time of occurrence: _____ at _____ M.

(a) What exact type of vehicle or vehicles? _____ Data _____ 192 _____

5. Place of occurrence: _____

(a) At street intersection? _____ (b) Within 300 feet of school? _____ (c) Residential section? _____

(d) Business section? _____ (e) On safety island? _____ (f) Running on sidewalk? _____

6. File driver: _____

(a) Sex _____ (b) Age _____ (c) Country of birth _____ (d) Owner or chauffeur? _____ (e) Driver injured _____ (f) Killed? _____

7. Property damage: _____

(a) Were involved vehicles damaged? _____ (b) How much? (dollars) _____ (c) Other property damaged? _____ (d) How much? (dollars) _____

8. Give additional information of value: _____

Signed: Name _____ Rank _____ Shield _____ (Front) _____ Countersigned: _____ Officer in charge _____

Persons Killed or Injured		Driver or Operator		Owner or Chauffeur		Injured	
Name	Address	Age	Sex	License No.	Killed	Severely	Slightly
1 _____	_____	_____	_____	_____	_____	_____	_____
2 _____	_____	_____	_____	_____	_____	_____	_____
3 _____	_____	_____	_____	_____	_____	_____	_____
4 _____	_____	_____	_____	_____	_____	_____	_____

Were arrests made? _____ On what charge? _____ Development of Case _____

Was person at fault fined? _____ How much? _____ Imprisoned? _____ What term? _____

Paroled? _____ If chauffeur, license revoked? _____

Was suit for damages instituted? _____ For what amount? _____ If possible, give final settlement of claim _____

Did any injured subsequently die? _____ Were any permanently disabled? _____

Other developments? _____

National Safety Council. Public Safety Section. Form 1-b (Back)

Highway Non-Vehicular Accidents, Final Report, Police Dept., City of _____ State _____ Date _____ 192 _____ Form 2-b

HIGHWAY NON-VEHICULAR ACCIDENTS

1. Describe fully the nature of the accident: _____

2. Specify exact cause of the accident under each heading (a) to (j). See instructions.

(a) Street and sidewalk conditions _____ (b) Physical condition of injured person _____
 (c) Was injured person careless? _____ (d) In what manner? _____
 (e) Was injured person pushed or knocked down? _____ (f) In what manner? _____
 (g) Was injured person hit by falling object? _____ (h) Describe object and cause of fall _____
 (i) Weather conditions? _____ (j) Any other cause? _____

3. Time of occurrence: _____ 4. Place of occurrence: _____
 Date _____ 102 _____ at _____ M _____ (a) Residential section _____ (b) Business section _____ (c) On sidewalk _____ (d) Middle of street _____

5. Property damage: _____
 (a) Was any property damaged as result of accident? _____ (b) Damage (dollars) _____

6. Give additional information of value: _____

Signed: Name _____ Rank _____ Shield _____ Countersigned: _____ Officer in charge _____
 (Print)

Persons Killed or Injured

Name	Address	Age	Sex	Killed	Severely Injured	Slightly Injured
1. _____	_____	_____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____	_____	_____

Persons Responsible _____

Name _____ Address _____

Development of Case

Were Arrests made? _____ On what charge? _____
 Was person at fault fined? _____ How much? _____ Imprisoned? _____ What term? _____
 Paroled? _____ Discharged? _____ For what amount? _____ If possible, give final settlement of claim _____
 Was suit for damages instituted? _____ Were any permanently disabled? _____
 Did any injured subsequently die? _____
 Give any other developments of case _____

National Safety Council, Public Safety Section, Form 2-b, (Back)

Form 3-b
192

General Accidents. Final Report. Police Dept., City of _____ State _____ Date _____

NOTE: This form should be used ONLY for those unusual accidents which cannot properly be reported on any other form. This form covers configurations, explosions, floods, drowning, riots, fights and also accidents resulting from firearms, sports, games, etc.

1. Describe fully the nature of the accident; See instructions.

2. Specify exact cause of accident:

3. Weather conditions: _____ 4. Time of occurrence: _____ 192 _____ at _____ M

5. Place of occurrence: _____
 (a) Residential section _____ (b) Business district _____ (c) Sparsely settled district _____
 (d) Amusement center _____ (e) Park _____ (f) Bridge _____ (g) Tunnel _____ (h) Other _____

6. Property damage:
 (a) Was any property damaged as result of accident _____ (b) How much? (dollars) _____

7. Give additional information of value: _____

Signed: Name _____ Rank _____ Shield No. _____ Countersigned: _____ Officer in charge.

Name	Address	Age	Sex	Killed	Injured	
					Severely	Slightly
1. _____	_____	_____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____	_____	_____

Persons Killed or Injured

Persons Responsible		Development of Case	
Name	Address	Discharged?	For what term?
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Were arrests made? _____ (In what charges? _____) _____

Was person at fault fined? _____ How much? _____ Imprisoned? _____ For what term? _____

Paroled? _____ Discharged? _____

Was suit for damages instituted? _____ For what amount? _____ If possible, give final settlement of claim _____

Did any of injured subsequently die? _____ Were any permanently disabled? _____

Give any other developments of case _____

National Safety Council. Public Safety Section. Form 3-b. (Back)

Buildings and Structures Accidents. Final Report. Police Dept., City of _____ State _____ Date _____ 02
BUILDINGS AND STRUCTURES ACCIDENTS

Form 4-b

1. Describe fully the nature of the accident: _____
2. Specify exact cause of the accident under each heading (a) to (f). See instructions.
 (a) What defect in building or structure? _____ (b) What defect in building management or supervision? _____
 (c) What fault in building inspection? _____ (d) Date of last inspection _____
 (e) What fault of persons using building? _____
 (f) Any other cause? _____
3. Describe building or structure: (Theatre, motion-picture house, hotel, school, commercial building, factory, dance hall, public amusement device, auditorium or lecture hall, restaurant, etc.) _____

4. Time of occurrence: Date _____ 192____ at _____ M.
5. Place of occurrence:
 (a) Business section _____ (b) Residential Section _____ (c) Sparsely settled district _____ (d) Other _____
6. Property damage:
 (a) Was any property damaged as result of accident? _____ (b) How much? (dollars) _____
7. Give additional information of value: _____

Signed: Name _____ Rank _____ Shield No. _____ Countersigned: _____ Officer in charge.

Persons Killed or Injured

Name	Address	Age	Sex	Killed	Injured	
					Severely	Slightly
1. _____	_____	_____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____	_____	_____

Persons Responsible _____ Address _____

Development of Case

Were arrests made? _____ On what charge? _____
 Was person at fault fined? _____ How much? _____ Imprisoned? _____ For what term? _____
 Paroled? _____ Discharged? _____
 Was suit for damages instituted? _____ For what amount? _____ If possible, give final settlement of claim.
 Did any injured subsequently die? _____ Were any permanently disabled? _____
 Other developments of case _____

National Safety Council. Public Safety Section. Form 4-b. (Back)

Form 5-b
192

Elevator Accidents. Final Report. Police Dept., City of _____ State _____ Date _____

ELEVATOR ACCIDENTS

1. Describe fully the nature of the accident:

2. Specify exact cause of the accident under each heading (a) to (g). See instructions.
 (a) Hoisting cables _____ (h) Drum or counterweight cables _____
 (c) Trip or slip of injured person? _____ (i) Overcrowding in car or at landing? _____ (e) Horserplay in car? _____
 (f) Did injured walk into shaftway through open gate? _____ (g) Other cause? _____

3. The Elevator:
 (a) Passenger or freight _____ (b) Capacity (in persons) _____ (c) Capacity (in pounds) _____
 (d) Electric or hydraulic _____ (e) Other details _____

4. Elevator equipment:
 (a) Safety dog? _____ (b) Slack cable stop? _____ (c) Cable limit stop? _____ (d) Machine limit stop? _____ (e) Electric limit switch? _____
 (f) Possible to start elev or while landing door is open? _____ (g) Did any safety device fail? _____ (h) Which one? _____

5. Was injured person:
 (a) Entering or leaving car? _____ (b) Riding in car? _____ (c) Working in shaft? _____ 0. Time of occurrence? _____ 192 at _____ M
 7. Place of occurrence: (a) Office building _____ (b) Apartment house _____ (c) Factory _____ (d) Store _____ (e) Other (Specify): _____
 8. Any property damaged? _____ How much? (dollars) _____ 9. Any other details of value? _____

Signed: Name _____ Rank _____ Shield _____ Counter signed _____ Officer in Charge _____

Persons Killed or Injured					
Name	Address	Age	Sex	Injured	
				Severely	Slightly
1					
2					
3					

Persons Responsible

Name	Address

Development of Case

Were arrests made? _____ On what charge? _____ Imprisoned? _____ For what term? _____
 Was person at fault fined? _____ How much? _____
 Forfeited? _____ Discharged? _____
 Was suit for damages instituted? _____ For what amount? _____ If possible, give final settlement of claim.
 Did any injured subsequently die? _____ Were any permanently disabled? _____
 Give any other developments of case.

National Safety Council, Public Safety Section. Form 5-b, (Back)

CHAIRMAN VAN SCHAAACK: Dr. Dublin's committee has done excellent work and it seems to me the appropriate way for this Section to express its sense as to the value of the work could best be shown by passing a motion to that effect.

C. M. TALBERT: I move that we express our thanks to Dr. Dublin and his committee for this splendid work. I know full well what it means, having had some little experience of that character. Also, that it is the sense of the Section that the Executive Committee be requested to formulate and carry out, as soon as possible, plans for developing this body of valuable statistics. (The motion was seconded and, on being put to a vote by the Chairman, prevailed.)

REPORT OF NOMINATING COMMITTEE

CHAIRMAN VAN SCHAAACK: We will now have the report of the Nominating Committee.

MR. C. HOWARD STEWART: Your committee begs to submit the following nominations:

Chairman, David Van Schaack.

Vice Chairman, D. E. Parsons, Vice President and General Manager, East St. Louis and Suburban Railway, East St. Louis, Ill.

Vice Chairman, R. B. Stoeckel, Commissioner of Motor Vehicles, Hartford, Conn.

Secretary, Mr. A. H. Lintz, Secretary-Manager, Cleveland Safety Council.

MR. ROSSELAND: I will volunteer to put the motion. (The motion was seconded and, on being put to a vote, unanimously prevailed.)

CHAIRMAN VAN SCHAAACK: I am very appreciative of the honor you have bestowed upon me, in asking me to act as your Chairman for another year. I shall do the best I can.

Mr. C. M. Talbert of St. Louis, whom many of you know so well and favorably, is the original Chairman of the Public Safety Section, and it is a question in my mind why he was not made perpetual Chairman, because of the satisfactory manner in which he performed the functions of the office, will now speak to you on "Progress in Standardizing Signs and Signals."

MR. TALBERT: The reason I was not made perpetual Chairman of this Section was because the one who should be has just stood before you. I congratulate him and the Section on having such a Chairman as Mr. Van Schaack. It is a very fortunate movement that has attracted to its service a man who is fitted by inclination and desirability to the office and I pay my respects to him as my super-worthy successor. May he live long and prosper!

PROGRESS IN STANDARDIZATION SIGNS AND SIGNALS

C. M. TALBERT, VICE PRESIDENT, DUECHLEE & TALBERT, INC., ST. LOUIS, MO.;
CHAIRMAN, STANDARDIZATION COMMITTEE, NATIONAL SAFETY COUNCIL.

Those who have been interested in public safety work and particularly that part of it which pertains to highway traffic have, for some

time, realized the necessity of standard signs and signals, but it is only recently that the general public has come to recognize its importance.

Within the past few months the public press has carried numerous notices and reports of meetings of delegates, associations and representatives of various interests who have consulted and agreed upon the necessity of such standardization and have usually made certain recommendations. These recommendations, however, when made definite, have been so varied as to force the conclusion that there is no generally accepted standard for even the most commonly used or most necessary signs. The Safety Council, through its committees, has given thought to the problem and has had it in mind as one of those most needing a solution, but has not adopted a standard of its own nor made positive recommendations.

It has seemed to me, as Chairman of the Standardization Committee, that a service could well be performed at the present time by having the Council take the lead in gathering all available information as to existing signs that have, in any way or in any part of the country, become commonly used and could also gather and compile the results of the various conferences and meetings that have been held and thus, if possible, make itself a clearing-house of available information, and that it, as a neutral organization without pre-conceived ideas, take the lead in getting together these various interests and proposed standards and thereby materially help in arriving at some decision or conclusion which would be accepted by the country at large as the standard. Among the matters to be considered in such standardization are the following:

- (a.) Complete traffic code.
- (b.) Signs and signals attached to an automobile and intended to be seen by other motorists, traffic officers and pedestrians.
- (c.) Signs and signals on the highway for the attention of the motorists.
- (d.) Signals given by traffic officers for the direction of motorists or pedestrians.
- (e.) Roadway construction.

This last item is one that has not been given much attention by the general public or by motorists but which is extremely essential to safety on the public highways. It will be mentioned further on in this paper.

STANDARD SIGNS AND SIGNALS

(a.) Traffic Code: This was probably the first of the matters to be given definite study by those interested, and there have been codified and presented at least a half-dozen from as many different sources, each intended by sponsors to be the standard; none of them, however, have succeeded in establishing themselves as the dominating one.

(b.) Signs and Signals Attached to Automobiles: The matters coming naturally under this head consist of headlights, tail lights, spot lights and those signals which are intended to indicate to those not in the car that the car is to make some change in its movement; that is, it is going to stop, start or turn to either the right or left. This involves consideration of all the numerous and various patented devices for making such

indications and will undoubtedly be the subject of long controversy before definite standards are accepted.

(c.) **Signs and Signals on the Highway:** There has probably been more thought and more experimental work devoted to these than to any other single item; this largely from the fact that the signs in themselves are so numerous and for so many different purposes and are subject to so many variations in shape, size, color, letters and printed information as to make it seem almost hopeless that there can be any uniformity of them for some time to come, although these very points but serve to emphasize the absolute necessity for such, if they are to completely serve their purpose. For example, a collection by the National Safety Council recently of information on the different kinds of traffic posts showed that, in this one item alone, they range in height from six inches to fourteen feet; that there was no uniformity in color except that red seemed to predominate; that there was no uniformity of material, of construction or size of globe nor even of location in the highway, and there have been numerous accidents from the confusion of red lamps that were intended as traffic lights with other red lights which were placed as danger signals on railroad crossings, retaining walls and open ditches.

A meeting recently held under the auspices of the American Engineering Standard Committee, wherein they called into a conference representatives of forty-two public, governmental and safety organizations in New York, initiated what is hoped will be a solution, so far as, at least, colors are concerned. As a result of this conference, a national code on traffic signal signs is to be developed under the joint sponsorship of the United States Bureau of Standards, the Association of State Highway Officials and the Public Safety Section of the National Safety Council. Our active representatives on the committee formulating this code are Mr. Van Schaack, Mr. W. S. Paine of his staff; Mr. Simpson of the Travelers Insurance Company, and Mr. Rosseland of the National Safety Council headquarters staff. The committee will include representatives of some thirty organizations which are interested, so that the code when formulated will undoubtedly be recognized widely as a national standard.

(d.) **Signals Given by Traffic Officers:** These include generally all directions given by traffic officers to the motorist or to the pedestrians and include such matters as arm signals indicating movement of traffic (both vehicles and pedestrians), whistles, semaphores operated by hand, semaphores operated from towers, and lights of various colors operated and showing from towers. These last have been developed very greatly within the past two or three years but with no degree of uniformity so far as the different larger cities are concerned.

ROAD CONSTRUCTION AND ITS BETTERMENT

(e.) **Roadway Construction:** As stated before, this is a matter of very great importance to public safety but because of its technical side and because it is a matter in which the general public could hardly voice a sentiment, it has not been given much public attention.

A paper recently presented at the annual meeting of the National Highway Traffic Association in New York emphasized the necessity for considering public safety in road construction work in general as follows: That the estimated vehicles now registered in the United States were about 11,000,000 but that 90 per cent of these 11,000,000 were confined in their movement to 10 per cent of the roadways.

There are at least five common faults which a road builder might help to eliminate:

1. Short sight distances on curves, both horizontal and vertical.
2. Insufficient width of pavement, especially in congested districts.
3. Inadequate, irregular and improper placing of danger signs.
4. Tendency of detours under traffic to become impassable.
5. Railroad grade crossings.

The writer further suggests that, if possible, detours should be confined to one direction, because usually there are bad curves and other dangerous conditions.

He further suggests that the road should be built one-half at a time. He suggests co-operation by highway engineers:

1. To secure good designs for new roads.
2. To promote adequate improvements for old roads.
3. To insist upon reconstruction of existing roads at places which have been proven dangerous.
4. To improve the location of the center line on dangerous curves and elevations.

STANDARD PRACTICES FOR SAFE OPERATION

The paper further proceeds to give ten points which are recommended for standardized practice having in view particularly and peculiarly the safety of motorists. These cover:

1. All curvatures, both vertical and horizontal.
2. Banking for curves.
3. Painting center line of pavement on curves.
4. Posting signals 500 feet each way of sharp curves.
5. Legislation prohibiting cars passing in the same direction on a curve unless there be an unobstructed view of at least 500 feet.
6. Minimum radius of curves approaching a bridge.
7. That earth slopes be not less than one-quarter slope.
8. Placing of shoulder of gravel or crushed stone.
9. Elimination of advertising signs adjacent to the roadway except those having to do with traffic.
10. That a definite sum be set aside annually for betterment of hazardous conditions.

The report as read presents an encouraging situation because it shows the widespread interest in making the highways safe and that those that have to do with the designing and building of them are taking a practical interest in it.

The part to be taken by the National Safety Council in the standardization work will probably depend upon the amount of money it is able to spend upon it. The thing it should logically do would be to

make a complete investigation and report upon the present status of the entire subject, gathering together in detail all the information available on the different subjects, studying, cataloging and segregating them according to their apparent value. This would greatly assist any group making a study of them, and undoubtedly, with a comparative small amount of work, a great many of them can be eliminated and leave a group which could be the basis of a final determination. This information should be collection from State highway departments, municipalities, automobile clubs and from those interested in various so-called national highways. Our own local Councils could furnish valuable information.

The Council could well take the lead in selecting a representative committee to work on these reports, paying particular attention to the personnel of the committee and being sure that the various diverse interests and geographical sections were properly represented.

HARD WORK NECESSARY TO OBTAIN BEST RESULTS

The collection of this data, the work to be done upon it as indicated above, preparing a digest of the work of the committee and presenting results of it, would entail quite a good deal of work and would undoubtedly require the services of a well-qualified man for a considerable length of time. This man should make a report, which should be printed in pamphlet form and given wide distribution. The report should cover the items mentioned above and not covered in the national code already under way.

It is, therefore, the recommendation of the Chairman of the committee that the Public Safety Section immediately consider the matter and, if possible, furnish the necessary funds for employing the man referred to and during the time of his preliminary work that the Council undertake to form a general committee for the purpose of considering the entire matter and with the idea and purpose of ultimately presenting a completed report covering the items just mentioned.

DISCUSSION

MR. BOYER: Almost every State has a department of motor vehicles and the inspectors could quickly get a line on different kinds of signs used. We could ask them to secure that information. I would also like to suggest that all ambulances, police patrols and fire apparatus carry on the dash, a small electric light with a green glass, so approaching vehicles will observe the law in vogue in many States "Hold to the right and stop!" when such vehicles approach.

CHAIRMAN VAN SCHAAACK: I will be very glad to present your suggestion, Mr. Boyer. Captain W. S. Gilbreath, manager of the Detroit Automobile Club, has kindly promised to discuss this subject.

CAPTAIN W. S. GILBREATH (Manager, Detroit Automobile Club): I represent an organization of 16,000 automobilists in the city of Detroit; a year from today I will represent an organization of 32,000; we have a registration in this county of 187,000. I am not advertising the Detroit Automobile Club, I am asking the question as to how far you have gone

with the work of obtaining co-operation of automobile clubs? We are rendering service to the motorist from every angle we can, from widening streets to reserving rooms for our members. There are upward of 10,000,000 motorists in the United States and a large number of clubs who are earnestly and honestly working for public safety. The work of preventing accidents must be carried through State Legislatures and city councils—it is a tremendous task, but it can be done. Your proposition of standardization is good; have you thought about presenting it to the meeting of police chiefs and officers to be held in New York very shortly? If a proper standard can be worked out it will meet with almost universal approval. Sixty-five thousand inquiries reached my office last year and not a day passes but I receive suggestions of a safety nature. Many commercial devices are offered but a number are too complicated for practical use—we need the services of a committee of trained men to standardize these matters. The automobile clubs will be glad to help.

CHAIRMAN VAN SCHAAK: I regret very much Motor Vehicle Commissioner Stoeckel is unable to be here but he has given us a brief report.

THE BEST WAY TO ELIMINATE TRAFFIC HAZARDS

R. B. STOECKEL, COMMISSIONER OF MOTOR VEHICLES, HARTFORD, CONN.

At a recent meeting of the Public Safety Section of the National Safety Council I submitted, through Chairman Van Schaack, the tentative plan for an organization which should combat traffic accidents. In brief, that plan amounted to an attempt to interest the professional motor vehicle administrators in all the States. At the meeting of the Section the plan was authorized and I was requested to develop it. I have given some time to it and the following is the present condition of the organization:

There is in existence a conference of motor vehicle administrators which includes Maine, New Hampshire, Vermont, Massachusetts, New York, Rhode Island, Connecticut, New Jersey, Pennsylvania and Maryland; applications have been presented by several other States to join this conference and it is expected they will be added. This conference has accomplished much in its brief existence of less than two years. It has held four meetings a year, all of which have been fully attended. So far it has directed its efforts toward uniformity on certain applications of motor vehicle laws, such as the right-of-way rule, a hand-signal system, the adoption of lighting devices, standard weight for commercial motor vehicles, a fee system, etc. The results have far surpassed the most sanguine expectations. The conference has gone on record for:

1. Uniform vehicle specifications.
2. Uniform vehicle weights on highways.
3. Uniform reciprocity law.
4. The right-of-way rule, giving the right of way to the vehicle approaching from the right.
5. Better laws to discipline operators of motor vehicles.
6. Uniform motor vehicle laws in all of the States concerned. The question of theft of motor vehicles will be considered at an early date.

EXPERIENCE AND STUDY OF MOTOR ACCIDENTS

The subject of accident prevention has been actively taken up by Connecticut at that conference on two different occasions. The work of the National Safety Council and the broad plans outlined have been discussed. As yet, there have been no resolutions presented, but there is no reason why the conference cannot be committed to this plan. My work, as chairman of the committee, has been almost exclusively in connection with this conference, both because it is nearest at hand and because any such broad proposition as calling for co-operation on the part of administrators of motor vehicles all over the United States must necessarily be based upon experience and a thorough study of the problems each has to meet and of the machinery which he has at hand to meet them.

I have, therefore, not taken up participation by correspondence as fully as I had expected, but am at this date ready, from the standpoint of preparation, to write a circular letter in the name of the National Safety Council explaining the situation as it appears to me and asking what co-operation can be had from each individual administrator's office. In addition, I am in hopes that it may be possible, when the matter is properly presented, to organize a middle western conference similar to the eastern. If that could be done and could eventually be followed by a far western conference, the whole plan could be simplified, because it would then be possible to deal through conferences, including groups of States, rather than with individuals, and uniform laws and enforcement could be attained much sooner.

An experimental process for the reduction of motor vehicle accidents has been initiated in almost every one of the States comprising the eastern conference, to a greater or less degree, during the last six months, but a study of the results obtained has not been possible. The method pursued in Connecticut, under the direction of the motor vehicle department, has been to interest the professionals in charge of traffic and all of the influential civic organizations in a movement to control city traffic more carefully.

ENGINEERING METHODS WILL BRING RESULTS

An accident tabulation has been provided by the motor vehicle department, by means of which it will shortly be possible to point out to the police departments which are the most dangerous locations in each city and at which accidents occur. An effort will be made to get the police to concentrate on those locations as fast as they can be selected—to slow down traffic at those points. Traffic counts are being made at some of these intersections which will be analyzed and from which it will be possible to learn which turns are more dangerous to make and what percentage of cars make those turns. In short, accident prevention is being attacked from an engineering point of view, with the ultimate intention of traffic direction in locations now not under direction, by the installation of devices such as traffic buttons, silent policemen, blinkers, traffic lines or any other tried and useful method. Unreasonable speed is the greatest single factor contributing to accidents in localities of this

kind and the attempt to control and direct that has, in Connecticut, notwithstanding an increased registration of about 20 per cent plus a constant out-of-state traffic of an increase of not less than 10 per cent, held accidents uniform.

Fatal accidents in Connecticut, in comparison with former years, shows a gain of 31 per cent. Fatal accidents can, in my opinion, be considered as an index of all personal injury accidents, because they do not differ from ordinary forms of accidents except in result.

In Connecticut and through the whole of the eastern conference it is a fact that the principles of discipline and education are being applied to the full extent which public sentiment demands. The further application of those remedies depends upon an increased and better public sentiment for less accidents; therefore, after the organization of this committee, which will include prominent professional traffic officials all over the United States, a publicity bureau of some kind should be considered; the foremost ideas on the subject should be gathered with a view to teaching safety in schools, by lectures and films, and by any other means.

COMMUNITY EFFORT NECESSARY TO PREVENT ACCIDENTS

The educational side of the prevention of traffic accidents has scarcely been touched, so far as its possibilities go, nor is it possible at the present date to determine, except as a matter of opinion, what the immediate results might be. It will, in all probability take a generation from the time when actual education is thoroughly and universally begun to produce a maximum result, but indirect results of a very favorable percentage can be had forthwith in any locality which will properly teach traffic-accident prevention. So far as Connecticut is an index to the problems of the East, it is easy to see from the statistics now gathered that education is having a favorable result. A careful analysis of the fatal accidents of the last three years shows that the pedestrian is beginning to realize the necessity of care more fully than heretofore and his participation in traffic is better than it ever has been.

A schedule of the fatal accidents of the State of Connecticut for the last three years, a schedule of the traffic accidents in the five principal cities of the State, week by week, and a schedule of enforcement by suspensions of motor vehicle licenses are appended.

A summary of this report is that the work of the National Safety Council, so far as the Traffic Hazards Committee is concerned, has been started in the East, is in its experimental condition at present, and will be pursued along the lines laid out in this report and in the former recommendation made to the Council, in accordance with any action taken by it at this conference.

CHAIRMAN VAN SCHAAK: We are exceptionally fortunate in having with us a gentleman who can be considered an authority upon matters under discussion. It gives me the greatest of pleasure to introduce Professor Arthur H. Blanchard.

ELIMINATION OF TRAFFIC HAZARDS IN HIGHWAY IMPROVEMENT

ARTHUR H. BLANCHARD, PRESIDENT, NATIONAL HIGHWAY ASSOCIATION, AND
PROFESSOR OF HIGHWAY ENGINEERING AND HIGHWAY TRANSPORT,
UNIVERSITY OF MICHIGAN.

An intimate relationship exists between the elimination of traffic hazards and the efficient design, construction and maintenance of highways. A momentous responsibility rests on Federal, State, county and municipal highway engineers to constantly realize the public duty which is imposed upon them to safeguard to the maximum extent the life and property of persons using highways.

In the field of municipal highway improvement more attention should be concentrated on methods to relieve congestion of traffic on city streets. The construction of ample widths of roadways, arterial diagonal streets and circumferential streets will materially assist in the relief of congestion of main traffic and business streets in many cities. State and municipal highway officials should co-operate in the routing of through traffic around the business sections of large cities and even outside the limits of small municipalities. Marked relief from traffic congestion has resulted wherever this fundamental principle of city and town planning has been adopted.

A detail of street construction, often overlooked in many municipalities, which materially aids in the safe use of streets, is the construction of curb corners with the longest radius practicable. With properly designed curb corners, the tendency of motor vehicles, in turning right-hand corners, to encroach upon the left-hand side of the roadway is materially reduced.

State and county highway engineers may, by proper highway design, construction and maintenance eliminate or measurably reduce many traffic hazards.

ROADWAYS MUST HAVE AMPLE WIDTH

Widths of roadways should be constructed which will allow the safe passage of all classes of vehicles utilizing a given highway. For a two-lane state trunk highway the paved width should not be less than eighteen or twenty feet, depending upon the traffic to which it will be subjected. Serious congestion is resulting on many trunk highways due to the temporary parking of motor vehicles undergoing repairs or stopping for brief intervals. These obstructions may be obviated by the construction of five-foot shoulders of sufficient strength to carry standing vehicles. Cases have been noted where five vehicles within a distance of one mile, on a highway outside of a municipality, have been parked, undergoing repairs, on the roadway. This practice at night, especially in the case of a vehicle without a tail light, constitutes a serious source of danger.

On narrow roadways, fourteen to seventeen feet in width, the safety of the traveling public may be increased by the marking of a center line

on the pavement surface. Where traffic demands a greater width than a two-lane highway, the construction of a four-lane highway of thirty-six to forty feet in width is recommended. The construction of three-lane highways should not be permitted as under no practicable traffic regulations is it feasible to safeguard travel on the center lane of travel.

Traffic hazards on curves may be materially reduced by constructing the curves with a long radius, banking the roadway of the curves, constructing an extra width of the pavement on the inside of the curves, marking a center line on the pavements and eliminating obstructions to view on the inside of the curves. Rightangle corners within distances of each other of less than 500 feet exist in many localities. These may be classified as ultradangerous traffic hazards and should be eliminated by the construction of a long double reverse curve in place of the two sharp curves and the intervening short straight stretch of roadway.

In many cases, hill crests on highways constitute as serious traffic hazards as sharp curves on level stretches of highways. The tendency of many motorists to travel in the center of the roadway when no approaching traffic is observed has caused many accidents at crests. A center line marked on the pavement over the crest materially reduces this traffic hazard. It is believed that the expense of placing danger signs, calling attention to this hazard, on the sides of the roadways approaching all dangerous crests would be justified.

UNOBSTRUCTED VIEW AT RAILROAD CROSSINGS

Railroad grade crossings are a constant source of accidents. It is evident that their total elimination is desirable but unfortunately is not practicable, in all cases, in the present state of the financing of highway improvements. Much can be done, by proper design, to reduce traffic hazards in the case of railroads crossing highways at grade. A clear sight of the railroad crossing for 500 feet on each side should be provided with a clear sight of the railroad for 1,000 feet on each side of the highway. The width of all roadways crossing railroads should be at least twenty feet. For a distance of 100 feet on each side of the railroad the grade of the highway should be level or not over two feet rise or fall in 100 feet. The suggestion by some officials to construct humps in the highway to slow down traffic approaching railroad crossings is unreservedly characterized as pernicious.

The field of highway maintenance provides many opportunities for reducing traffic hazards. Methods should be employed which will reduce obstructions to traffic to a minimum. The use of gravel roads, which abound in the middle West, is attended by many accidents which may be materially reduced by proper maintenance. The excessive use of loose gravel has been the cause of many accidents while the traffic hazard of dense clouds of dust is apparent to all who travel gravel roads which have not been so maintained as to eliminate or materially reduce the dust nuisance.

After a brief discussion the Section adjourned.

THURSDAY AFTERNOON SESSION

VICE CHAIRMAN DEARMAND: The first speaker this afternoon will be Mr. S. C. Mumford of Detroit.

BENEFITS OF COMMUNITY ORGANIZATION FOR SAFETY

S. C. MUMFORD, DETROIT EDISON COMPANY, DETROIT, MICH.

The conditions to the success of any community enterprise are mainly two: (1) Education of the individual to the point of recognizing the desirability of the enterprise and a willingness to work personally for its achievement, and (2) the co-operation of all the individuals of a community to put the enterprise across. Neither one, without the other, will result in much success in developing or carrying out a program of any kind. Safety is no exception. It is not an individual matter, its purpose to be achieved by personal vigilance, nor is it something which can be brought about by an organized community unless individuals are willing to adopt its principles into their daily lives as part of the business of living.

The first means to a successful safety program—individual support—is a relatively easy thing to attain. Life, health and well-being are things so near the heart of everyone that any project which touches upon them as intimately as safety work does cannot fail to be of interest. Community effort, however, is not so simple a matter. Individuals are willing to indorse an uplifting movement out of all proportions so long as it does not make demands upon their time and money. When it comes to actively entering into the movement, taking the initial steps toward organization and the like, man's natural inclination to avoid anything new interferes. The benefits to be derived from community organization are too great to permit of any laxity in attempting to bring safety work into general favor and to secure group support. The fact that all progress toward the civilization we have now reached has come through the organized effort of communities is too well known for me to waste your time in much elaboration. How little can be done by individual effort alone, in the face of conscious or unwitting opposition of a whole community group, is an axiom needing only illustration.

In the early agricultural period of our society every piece of work had to be done by one workman. Consequently he had little; his life was narrow, his outlook limited to the needs of the present and the immediate future. The growth of population, and the increased complexity of life attendant upon the more crowded conditions, however, made increased production a necessity. It was no longer possible for one man to produce all that he needed to provide for himself and his family. It was then that community organization was developed. Barn-raisings, husking-bees, threshings, spinning and quilting bees were all forms of community effort which not only accomplished the work necessary to be done but brought the people together in close sympathy and gave them a keen sense of group responsibility which made for better understanding and appreciation.

Then came the beginning of the age of machinery and the shifting of population from farmland to town. With the change in conditions which this migration brought the whole spirit of the age began to alter. The human element, which had been uppermost during the agricultural period, was subordinated to the impersonal efficiency of machinery. Interest lay not in how to help each other so that all could have more but how to help one's self so that one's personal advantage could be increased. The effects of this individual attitude soon became apparent. Labor troubles became common, accidents increased, crime was prevalent.

SOCIETY SUFFERS FROM SELFISH ATTITUDE

This condition of affairs continued until the middle of the nineteenth century before people began to realize that society was concerned with the private life of every individual. A period known as the "humanitarian" period was ushered in about 1837. A class of eminent men, in sympathy with labor, realizing that not only labor itself was losing but that society as a whole was suffering from this selfish attitude, put all their influence to swinging the pendulum toward the almost forgotten community life of the past age. They brought about the beginning of labor legislation, of accident insurance, of welfare associations and of other forms of community organization. Results soon began to be seen in a better spirit among employers and employees. Selfishness diminished and community life began to function again.

With the reappearance of group organizations, great things began to be accomplished for civilization. Through them, and organized public opinion, much was done in the way of abolishing imprisonment for debt, providing wage and homestead exemptions, establishing free schools, removing the stain from poverty and instituting many other industrial and social reforms all purposing to help unfortunate individuals to help themselves. None of these things could have been accomplished by individual effort alone. They had been held as goals for some far-distant future by sociologically-minded men for a long time but they began to show fruition only when social groups took them up and began to work for their achievement. Not the least among these great movements was safety.

Many of the abuses which followed in the wake of the industrial revolution, and continued long after the machine age was an established fact, were due in great part to a misconception on the part of employers of what industrial efficiency really is. They thought that cheapness was the essence of superiority in business and consequently cheap production was the mark for which they aimed. Keeping material cost low, without much consideration of the human factor, caused many accidents, the seriousness and cost of which were realized only after years of poorly equipped buildings, unsanitary conditions and badly guarded machines had snuffed out the lives of thousands of workmen. Then those manufacturers who had come to understand true efficiency in terms of better rather than cheaper product, co-operating with many who for years had been trying to put safety across on the basis of common humanity, but with little success because of the opposition of the group, began to bring

about reforms which would assure comparative safety to all workmen. They formed safety councils and commissions composed of employers and employees to investigate unsafe conditions and bring about their improvement. Through organized public opinion they secured safety legislation for the control of industrial accidents and occupational diseases. Industrial companies are now required, first of all, to safeguard and regulate hazardous machinery and furnish a reasonably safe place in which to work. They must report all accidents which occur, prohibit people who are susceptible to accident or disease from working in dangerous places and outlaw substances and instruments which render employment unsafe.

SEVEN YEARS OF SAFETY EFFORT

Industrial safety was the first phase of a general program of accident prevention to be taken up in Detroit. Seven years ago a Safety Council was organized among some of the most progressive industrial organizations of the city. Their work was very successful and the interest they aroused on the subject of safe living and carefulness in all walks of life attracted others to the Council. At the present time the Detroit Safety Council includes representatives from all the industrial plants in this city and many from factories and plants throughout the state.

Early in the career of the Council it was represented in the National Safety Council and three years ago the work had so expanded that a full-time paid executive was appointed to transact the business of the local organization. As the interest in industrial safety grew the possibilities of extending the work to other fields grew in proportion. Since 1900 the growing volume of motor vehicles in the city had made traffic a serious problem. The increasing number of deaths, and the conviction that many accidents could be prevented, convinced many clear-minded men that some action against traffic accidents was imperative. The Detroit Automobile Club, upon the suggestion of such men as Charles T. Bush, William E. Metzger, Thomas P. Henry, Edward Hines and Captain Gilbreath, took up the problem and a safety committee was appointed. These men, all of whom have served as chairmen of the Safety and Traffic Committee, worked hard and effectively to decrease accidents. Their committees were able to reach thousands of automobile owners, through the Automobile Club, with a program of careful and considerate driving, making them see their personal responsibility for the saving of life and limb and educating them in safety to such a point that they were willing—that they were anxious—to promote it in every way they could.

AUTOMOBILE CLUB RENDERED VALUABLE SERVICE

The Detroit Automobile Club helped in many other ways to maintain safety for the city. A representative of the members of the club has appeared at every session of the State Legislature to talk for or against legislative measures which affected safety conditions in Detroit. Propaganda for safety was issued from their offices regularly and its effect has been enormous. Their co-operation with every safety movement or campaign has spelled its success in several instances.

By 1918, however, the problem had gotten out of their hands. Safety work in Detroit was too big a problem for one organization alone to swing. Auto owners belonging to the club were careless and accidents due to their carelessness were few but thousands of people who were neither automobile owners nor interested in the Detroit Automobile Club had not been reached. In that year, with the re-establishment of the traffic department, the co-operation of the police was secured. The nature of police duties gave that department an opportunity to carry the work into other fields. For some time they very effectively held up the adult end of safety work.

In May, 1919, the first safety campaign was held in Detroit. The Bureau of Public Safety of the Detroit Police Department and the Detroit Automobile Club put into execution an intensive educative program, consisting of talks on safety, moving pictures of how accidents occurred, publicity to traffic regulations and the like. The public schools took active part during this campaign and in September, 1919, Superintendent Frank Cody put into use a course of study in safety education as part of the regular curriculum. The public schools had taken up safety in a small way before. It was thought that if the children in the schools could be made, through education, to respect human life in others as well as themselves, and were instructed in preventives and first-aid measures, accidents would in time be diminished and safety made a reality.

CHILDREN INTERESTED IN THE WORK

Great things were accomplished in the schools, but so many other factors than children are involved in accident prevention that at first the results fell far short of what it was hoped they would be. Now that the co-operation of the other agencies meant more effective organization for all, a definite and systematic plan for safety work could be adopted. The benefits of this co-operation made themselves felt at once in an increase of only 32.5 per cent over 1918 in traffic accidents in Detroit while the growth in population and in number of vehicles would lead you to expect an increase of about 75 per cent.

The work, once begun, rapidly enlarged in scope. Children brought what they had learned home and their parents became interested in the work. Soon community groups began to organize for the express purpose of promoting the work. Fraternal organizations took up the cudgel for accident prevention, a Safety Council was formed and incorporated in the National Safety Council, the Public Safety Committee composed of representatives from the Detroit Police and Fire Departments, the Park and Public Lighting Commissions, the Board of Education and Detroit Automobile Club, as well as private citizens, was organized. At their meetings they developed plans for making the streets safe and brought to the proper authorities suggestions for better traffic regulations, safety devices and warning signs.

Early the next year the women's clubs in Detroit were interested in the safety campaign and the Federation Public Safety Committee was appointed by the president of the Federation of Women's Clubs. By means of an educational program they reached 10,000 clubmembers with

their safety propaganda and their work with neighborhood clubs and church organizations brought many others into active participation in the safety campaign, which had by this time become one of the city's chief interests. With so large a portion of the community organized for safety, public opinion forced the hangers-back if not to actively co-operate at least to abide by the decisions of the organized groups.

Individual effort, as represented by the work of any one of these organizations alone, could not have done more than prevent accidents in isolated and negligible cases. Community effort has made it a permanent feature of the city organization and one of the most successful of municipal activities. The benefits derived from community organization can be definitely stated. First of all, organized effort has made Safety a national slogan—yes, something more than a slogan for it is backed by constructive work in all cities of the United States to make the slogan stand for something real. It has brought safety before the eyes of all the public, where only a very limited number could have been brought to see the advantage of safety work without it. Furthermore, it has secured some very effective legislation for the cause of safety merely through the force and sentiment of numbers.

COMMUNITY INTEREST AND EFFORT PAYS

Community interest and community effort pays in safety work. If there are any among you who doubt its value you need only to glance at Detroit's record for the past three years for proof of its effectiveness. Since 1918, when the systematic and continuous safety campaign was first introduced, a total of 1,098 cases of death or personal injury have been prevented. The economic saving during the last calendar year, reckoning the fatalities in terms of capitalization of \$5,000 each and the loss of time of injured conservatively at \$100.00 each, amounts to \$579,800 in personal service alone.

Insurance liability rates on automobiles have decreased from \$42.50 (the basic rate on Ford cars, others have decreased in proportion) to \$28.50, this is a saving of \$14.00 per person per year. In Wayne County, if every automobile owner carried liability insurance, \$1,931,594 a year would be saved in insurance premiums. Community effort, if it can bring about these results, pays, you see, in life, happiness and money. Detroit has the reputation of being one of the best-governed cities in the country. It is in a large measure due to the splendid co-operation of every city department and the citizens who make up the governed body, in the safety work which has been carried on here, that our city has gained that reputation.

VICE CHAIRMAN DEARMAND: I am sure we all appreciate the very able paper of Mr. Mumford. The first part of it impressed me particularly, because it took up a psychological study of changes of groups, from getting together for knitting bees to present-day safety methods.

Our second speaker will be Mr. A. Ryder.

AUTOMOBILE ACCIDENTS IN THE UNITED STATES

AMBROSE RYDER AND H. P. STELLWAGEN, AUTOMOBILE DEPARTMENT, NATIONAL BUREAU OF CASUALTY AND SURETY UNDERWRITERS
By H. P. STELLWAGEN

The automobile caused the death of 13,000 people in the United States during 1921, an average of over 35 per day and an increase of nearly 1,000 over 1920. About 75,000 persons meet their death every year in accidents of one sort or another. The automobile, then, is responsible for over one-sixth of all deaths by accidental causes and, therefore, stands very high among the preventable causes of accidental death.

A tabulation of traffic fatalities in fifty American cities shows a total of 3,837 automobile deaths, as compared with 3,637 for 1920. The 1921 automobile death rate for these cities was 155.1 per million population, an increase of 3.6 per cent over the 1920 death rate of 149.7. The data for those cities, which are scattered over the entire United States and which aggregate a population of 24,735,383, may be considered characteristic of the whole country. It is, therefore, reasonable to assume that the percentage increase in the 1921 automobile death rate over the 1920 rate for those cities was the same as that for the entire United States. The 1920 rate for continental United States, as reported by the United States Bureau of the Census, was 104.05 per million population. On the basis of a 3.6 per cent increase this figure becomes 107.8 for 1921. This rate applied to the estimated population of the United States as of July 1, 1921, of 107,833,284 produces a total of 11,624 deaths from automobiles in the United States for 1921. This figure does not include automobile fatalities which occurred at railroad grade crossings. According to the classification scheme used by the United States Bureau of the Census and by the health department of the fifty cities whose data are included in this report, all deaths caused by collision between automobiles and heavier vehicles (such as railroad trains and interurban trolleys) are assigned to the heavier vehicles.

FEW MOTORISTS CAREFUL AT RAILROAD CROSSINGS

This statistical classification notwithstanding, the automobile must take the blame for most automobile accidents at railroad crossings. Actual observation on a large scale has proved that few motorists observe ordinary precautions when approaching grade crossings, such as slowing down to moderate speed and looking and listening before crossing the tracks.

According to statistics compiled by the Interstate Commerce Commission there were 1,702 persons killed at railroad crossings in 1921. About 75 per cent of these, or 1,276, were occupants of automobiles. These 1,276 deaths added to the 11,624 as calculated on the basis of the United States Bureau of the Census data, give a total of 12,900 and the meagre allowance of an even hundred deaths for collisions between automobiles and street cars, interurban trolleys, etc., brings the figure up to 13,000.

The number of people injured (not killed) in automobile accidents cannot be estimated very closely because of the scarcity of data on the

subject. However, an approximation of such injuries may be made from the following: In the state of Massachusetts, for the six-year period 1915 to 1920 inclusive, 2,608 people were killed in automobile accidents and 68,671 injured, or 26.4 injuries for every fatality. In the state of Iowa, from 1916 to 1919, 14,200 people were injured and 920 were killed; a ratio of 15.4 to 1. Naturally the ratio of injuries to deaths would be lower in a state like Iowa, where accidents are proportionately more severe, than in Massachusetts where the congestion of population in the cities accounts for more minor accidents. According to figures compiled by the police department of New York City, 848 persons were killed and 20,461 injured in that city during 1921, making 242 injuries for every death. It is reasonable to suppose that the country-wide proportion between injuries and fatalities is between 20 and 24 to 1. This means that there were at least 260,000 people injured in automobile accidents in the United States during 1921, and possibly as many as 300,000.

PROPERTY DAMAGE VERY HEAVY

Property damage done by automobiles is even more difficult to estimate. Only a few cities and practically no states have kept statistics on automobile accidents involving damage to property; however, a rough approximation of the damage can be made on the basis of the statistics of casualty insurance companies as compiled by the National Bureau of Casualty and Surety Underwriters. These statistics show that there are approximately four property damage accidents to every accident involving personal injury and that each accident results in about \$50 damage to property other than the car responsible for the accident. It may be assumed, therefore, that there were over 1,000,000 automobile property-damage accidents in the United States during 1921, costing at least \$50,000,000. This figure does not include loss through fire and theft, nor does it include much of the damage sustained by the automobiles themselves.

A comparison of automobile deaths and death rates for 1921 and 1920 in fifty American cities is shown in the accompanying table. This data has been furnished by the health officers of the cities enumerated and may be considered fairly accurate. Too much stress must not be placed on the individual records of the respective cities. It is a well-established fact that cities with excellent hospital facilities show a comparatively high death rate, because victims of automobile accidents are brought into those cities from the surrounding country and die there of their injuries. Such deaths are ascribed to the cities to which the victims are brought and, therefore, it happens that the actual death rate does not always reflect local conditions.

The increase in the automobile death rate of 149.7 to 155.1 per million population came about in the face of an actual decrease of 4.8 per cent in the death rate for all vehicles. From the following summary it will appear that the death rates for street railways and steam railways fell off considerably in 1921. On the other hand, the "other vehicles" classification, which includes for the most part horsedrawn vehicles, motor-cycles and bicycles, increased somewhat.

TABLE I
Automobile Fatalities in Fifty American Cities, 1921 and 1920
Population, 1921, 24,785,888

	Number of Deaths		Death Rate per Million Population	
	1921	1920	1921	1920
Akron, Ohio	35	41	152.8	190.2
Baltimore, Md.	106	97	141.0	130.6
Birmingham, Ala.	40	25	214.9	138.5
Boston, Mass.	104	90	137.3	119.7
Bridgeport, Conn.	25	30	166.7	206.0
Brockton, Mass.	13	15	192.1	224.7
Buffalo, N. Y.	79	103	152.0	201.5
Chicago, Ill.	541	450	194.6	164.9
Cincinnati, Ohio	80	56	198.3	138.9
Cleveland, Ohio	154	153	185.3	189.1
Dallas, Texas	25	25	151.3	153.9
Dayton, Ohio	16	24	101.2	155.4
Denver, Colo.	40	38	152.0	147.0
Detroit, Mich.	134	173	125.2	169.5
Elizabeth, N. J.	9	6	90.8	62.0
Erie, Pa.	21	17	215.5	179.4
Fall River, Mass.	10	12	82.9	99.5
Grand Rapids, Mich.	14	14	99.2	100.7
Hartford, Conn.	21	41	145.7	292.7
Hoboken, N. J.	6	9	88.1	132.2
Indianapolis, Ind.	46	40	141.4	125.7
Jersey City, N. J.	37	41	122.2	136.9
Kansas City, Mo.	65	51	193.4	155.3
Lawrence, Mass.	14	14	146.4	147.8
Los Angeles, Cal.	178	153	291.0	267.8
Louisville, Ky.	21	16	89.0	68.0
Lowell, Mass.	19	8	167.0	70.7
Milwaukee, Wis.	49	66	104.6	143.0
Minneapolis, Minn.	48	42	122.2	109.2
Newark, N. J.	64	74	150.6	177.2
New Bedford, Mass.	8	8	64.0	65.3
New Haven, Conn.	19	33	113.8	201.3
New York, N. Y.	849	763	147.6	134.6
Omaha, Neb.	28	38	142.0	194.9
Passaic, N. J.	14	11	214.4	171.1
Philadelphia, Pa.	254	246	136.2	134.0
Pittsburgh, Pa.	111	96	186.1	162.5
Portland, Ore.	27	31	101.9	118.9
Providence, R. I.	39	35	162.7	146.8
Reading, Pa.	15	25	137.5	230.3
Rochester, N. Y.	41	34	134.4	113.7
St. Louis, Mo.*	112	102	142.5	131.3
St. Paul, Minn.	35	33	147.4	140.1
Salt Lake City, Utah	20	27	164.6	226.1
San Francisco, Cal.	92	92	176.9	179.3
Springfield, Mass.	23	19	169.5	144.3
Toledo, Ohio	36	47	142.2	190.3
Trenton, N. J.	29	14	236.2	116.2
Washington, D. C.	55	43	121.1	97.1
Yonkers, N. Y.	16	11	154.8	108.6
Total	3,837	3,637	155.1	149.7

*There were only 97 deaths in St. Louis in 1921 according to statistics compiled by the St. Louis Safety Council.

TABLE II
Traffic Fatalities in Fifty American Cities
(Rates per million population)

	Number of Deaths		Rates		Per cent Increase* 1921 Rate Over 1920
	1921	1920	1921	1920	
Automobile	3,837	3,637	155.1	149.7	3.6
Street railway	601	772	24.3	31.8	-23.6
Steam railway	841	1,077	34.0	44.3	-23.2
Other vehicles	321	293	13.0	12.1	7.4
All vehicles	5,600	5,779	226.4	237.9	-4.8

*Minus sign (—) denotes decrease.

The following table lists the cities according to their death rates for 1921 from the highest to the lowest:

TABLE III
Automobile Death Rates in 50 American Cities, 1921
(Showing the range in death rates from the highest to the lowest)

City	Death rate per million pop.	City	Death rate per million pop.
1. Los Angeles	291.0	26. Lawrence	146.4
2. Trenton	236.2	27. Hartford	145.7
3. Erie	215.5	28. St. Louis	142.5
4. Birmingham	214.9	29. Toledo	142.2
5. Passaic	214.4	30. Omaha	142.0
6. Cincinnati	198.3	31. Indianapolis	141.4
7. Chicago	194.6	32. Baltimore	141.0
8. Kansas City, Mo.	195.4	33. Reading	137.5
9. Brockton	192.1	34. Boston	137.3
10. Pittsburgh	186.1	35. Philadelphia	136.2
11. Cleveland	185.3	36. Rochester	134.4
12. San Francisco	176.9	37. Detroit	125.2
13. Springfield, Mass.	169.5	38. Jersey City	122.2
14. Lowell	167.0	39. Minneapolis	122.2
15. Bridgeport	166.7	40. Washington	121.1
16. Salt Lake City	164.6	41. New Haven	113.8
17. Providence	162.7	42. Milwaukee	104.6
18. Yonkers	154.8	43. Portland	101.9
19. Akron	152.8	44. Dayton	101.2
20. Buffalo	152.0	45. Grand Rapids	99.2
21. Denver	152.0	46. Elizabeth	90.8
22. Dallas	151.3	47. Louisville	89.0
23. Newark	150.6	48. Hoboken	88.1
24. New York	147.6	49. Fall River	82.9
25. St. Paul	147.4	50. New Bedford	64.0

Quite a different story is told if the automobile fatalities be related to the number of automobiles registered in the above cities. Unfortunately, automobile registration figures for many of those cities are unavailable, but the following table for ten of the cities listed in Table III will show that when death rates are calculated on the basis of automobile registration the cities arrange themselves in altogether different sequence than they do in Table III:

TABLE IV

City—	Auto. Registration* 1921	Autos. per 1,000 Pop.	Death Rate per 100,000 Autos.
Chicago	168,221	60	321.5
New York	313,000	54	271.2
Boston	46,006	61	226.0
Buffalo	49,100	95	161.2
St. Louis	70,671	90	152.5
Cleveland	111,630	134	138.0
Detroit	118,000	110	113.6
Los Angeles	200,000	327	89.0
Washington	63,350	139	87.0
Baltimore	139,639	186	75.9

*Estimated from registrations for counties in which the cities are located, or by police departments where there is a local tax, or by automotive trade associations from local sales.

Table IV should be compared with Table III. Although the automobile death rate for Los Angeles is about twice that of New York City when based on population, it is only one-third as large when calculated on automobile registration. Cleveland's death rate, based on population, is a great deal higher than that of Boston, but only about one-half the size of the latter's on the basis of automobile registration.

A grouping of the fifty cities by size presents an interesting comparison:

TABLE V

	No. Deaths	Death Rate per Million Pop.
Ten largest cities	2,543	160.9
Next ten cities.....	619	149.1
Next ten cities.....	338	140.2
Next ten cities.....	200	139.8
Ten smallest cities	137	145.7
Total	3,837	155.1

The 2,543 deaths for the first group of ten represent two-thirds of the total as reported for the fifty cities and about one-fifth of the total as estimated for the entire country.

CAUSES WHICH HAVE PRODUCED EXISTING SITUATION

Having determined something of the extent of the automobile accident problem, the next step is to find out the causes that have produced the existing situation. Despite the scarcity of information on the causes of automobile accidents, some definite conclusions may be arrived at from the following data.

The Travelers Insurance Company of Hartford, Conn., recently analyzed 200 fatal and 200 near-fatal automobile accidents. The analysis produced the following information:

Cause—	Number of Accidents
Too much speed	131
Careless operating	64
By drunken operators	40
By children darting in front of car.....	40
By cutting in ahead of traffic.....	30
Insufficient lights	12
Defective brakes	9
Dazzling lights	7

The Massachusetts Department of Public Vehicles tabulated 521 fatal and 390 near-fatal automobile accidents for 1921. In 292 cases the cause of the accidents was given as "too fast for conditions" and in 150 cases the cause was "careless operation." These two causes led all the rest. In Maryland the State Roads Commission investigates all automobile accidents and plots them on a highway road map of the state. From this map it is evident that most of the accidents occur, not in the congested parts of the state, not on the sharp curves and deep grades along the roads, but on the long straight stretches of improved roadway which invite the motorist to speed up his machine.

CARELESS AND RECKLESS DRIVING

All this evidence points to the fact that the chief cause of automobile accidents is the careless and reckless motorist. Of course, the child darting in front of an automobile and the pedestrian running across the street are responsible for many accidents, but the chief offender is the motorist who jeopardizes human life through sheer thoughtlessness or criminal recklessness.

A striking example of what can be accomplished in the reduction of automobile accidents by taking drastic action against offending motorists was furnished by the state of Massachusetts. In 1920 there were 21,086 injuries in that state from motor vehicle accidents and in 1921 the figure

was 11,487, a decrease of 45 per cent. During 1921, 4,899 licenses were revoked—evidently the revocation of these licenses had a stimulating effect on careful driving.

By AMBROSE RYDER

The field of automobile accident prevention is large. It reaches from Maine to California and from Texas to Wisconsin; from the automobile factory to the school-room and from the street to the courtroom. It embraces hundreds of large activities, such as city planning, the laying out of routes, the construction of highways and traffic regulation, and thousands of details, such as signaling for turns and the color of lights. In one or more ways it touches the lives and the doings of every one of the people of the United States.

The subject is altogether too broad to cover in a short paper and I am limiting myself, therefore, to a general statement of the situation, particularly as it relates to the casualty insurance companies.

The field of accident prevention can be subdivided in many different ways. I have chosen four main subdivisions, as follows:

Positive prevention of automobile accidents is accomplished by a complete removal of danger zones. For example, by building overhead highway crossings, by keeping pedestrians off certain sections of the street, by sufficient and adequate playgrounds to keep children off the streets, by elimination of bad curves, steep hills and slippery road surfaces, by elimination of blind curves and blind intersections—in general, by any positive action to remove danger points or causes of danger.

Corrective prevention of automobile accidents is accomplished by sign boards at bad places in the roads and warning signals, by rotary crossings and safety zones, by tire chains, anti-skid brakes, rain-vision windshields, stop signal devices and bumpers, by speed governors and registering speedometers, by reporting of accidents and licensing of drivers—in general, by any means or device that helps to minimize the possibility of accidents.

Education in the prevention of automobile accidents involves talks and illustrations to school children, lectures to chauffeurs, circulars and advertisements to automobile drivers, teaching how careful driving and the value of life, instructing pedestrians in the rights of motorists, instruction in the care and upkeep of automobiles—in general, instilling in the minds of every man, woman, and child the whys and wherefores of preventing automobile accidents.

Regulatory measures to prevent automobile accidents embrace laws governing the operation of automobiles, traffic regulations, State licensing of cars and of drivers, strict enforcement and adequate punishment for violations—in general, all laws, ordinances and regulations laid down by State and municipal governments to prevent accidents.

POSITIVE PREVENTION OF AUTOMOBILE ACCIDENTS

I wish particularly to emphasize the first of these four main subdivisions, namely, the field of *positive* prevention of automobile accidents. It is far better to build a fence at the top of a cliff than to keep an ambulance

at the bottom. A hundred times more good is accomplished by providing adequate playgrounds for children, so they will not want to play in the streets, than to deny children a safe place to play and then tell them in the class-room that they *must not* play in the streets.

Railroads realize that the way to avoid accidents along their route is to keep their tracks on private property—closed to the public. Automobile transportation is very similar to railroad transportation. Every automobile should be treated as a miniature train and, insofar as possible, kept away from pedestrians. This can be accomplished in the cities by fencing the streets between crossings and, wherever possible, by moving the street car tracks to the edge of the streets so that passengers may get on and off without being disturbed by automobiles. All through traffic in large cities should be diverted to boulevards, with overhead crossings at highway intersections. Automobiles going from one city to another should not be routed through the center of a city, town or village along the route—wherever possible, state highways should by-pass the intermediate cities and towns.

One of the most important fields of *positive* prevention of automobile accidents is the elimination of ordinary grade crossings. The scheme of "rotary traffic" is proving quite satisfactory, but at many points the overhead crossing offers the only positive remedy.

The ordinary overhead crossing is not safe; there are too many intersections of traffic from one highway to the other. It is possible, however, to construct crossings that will eliminate every point of intersecting traffic—that will provide continuous flows of traffic for both right and left turns from either highway to the other. Think what it would mean to automobile traffic along a boulevard of a crowded city, or along boulevards between large cities, for automobiles to continue uninterrupted in their flow and to make right and left turns at intersecting highway points without stopping and without crossing the path of any other automobile. Overhead crossings are expensive, but this would be offset, first, by the added efficiency, and, second, by the saving due to elimination of policemen at intersections.

POSITIVE PREVENTION WILL COME IN FUTURE YEARS

The *positive* prevention of automobile accidents is analogous to insulation for electric wiring and keeping high-tension wires out of reach. The annual death toll from electrocution would be even greater than that from automobiles if unprotected electric wires were placed waist-high along sidewalks, halls and stairways. Of course, there would be the usual warning signs, "Dangerous! High-Voltage Wire! Do Not Touch!" and school children would be told not to get near the wires; the papers would print a daily casualty list and there would be editorials and lectures on the terrible recklessness and carelessness of people who thoughtlessly bumped against the electric wires. But all of that is avoided, happily, by the positive removal of the electric danger zone. We need to do much the same for the automobile. It should be segregated wherever possible and kept in a "straight and wide path" all its own.

From a practical point of view, however, it will be a long time before we can hope for any measure of positive prevention of automobile accidents. Overhead crossings and segregated highways are altogether too expensive for extensive use. Our energies must be devoted, therefore, to these other fields of accident prevention, *i. e.*, corrective measures, education and regulation.

A great deal has been accomplished by the judicious use of signboards, by motorcycle police and by educating drivers. What has been done to date, however, is merely an indication of what can be done and must be done in the future.

Casualty insurance companies are interested in the entire field of automobile accident prevention. Rates for automobile insurance depend on the losses themselves—as the losses increase in number and in size the rates must be increased accordingly. Strange to say, insurance companies make more money where the rates are low than where the rates are high; those classes of risks which carry the lowest rates, known as *preferred risks*, are the ones which have proven the most profitable. Risks which carry extremely high rates are the ones the companies are slow to accept; usually that class of business has shown an unprofitable loss ratio year after year.

Some automobile rates are so high that it is almost hopeless to expect to make ends meet by any further increase in rates; no matter how rapidly the rates are increased the losses seem to keep one jump ahead. Instead of curing the situation by increasing the rates, insurance companies are striving to cure the situation by reducing the losses, and this means by preventing the accidents. Insurance companies, therefore, are not only serving themselves when they carry on campaigns for prevention of accidents, but they also serve the policy holder and the public at large.

Only recently the insurance companies, members of the National Bureau of Casualty and Surety Underwriters, set aside a large sum of money for the purpose of carrying on automobile accident prevention work during the coming year. It is not my purpose, in this article to touch on that work. I am only expressing some personal views.

INSURANCE COMPANIES AND EDUCATIONAL WORK

The insurance companies can accomplish much by impressing on the citizens of each city the fact that they make their own automobile rates. If a given city has bad traffic regulations, poor law enforcement and narrow streets with bad crossings then accidents are the more numerous and rates must be increased accordingly. On the other hand, if active steps are taken to prevent automobile accidents in a city and neighborhood, then the losses and rates decrease. In this way the insurance companies are encouraging every city and every owner of an automobile to prevent accidents.

Suppose, for example, that a city of 250,000 can reduce its accidents by only 10 per cent and that the losses of the insurance companies are

reduced accordingly. The rate can be reduced 10 per cent and this would mean a saving of approximately \$4.00 to each car insured. (Cars not insured receive a similar benefit as the owner is carrying his own insurance.) If there are 15,000 cars in the city, the total saving is \$60,000. Purely from a dollars-and-cents point of view, automobile owners can well afford to invest in accident-prevention work.

Each class of risk is also rated by the insurance companies according to its own experience. In general, commercial cars have had a poorer experience than the private type of cars, and the taxi-cab and other public automobiles have had a worse experience than commercial cars. Each class of risk must pay for its own experience. Therefore, the owners, coming within a given class, either independently or acting through their association, know that it is up to them to prevent accidents if they want their rates reduced. Similarly, the insurance companies carry the rating program even to individual risks, insofar as they can possibly do it, so that each policy-holder knows that his own loss record is a potent factor in the determination of his own rate.

Trained engineers are sent by the insurance companies to travel from town to town, visiting policy-holders and teaching them how to eliminate accidents. If a certain risk is having a bad accident record, the insurance company immediately gets in touch with the policy-holder and does everything in its power to correct the situation.

I have tried to emphasize the thought that we should "*invest* in automobile safety," with emphasis on the "*invest*." It isn't enough merely to talk safety and tell the other fellow that he should always be careful. People must be made to see that it pays to go in for automobile safety, that it *pays* to build the right kind of roads, that it *pays* to keep children off the streets and that it *pays* to license drivers and punish offenders. Automobile accident prevention is not a "play job," it is a *business*, and if it is to succeed as a business we must treat it like any other business and *invest* with the idea of getting good returns for our time and money.

AUTOMOBILE ACCIDENT TOLL IS VERY HEAVY

We have only scratched the surface of automobile safety. The street cars and railroads have succeeded in bringing the death total down and down each year for a good many years, but automobile deaths are still rapidly increasing. If automobile deaths at railroad crossings are listed as automobile deaths, where they more properly belong if *cause* is to be the determining factor, and not as railroad accidents as at present, then the grand total of automobile deaths for the country is now greater than for all other vehicles combined. More people are killed by automobiles than are murdered. There are more automobile deaths than suicides. Our job is to put a crimp in the upward curve of automobile deaths and to keep up the good work year after year until the death total has reached a respectable minimum.

VICE CHAIRMAN DEARMAND: The next speaker is Mr. G. H. McClain.

TEACHING SAFETY TO THE PUBLIC THROUGH PUBLICITY

G. H. McCLAIN, MANAGER, LOUISVILLE SAFETY COUNCIL.

We are all agreed that newspaper publicity plays a very important part in our plans to sell the idea to the general public. The value and necessity of publicity is demonstrated in a number of ways. "Movie" stars reach their height of fame and fortune because of what is said of them in the columns of the newspaper and the reverse is true when notices are of an adverse nature. Our aspiring political friends arrive or do not arrive, as the case may be, because of the papers. Let us attempt to analyze the fundamentals back of it all.

The daily press is the most efficient way of reaching the largest number of people in the quickest possible time as a daily paper finds its way into 90 per cent of homes. It not only carries current news but a great deal may be classified as propaganda—this may be of a political, religious or civic nature.

Most people are susceptible to the power of suggestion; this is recognized and capitalized by window trimmers, patent medicine advertisers, doctors, lecturers, etc., and the propaganda pages of a paper carry a great many suggestions, direct or implied. They start us thinking along a given line on a given topic and, in my opinion, this is the fundamental or foundation upon which we are to sell safety ideas in our respective communities.

FOUNDATION FOR CAMPAIGN OF PUBLICITY

Example: Campaign against speeding in Louisville, Ky. We may say that we are suggesting to the community that accidents can and should be prevented. Each article that appears in the daily press should have this for an underlying basis.

Sight Example: School safety, home safety, public accidents, etc. As a matter of fact the daily press does much of our thinking on matters of civic and public interest. It may be through the news columns or on the editorial page. The idea is advanced and we consciously or unconsciously agree or disagree. Those of us who are managers of local Safety Councils find the press a powerful influence in such matters as needed legislation, law enforcement, etc.

Comment on Police and Courts: A problem that continually confronts us is, How may we secure adequate and effective publicity?

Paid press agents, careful cultivation of proper newspaper men, newspapers as Council members, preparation of news material, etc. There is no hard and fast rule to be applied, each community presents its own particular problem.

I have attempted to emphasize the necessity of an adequate amount of publicity. I have not gone into detail as to the material—this should suggest itself. Let us study carefully this important link in our programme. If we are falling short, analyze the situation and determine the cause.

If we capitalize on a human fundamental and suggest the idea of carefulness often enough and in the right way our efforts will bear fruit.

VICE CHAIRMAN DEARMAND: The next speaker, Mr. Elzy, is not present, but Mr. A. H. Lintz of Cleveland will give rather a brief resume of his paper.

ELIMINATING ELEVATOR HAZARDS

E. P. ELZY, AETNA LIFE INSURANCE COMPANY, HARTFORD, CONN.

I appreciate the confidence expressed by my appointment to serve another term as Chairman on the Elevator Hazards Committee, in company with Mr. T. A. Walsh, manager of the Wilmington Safety Council, as Vice Chairman, and Mr. Adam H. Lintz, manager of the Cleveland Safety Council, as Secretary, with the privilege of inviting to membership on the committee such men as we desired to have associated with us in the work. Accordingly, upon my invitation Mr. Alexander Marks, engineer, the Otis Elevator Company, New York City; Mr. James G. Shaw, supervising inspector, the Travelers Insurance Company, New York City, and Mr. Dale F. Reese, superintendent, engineering department, the Ocean Accident and Guarantee Corporation, Ltd., New York City, accepted membership on the committee.

Our first meeting was held in New York City on Feb. 17 with Mr. Marks, Mr. Shaw, Mr. Stork (representing Mr. Reese) and your chairman present. At this meeting we outlined the work of your committee and arranged for its distribution.

Mr. Marks agreed to prepare a paper on each of the following subjects: "Emergency Brakes," "Emergency Releases," "Emergency Switches" and "Emergency Exits."

Mr. Shaw: "Landing Doors and Landings," "Car Doors and Gates" and "Controlling Devices."

Mr. Reese: "The Importance of the Operator," "General" and "Description of Different Elevators."

Mr. Elzy: "Automatic Limit Stops," "Car Safety Device" and "Slack Cable Device."

After the completion of these papers each committeeman exchanged copies with the other members for criticism and suggestions.

The several meetings which followed resulted in the contents of these papers being embodied in a "Course in Safety for Elevator Operators," consisting of six lessons, as follows:

Lesson No. 1: "The Operator," "General" and "Description of Different Elevators."

Hydraulic Elevators: "Low Pressure Type," "High Pressure Type," "Vertical Type," "Horizontal Type" and "Plunger Type."

Electric Elevators: "Drum Type" and "Traction Type."

Belt Driven Elevators: "Double Belt Machines" and "Single Belt Machines." Also eleven questions on these subjects.

Lesson No. 2: A short treatise on "Controlling Devices" followed by five questions on the subject; also "Automatic Limit Stops" with four questions.

Lesson No. 3: Explains "Slack Cable Devices" and "Emergency Safety Stop Switches," with questions.

Lesson No. 4: "Car Safety Devices" and "Emergency Car Exits."

Lesson No. 5: "Landing Doors and Landings," "Interlocks," "Electric Contacts," "General" and "Emergency Release Devices."

Lesson No. 6: "Car Doors and Gates" and "Emergency Car Brake."

Our report is respectfully submitted with the recommendation that the Public Safety Section transmit it to the National Safety Council, suggesting that copies of the lessons be forwarded Secretaries of local Councils for use in their vocational schools for the instruction of elevator operators.

MR. A. H. LINTZ: I offer as a motion that the Public Safety Section formally approve the report of the Elevator Hazards Committee and recommend that the lessons be printed and distributed at the earliest possible moment. (The motion prevailed.)

CHAIRMAN VAN SCHAAK: Mr. Frank E. Morris is not able to be with us and Mr. Lewis E. MacBrayne will read his paper.

TYPICAL SCHOOL HAZARDS

FRANK E. MORRIS, SAFETY ENGINEER, LIBERTY-MUTUAL INSURANCE COMPANY, BOSTON, MASS..

School hazards have been interpreted by your committee as including all potential accidents that may threaten a child from the time it leaves home on its way to school until its return. The accidents to children of school age that are daily recorded in the newspapers seldom occur on the school premises, but frequently happen soon after the close of the afternoon session. It is, therefore, apparent that any program outlined to develop methods for eliminating school hazards must take notice of these facts.

Obviously the organization of a safety program in a school should begin with an understanding of the hazards of the building and the development of emergency measures to meet them. Practically every school anticipates the fire hazard; this subject has been carefully investigated by the National Fire Protection Association and reported upon in its leaflet, "Fire Protection for Schools."

There are a few outstanding facts that the principal of a school should make a matter of personal attention. If a fire is discovered during school hours his problem is not to extinguish it but to empty the building of its occupants as safely and rapidly as possible. In anticipating such action, in the organization of fire drills, he should detail trustworthy monitors to clear basement toilets of possible occupants and assist any crippled children who may be numbered among the pupils.

Where there are several exits, the fire signals should be so arranged as to indicate which are to be used if by chance one has been rendered unsafe by smoke. If the basement is used for manual training, gymnasium or other school purposes the possibility of the use of certain windows as emergency exits, if other escape is cut off by smoke, should be considered.

Inquiries by your committee have disclosed the fact that there are fire drills in certain schools that do not include the use of fire escapes with which the building is equipped; other schools are equipped with fire extinguishers, the practical use of which is unknown to many of the younger teachers.

We find that safety instruction has not always kept apace with equipment for manual training courses and vocational schools. It is possible to find school workshops where no effort has been made to guard transmission machinery within six feet of the floor; where the points of operation on a machine are not guarded, and where no use is made of bulletins showing how accidents on the machinery and tools in use can be avoided.

In such schools switches for motors are not enclosed nor are switch boxes and motor cases grounded. In short, school safety is a full lap behind school hazards.

On the other hand, in schools that seek to interpret safety through every possible channel, we find classes in chemistry posted as to antidotes for poisons, classes in domestic science instructed as to burns and the careless use of tubs of boiling water in their relation to accidents in the home; gymnasium classes able to demonstrate the prone pressure method of resuscitation, the theory of which has been explained in the physiology classes.

SAFETY PROGRAM WHICH PROVED SUCCESSFUL

In a Massachusetts city, where safety squads have been organized in all grammar schools, specific needs have been met in the following manner:

Safety squads of boys act as policemen at the hours of dismissal. The boys are selected with great care and their parents consulted and permission obtained from them before assignment of traffic duty to the pupils. The boys are instructed by the chief and sergeants of the police department in charge of traffic regulations.

Safety squad looks after schoolyard at recess.

In one section of the city a railroad bridge makes a dangerous congestion in traffic. Two boys who live near this danger spot have the responsibility of seeing that the younger children pass by in safety.

A slide in the schoolyard is excellent for the practice of caution at play and one boy is assigned to help the younger children.

In front of one school a traffic squad stops speeding motors with a sign "This is a school!"

In a high school, near a square of several intersecting streets, traffic duty is done at the closing hour by the school guard, who appear in uniform and render crossings safe for hundreds of younger pupils.

It is apparent from our study of available data that the peak of highway accidents, resulting from increased motor traffic, has not yet been reached and that the groups which are the last to yield to organized prevention work are composed of children or elderly people. In view of this fact, most serious attention should be devoted to the child-hazard problem in all large centers of population.

The problem of accidents to children on their way to and from school is one to be solved by education, whether it is undertaken in the school, the playground, or in the home, and the present opportunity is to sell this idea, not only to teachers and parents, but to communities as a whole.

It is important to give emphasis to the following fundamental information, that children of school age are injured in the following common ways:

1. By darting in front of a motor vehicle or a street car.
2. By using streets for a playground.
3. By getting on or off the rear end of a moving vehicle.
4. By stepping out carelessly from behind a parked car or other vehicle.
5. By following an ice cart.
6. By playing with bonfires, starting fires, contact with open gas flames.
7. By falls from high places.
8. By riding a bicycle carelessly among swift moving automobiles, by catching hold of a motor truck while riding a bicycle, or by riding on the handlebars of a bicycle.
9. By walking on railroad tracks or playing in freight yards.
10. By skating on thin ice or by playing about unsafe waters.

SUGGESTED METHODS FOR SCHOOL PROGRAM

These accidents can be greatly reduced by instruction of the child:

The School—Use of text books, safety organizations and poster contests; safety stories, pantomimes and plays.

The Home—Reach the mother first through safety programs in the parent-teacher associations, the club, etc. Supply women's magazines with articles on the increasing menace of the child hazard. Reach the father through his contact with organized industrial safety.

The Playground—In Massachusetts, this year, safety stories, posters or movies were supplied by the Safety Council to 300 playground supervisors. The mayors were first interested in the subject and in the larger cities conferences of playground supervisors were held and their interest secured in the practical details of the campaign.

Boy Scouts—This and kindred organizations are ready to undertake specific accident prevention work.

Serious accidents among school children can be reduced one-third wherever a campaign is fully organized. To undertake a Nation-wide program will involve a very large sum and the National Safety Council should limit itself to one or both of the following propositions:

(a) Set apart a sufficient sum to thoroughly organize a city of moderate size—preferably one with a high accident record for children of school age—and send a field secretary there to put over a year's campaign with the co-operation of the local municipal and school authorities, giving Nation-wide publicity to the experiment and publishing the details of the plan and its results for general use.

(b) If the National Safety Council can make no appropriation for this work, then special reports should be prepared on the five cities that are doing the most effective work to reduce school hazards; this data should be offered to other cities that show an interest in the subject.

DISCUSSION

MR. MACBRAYNE: Mr. Morris and I have been very much interested in the psychology of children with reference to accidents and what is the best manner to get safety to the child in the city where we have not sold the idea to the school authorities. In Boston, this spring, we laid this problem before the school department. Throughout the State we have obtained a reduction of about 10,000 casualties in automobile accidents over the preceding year, but in place of that there was an increase of 1,400 accidents in Greater Boston. You have no right to ignore the fact that while one part of a community, through a study of infant mortality, is reducing the rate of younger children's death, you are permitting other children to be killed because of lack of instruction in schools. The authorities said: "If you can show us a practical program to be worked out in other than school hours, we will make that a basis for discussion."

We made arrangements by which, every Saturday morning during May and June, they furnished us a high school with a thousand pupils or as many as the room would hold. By the end of June they were so impressed with our meetings that they asked us to continue them throughout the summer and we have been holding them and bringing the children from the playgrounds to each meeting.

At the first meeting we said: "Children are not forced to come to school Saturday morning, but they are invited to come and, consequently, there should be no rules. We want to gain their co-operation and the whole note of the meeting must be 'Boys and girls, we come to you as we came during the war to ask your assistance.'" The program, as arranged by Frank Morris, consisted of five-minute blackboard chalk talks; then we put on a one-reel comedy (no safety in it); a traffic officer gave a five-minute talk on signals; later on, we gave a safety film and a Boy Scout film. We started the meeting by asking what "A. B. C." meant and five or six answered, "Always be Careful!" We said: "Four times as loud!" and they responded. The whole idea with us was to register on their brains "Always be Careful!"

GETTING THE CHILDREN INTO THE PICTURE

We went over the various signals of the traffic officer and when we displayed the signal everyone shouted "Look left!" When we came to the "A. B. C." of safety one of the teachers said, "One moment, Mr. MacBrayne." She addressed the children, telling them not to shout so loudly. But we told her that our theory was to get the children into the picture and we did not want them told "don't do this and don't do that." "You sit down and be good," I told the teacher, "or you will stay after school."

A little girl in a pink dress showed how to cross a street. We illustrated: "Here is the curb, you are the father; what do you do when you get here: 'Look left.'" "My! there is a big truck coming, we better let it go by"—the big truck goes by. "All right! Now we can get across."

The traffic officer went on at the first meeting, I had had him assigned by the police commissioner, and he is now full-time on my payroll. I am

using him every day, not only in school, but at practices in the evening.

At the first school meeting he was all dolled up and did not explode. I told him where the trouble was: "You made a speech about yourself; forget yourself when you go on next time; do not say one word for the first two minutes." "What am I going to do for two minutes?" "I will show you," I answered. The next meeting he came with his cap and white gloves and began throwing signals, but did not say a word. When he had the attention of the children he said: "Boys and girls, you have all seen the traffic officer but perhaps do not understand his signals. As a boy I used to say 'Cheese it, the cop!' I do not want you to think of me as a 'cop'; I am not, I am a man whose job is to prevent people from being hurt and I have had a good day's work when I go home and say: 'No one was hurt on my post today.' If you boys and girls know the signals you can help.

"What does that mean?" "Stop." "Does it mean everyone is to stop?" and they answered, "Yes." "Oh, no," he said, "that means autos are to stop. When I turn my hand this way (illustrating) they are to come. When I do this it means 'People are to stop,' and when I do this (illustrating) it means 'People are to come.'" Then he had a number of boys and girls on the platform to show the signals, directing them to come, and they crossed over. Then we put on the safety film.

CHILDREN MUST HAVE PLACE FOR PLAY

Children cannot play in the streets any longer, but we did not say that to them. You cannot lie to a child, and we knew perfectly well that we cannot teach that to children in the south end of Boston, or the north end, because there are enough children to cover the streets when they are all out. There are no parks and no closed sections. We said to the children: 'You ought to get out of the street,' but we knew how hard it would be, so we appointed an auto captain to serve in each street, and when he sees an automobile seventy-six feet away he knows that in two seconds that automobile will come to where he is. He knows if an automobile is thirty-six feet away that when the driver puts on his brakes, on a slippery pavement, that it may slip and slide, so when the automobile is beyond seventy-six feet away he shouts a warning."

We do another thing at our meetings. If a child has been killed that week, if his age was 8 years, every boy or girl in the room 8 years of age stands up for ten seconds, in silence, as a message of sympathy to the father and mother of the boy that was killed.

This summer a fire truck was called out and as it was going along a boy ran into the street. To avoid running over the boy the truck ran into a pole; seven firemen were injured and sent to a hospital—one of the men is still there. We told the children the story and never to cross a street without being sure it was safe. They all pledged themselves to do so.

CHAIRMAN VAN SCHAAK: It is unnecessary to add an expression of thanks to Mr. MacBrayne. An invitation is extended to all delegates and visitors to call on Police Commissioner Inches and Inspector Jackson and to exchange experiences with them,

Mr. Beyer, our next speaker, needs no introduction to National Safety Council audiences.

PUBLIC SAFETY LESSONS TAUGHT THROUGH MOTION PICTURES

**DAVID S. BEYER, VICE PRESIDENT, LIBERTY MUTUAL INSURANCE COMPANY,
CHAIRMAN MOTION PICTURE COMMITTEE, NATIONAL SAFETY COUNCIL**

Mr. Will Hays, who recently gave up the position of Postmaster-General of the United States to become the spokesman of the associated moving picture interests, tells us that approximately twenty million people patronize the moving picture houses in this country every day and that "In a few years the motion picture has penetrated every hamlet in America. * * * Entertainment by the motion picture is afforded new millions monthly. In its educational possibilities in and out of theatres * * * we have scarcely scratched the surface. Almost overnight it has come to be the great recreational and entertainment agency of the country, one of the greatest teachers of our times, a fundamental influence shaping American life."

All over the country our schools are being supplied with motion picture equipment, just as fast as the boards of education can be separated from the necessary appropriations. I understand that Detroit is one of the leaders in this movement, with practically 100 per cent equipment, and Newark, Los Angeles and many other cities are making rapid headway. New York has an appropriation of about \$25,000 per year and the indications are that this will grow to a much larger figure in the near future.

Anyone who can recall his early school days will readily understand this interest. In geography we used to try to learn by heart such statements as "The principal products of Mexico are petroleum, gold, silver, hides, insurrections, etc." How much easier it is for the modern youngster who can see, via motion pictures, the operation of the oil wells, the mines, the cattle industry; where the dashing Villa may ride into the picture at any moment!

I don't believe it is necessary to try to convince this audience that motion pictures are the ideal way of putting across the hazards of the automobile, the fallen electric wire or the old swimming hole—I believe you are all convinced. What seems to be most needed is pictures to supply the demand.

One of the published objects of Mr. Hays' association is to provide good educational films. A lot of work along this line has already been done. One of the motion picture journals, which started out a couple of years ago to compile a list of one thousand and one educational films, found two thousand before completing the list, and a recent revision shows the number has increased to between five and six thousand.

DEMAND FOR GOOD SAFETY FILMS

There is a great need for good safety films, but so far only a slight response has been made to this need. During the last year or two a

number of communities have attempted to produce such a picture, but with rather indifferent success. In a large educational center an appropriation of several thousand dollars was recently made for a new film and a local distributing agent called in and told to go ahead and make a safety picture. There was no scenario or plan and the result was very much as though you called in a carpenter and told him to build you a house without saying how many rooms you wanted or whether it was to be of wood or brick; whether you wanted to use it as a bachelor's apartment or entertain your mother-in-law and all your country cousins. The picture is not yet completed.

Two or three things generally result in such a picture. In the first place there is usually an unrelated series of staged accidents. These soon lose interest, as would be the case if we were to try to read a whole page of accident descriptions in a newspaper. In such pictures there is usually a tendency to give a lot of footage to pictures of local officials, and in this way limit the interest and usefulness of the film to a narrow field.

A film should be planned just as carefully as a good architect would design a house. Important points to be brought out should be determined, the character of the audiences should be considered and the best psychological appeal developed. I recently saw the scenario of a play that was to be produced by one of the entertainment film corporations; it had been rewritten and revised by expert scenario writers six times, and was still being worked upon. That was before a single foot of the picture had been "shot."

Until our so-called educational pictures receive the same careful thought in the writing of the scenario, in the use of a skilled dramatic director and in the selection of its actors and settings, the effect will be about as interesting to the general public as the scrub ball team on the corner lot is in comparison with the big league.

EDUCATIONAL FILMS ARE OFTEN FAULTY.

Your Motion Picture Committee, which held a couple of meetings during the past year, after a lengthy discussion by men who have long been studying this subject, agreed that the value of the motion picture was increased tremendously by the injecting of the elements of human appeal. In other words, a connected scenario, where we get really interested in the characters, will hold the attention of the audience and put its lesson over with much greater effect than a mere series of disconnected incidents.

Where we see a rapid succession of accidents such as a man stepping off a sidewalk and being struck by an automobile, another man falling from a ladder, one being electrocuted, etc., the very monotony of the thing tires us and many people in the audience are liable to actually laugh and take it in the light of slapstick comedy.

How much greater is the effect if we follow the life of the individual to whom the accident is about to occur long enough to get the idea that he is human, like ourselves; one to whom life is sweet and who is look-

ing forward hopefully to the future, on whom an accident falls as a blighting tragedy!

Last year the business depression made it difficult to secure the necessary funds to produce new pictures and two or three safety films which were planned have been held up for this reason. A new scenario has been prepared under the auspices of your Motion Picture Committee and just as soon as the necessary appropriation can be secured we will go ahead with its production. Those who are interested in such a picture should communicate with the Council and assist in working out the big problem of supplying the need for public safety pictures.

ROUND TABLE DISCUSSION

CHAIRMAN VAN SCHAAK: Mr. Beyer is the last speaker on our formal program. We will now have a round table discussion of which Mr. MacBrayne will serve as Chairman.

CHAIRMAN MACBRAYNE: We have the background, now let's come across with the problems or the solutions you have found; tell us the best thing you have done on any of the subjects on today's program.

MR. J. H. REYNOLDS: What are they doing in Boston in conducting schools for drivers and what success have you had?

MR. MACBRAYNE: We held our first school this spring and it was very successful. We previously had been asked to call a meeting of taxicab drivers—the man who wanted it was interested in taxicabs and said: "I will furnish the hall and audience if you will furnish the speaker." We did so.

In organizing our school I sent a letter to the managers of all companies operating taxicabs, saying: "Here is a cracker-jack school; here are the lectures, each one of them presided over by a man active in the automobile industry of New England, a distributor, and each man who lectures is a specialist in his field; your men should come. There is a growing feeling, not on the part of pedestrians, but on the part of pleasure-car owners against the practices of the taxicab; here is a chance for you fellows to do two things—come out and be wised up as to their problems and tell us your troubles so that we can pass it back to the other fellows."

PRACTICAL EXPERIENCE ADVISABLE FOR LECTURERS

We opened the course with a transportation officer of the Twenty-Sixth Division, a man who had been overseas, and he was a cracker-jack. We followed with a man I had asked to ride 200 miles on a truck; he came back and told us who was right—what he said was following out the idea of getting the other person's viewpoint. He said: "I went out, intending to bump you for the things you do, but I discovered the seat of my truck was wrong. At the end of sixty miles I was out of patience, because of the seat. I found myself astride of the road, blocking traffic, which is one of the things that I have been trying to get after you for. Here is the other side of it." We had a good heart-to-heart talk at that school. The attendance ran up to 125, but many of the men were in charge of fleets, so where we did not get a driver out we slipped the idea to a manager.

We have letters saying: "When you have another school let us know. It is the exact thing we need to arouse co-operation among our drivers in an effort to reduce hazards."

A VOICE: Do you instruct your classes on the importance of brakes and steering mechanism? Just what instruction do you give, and what sort of notices do you send out as an inducement to get them to come? Do you go on with the class without entertainment?

MR. MACBRAYNE: We furnished little entertainment to the drivers; we relied entirely on a printed ticket, no admission except by ticket, who the lectures were by, and the name of the presiding officer.

We have a very able man in our registrar of motor vehicles—the first man in the country who began taking away licenses if he caught a driver taking a drink while running a car—you might be running five miles an hour but you would lose your license if there was sufficient evidence for this action. I put Mr. Goodwin, the State registrar, as the last man on the program: His speech was "How to Lose Your License." We passed the word around "Come out and we will put something over on this fellow. He thinks he is running this business, let's go and ask him questions."

We had a crowd out, all having it in for the registrar. Then we said to the registrar: "These fellows think you are coming in to tell what you are going to do with them."

For the first fifteen minutes he told of funny things that happened at his office in the course of his work and the hard-boiled drivers shook with laughter. "Here is my job," he said, "and if any man in the audience wants it he can get it." He recited the case of a child that had been killed the day before and how the mother came to his office, showing him the picture of the little one. The truck driver was not to blame, but he could not convince the mother of this fact, so his conclusion was: "Even when you are not to blame you have to help me with more careful driving." The audience was interested at once.

NEW TEXT BOOK SOON IN CHICAGO SCHOOLS

MR. LAUGHLIN: Attempts have been made for the past six or seven years to have Safety Council talks as a regular part of the curriculum in the schools. About two years ago Chairman Dean called a meeting of his committee and had present the superintendent, Mr. Peter Mortenson, and also President Davis of the board of education. He explained the ideals and principles of a text book to be used in the curriculum. Mr. Mortenson was not impressed and neither was Mr. Davis, but we finally secured their permission to call Dr. Payne from St. Louis to address what is known as the "Principals' Club." At this meeting they were so impressed by the words of Dr. Payne that Mr. Mortenson appointed a committee of three principals to prepare a small text book on safety. This was used in the public schools during the month of June, 1921. During the vacation period immediately following, that is during July and August, Chicago had a decrease in child fatalities of 10 per cent, and we attributed that decrease to the teaching of safety in the public schools. The proposition appealed to the board of education and to the super-

intendent to such an extent that he authorized the committee of principals to prepare a text book on the subject. This is now in its final stages and will approximate 200 pages. It is divided into twenty chapters—ten of which deal with various aspects of safety—including health, fire prevention, sanitation and allied subjects. The book has been reviewed by forty of the best known people in their lines in this country, and if any of you folks would be interested in seeing a copy or passing on it, giving us the benefit of such suggestions or criticisms that occur to you, we will be glad to have you do so, because we are ambitious to have this one of the best text books that has ever been issued.

MR. COLEMAN (Buffalo): Buffalo is like a great many other cities, it has a shortage of adequate playgrounds—we have a good many and they are fairly well scattered, but much of the planning for recreation work was done many years ago and many districts have grown to very considerable proportions in the last four or five years.

This summer the safety bureau of the Buffalo Chamber of Commerce made a survey of the city for playground facilities and we discovered a number of districts without suitable playgrounds. We appealed to the City Council for appropriations and promises to set aside certain streets during certain hours of the day for playground purposes. An appropriation of \$5,000 was obtained from the council to provide supervisors and such equipment as might be necessary for this class of streets. The playgrounds are now in operation and have been for three weeks.

RESERVING STREETS FOR CHILDREN'S PLAYGROUNDS

The smallest number of children I have seen on any one street is thirty and I have seen as high as 250. The beauty of it is the children who use these street playgrounds are the smaller ones, the children who would be, naturally, the greatest hazard on the streets.

The city park department is exceedingly pleased with the result, and I think, without question, they will increase the number very materially next year, but one thing I want to impress upon you is the fact you must have a trained leader on each street. We have a man for boys and a woman for girls, so the boys play in one section on the street and the girls in the other.

A VOICE: Are you giving safety instruction?

MR. COLEMAN: The whole thing is so new that we have not developed it to the fullest extent.

MR. MACBRAYNE: We made a contact with twenty-five mayors this summer, and gave instruction on playgrounds. I am anxious to develop the idea—most supervisors are young school teachers. Nearly all have a story telling period and there is an opportunity to utilize this time for safety information if we can get it over in an attractive form.

MR. CLARKSON (Pittsburgh): Despite the fact that the coroner's office of Allegheny county is a fee office he has gone on record as being a real accident preventor. Recently we made arrangements with him whereby the safety men of our district serve on his juries. Hereafter four of the jurymen each week will be safety men—that is, the heads of safety work in various plants or safety committeemen selected from the

plant. Heretofore juries have been handed down from one administration to another and have been composed of old chaps that had nothing else to do. They have listened to how an accident occurred and possibly, doing their duty, brought in a verdict. Now we propose to use the jury findings for publicity—I think it will make wonderful publicity—and by having safety committeemen on the jury it will permit those who represent the heads of various plants to take a great deal of safety back to their committees, discuss it, and find out what is the best safety way to prevent accidents.

CHAIRMAN MACBRAYNE: That is very good.

MR. WALSH (Delaware): The Council of Delaware started an investigation of state highways when a railroad survey was to be made. We had had numerous collisions on the highways and we went before the engineer of the commission with a sign devised by the Council. It was nothing more than the standard highway sign mentioned here yesterday, developed in conjunction with the association of motor vehicle executives in the Eastern States. We went a little further and put a reflector on it. The sign has not been placed on the main highways, but on the cross roads and county roads we have set that sign 300 feet off, with the result that a machine will catch it before it comes to the highway, probably through a growth of trees or something of that sort. The work has proved successful because three counties had adopted a sign previously and we had any old kind of a sign on the county roads which intersected the state highways. We are now going to have uniform signs, but I do not know that they have gone as far as we did in using reflectors.

CONVINCING DRIVERS OF NECESSITY FOR CARE

MR. KING (Pittsburgh): Mr. Clarkson did not tell you all that he has done. We have a safe drivers' club and this year we have had an attendance of 750, graduating 527. Graduates are given a pin and a card if they attend 75 per cent of meetings, providing they give a good excuse for not being present at the balance. We entertain the drivers and the merchants are interested, often contributing to the cost of the meetings. The captain of the traffic squad gave an address and the mayor was there. There was no compulsion on anyone to come, but we put it up to the drivers: "It is your duty to be there and what you get out of these meetings will benefit you in your job."

MR. ATWATER (Minneapolis): How did you convince them?

MR. KING: By the different cases we analyzed.

MR. CLARKSON: We have a safe drivers' club. We sent out a letter and pamphlets to companies that had six or eight automobiles. We asked them to pay a dollar for each of their drivers; if they had more than eight automobiles, we asked them to pay \$10 for membership. We got \$1,200 and only sent out one letter. We did not try to develop it further but memberships are still coming in.

MR. KING: I put it up to our drivers that for the last six months of the year every driver that passes that period without an accident will receive a substantial bonus. We are also going to give them a sign

to put on their machines: "My record for 1922, no accident!" We will have a banquet and when the drivers get the bonus of \$25, together with the pin and sign it will make the other fellows ashamed of themselves.

MR. MACBRAYNE: I have a membership of 2,500 automobiles in our Safe Roads Federation, which corresponds to the safe drivers' clubs. We give the men the right to report to us any case of reckless driving, or drunken driver. We do not encourage reports from pedestrians, but we know what driver will be fair to another. We get reports from all over the state and in a great many cases they are the very men we want to get after.

We mark dangerous curves with white lines and a man that swings over the wrong side of the road, over the white line, is reported. When we get such a report we send out what we call a friendly letter, giving information of the accidents at that curve, and say that the registrar considers that a violation of the law—that we want co-operation. The fact that we state the registrar considers it a violation, and we have the registrar's name on the heading of the notices, has a good result. The next time a man is reported, we suspend him for three days.

HOLDING INTEREST IN SAFE DRIVERS' SCHOOLS

MR. ATWATER (Minneapolis): In Minneapolis we have had three schools, one each year, and each year the number decreases. There is a tendency with those men who have taken one course not to care for another—no matter how you try or how carefully you prepare a course, your class will be smaller. With our last course we offered what in reality was a supplemental mechanical course. We found that out of 225 men enrolled most of them had never taken a course before, but that 125 stayed with the safety courses and 100 were so interested that they came two nights a week while the course lasted.

MR. PATTERSON (St. Louis): We have had four years' experience with gentlemen drivers' schools and two years with ladies', and with both courses we have given instruction in technical work as well as safe driving. Our classes are larger and larger each year. The course pertains to efficiency and economy in operation of automobiles and trucks for men and passenger automobiles for ladies. Last year I used slides to great advantage. The only trouble we have is to get a place large enough to hold the school.

The Section then adjourned.

Public Utilities Section

August 30, 1922

J. F. NAYLON, Chairman

New York Telephone Company, Newark, N. J.

EUGENE VINET, Vice Chairman

Middle West Utilities Company, Chicago, Ill.

A. O. MITCHELL, Secretary

Northern Indiana Gas and Electric Company, Hammond, Ind.

WEDNESDAY MORNING SESSION

THE meeting was called to order by the Chairman.

CHAIRMAN NAYLON: Mr. Webber, is the Nominating Committee ready to report?

MR. WEBBER: For officers of this Section for the ensuing year, your committee nominates the following:

Chairman—A. O. Mitchell, Northern Indiana Gas and Electric Company, Hammond, Ind.

Vice Chairman—H. A. Mott, Illinois Bell Telephone Company, Chicago.

Secretary—B. B. McCulloch, Bureau of Safety, Chicago.

There being no other nominations the Secretary was, upon motion duly carried; instructed to cast one ballot for the men selected by the Nominating Committee. The motion prevailed.

CHAIRMAN NAYLON: Our first paper is by Mr. John H. Eustace.

THE RELATION OF THE CHIEF ENGINEER TO ACCIDENT PREVENTION

**J. H. EUSTACE, CHIEF OPERATING ENGINEER, THE PEOPLES GAS LIGHT AND
COKE COMPANY, CHICAGO, ILL.**

The operating engineer by the proper use of *material, methods* and *labor* strives to produce a finished product with a minimum of cost. The successful operating engineer is never entirely satisfied with his results. If the costs of production are high, he must reduce them, or

if low, he strives to make them lower. His ambition is to produce a better product at a less cost than his competitor.

In the close analysis of costs, continued efforts are made to obtain materials of the best quality at as low a price as possible; methods are studied to the end that they may be improved and time studies are made in order that workmen may perform their duties in the shortest possible time and in the most efficient manner. All of these are necessary and as they should be for they all are steps towards the elimination of waste in industry.

In this saving of waste, good materials at low cost price and improved and efficient methods very obviously play a most important part and these two elements are very generally appreciated by operating engineers. The third essential, namely, the continued, uninterrupted and safe employment of labor with maximum of efficiency and output, and the saving of direct or indirect accident costs is not, however, always thoroughly recognized by the operating engineer. Nor does he always give the same close attention to accident prevention as he does to the selection of material and the development of economic methods. Whenever an engineer overlooks the waste caused by accidents as an element of his operating problems he is losing sight of a most important source of waste and failing to recognize a chance for business-like economy in the cost of production.

GOVERNMENT RECOGNIZES GREAT ECONOMIC WASTE

The United States government recognizes that there is a great economic waste in this country and under the direction of a great engineer, Herbert S. Hoover, is attempting to minimize it. Our government recognizes industrial accidents as an important factor in these efforts to place a check upon this useless wastefulness, a wastefulness the magnitude of which was not realized until recent years. Here is an opportunity for the engineer to render a great national service. What better service can any citizen perform than that of conserving our resources and at the same time save human lives and preserve the happiness of the American workingman and his family.

That the effort of the engineer to minimize accidents is well worth while may be illustrated by the fact that for the period of 1912 to 1920 the Safety Division of the Industrial Commission of Ohio accounts for a minimum total of \$80,000,000 for the medical and compensation cost of industrial accidents. This does not by any means measure the total cost of industrial accidents in the state of Ohio, for to this amount should be added the loss to the workers in wages over and above the amount of compensation received (which would add from \$40,000,000 to \$50,000,000). There is also the additional loss to employers from the greater labor turnover, which obviously slows up production and which has its bearing on spoiled material, damaged machinery and other losses. If this enormous loss is for one state only what must it be for the whole Nation? Statistics further show that there are 80,000 accidental deaths annually in this country of which 75 per cent are preventable. This aggregate

and percentage show our carelessness and almost criminal unconcern of the value of human life as American people.

Accident prevention is business-like economy in any industry, for if it is true that 75 per cent of all accidents are preventable, then it must follow that 75 per cent of accident costs can be saved. Aside from the saving in compensation paid an injured employee while off duty, there are other benefits to be derived from an efficient safety organization which must be reflected in the cost sheets. Among these benefits are improved service, better efficiency and higher morale, all of which follow well-directed efforts for safety of operation.

CHIEF ENGINEER MUST TAKE ACTIVE INTEREST IN SAFETY WORK

In these days, after our years of experience have proved that organized and careful plans for safety in the operation of our properties give returns of such great value, there are few business executives and few heads of departments who are unconvinced that safety is not only good business but also a great opportunity for doing good as citizens and contributing to the welfare of our great Nation. How many executives, however, back up this conviction with the same active interest that they give to their other industrial activities? There are many duties, particularly matters of detail, which may be properly delegated by the chief engineer to his assistants. There are, however, matters of policy which never can be delegated, but which must constantly receive the interest of the chief engineer and without his continual attention such policies are apt to become a dead letter so far as the operating organization within the plant proper is concerned, and of these duties accident prevention is a good example.

All of us must admit that safety pays, but is it not true that many of us do not get results because we expect Safety First to produce its own results? Such elements as publicity, meetings, buttons and talks on the subject certainly have their place in the work but they are details and to make them effective those who are in supervisory capacities must see to it that the prevention of accidents is a part of the everyday operation of the plant, for after all it is this very practical application of accident prevention which counts for most when results are measured, more than do the less important details just referred to.

Probably the most important step in safety in any organization, large or small, is that of education. The workmen must be taught to think safety and to act safety in their work and should be encouraged to report unsafe practices and to make suggestions toward the prevention of accidents. The man on the job is, after all, in the best position to judge unsafe conditions and practices, and if he is taught to think safety and encouraged to make suggestions for accident prevention he not only becomes a booster for safety, but feels that he is something more than a cog in the machinery and becomes a more efficient workman.

Such training, however, cannot be imparted without being supported not only in theory but in fact by the executives of the company, nor without the personal interest of such supervisors as the chief engineer and the knowledge throughout the organization that this support and interest

is really accorded. To satisfy the men that the company is in earnest all suggestions as to safety received from an employee, whether good or bad, should be acknowledged, so that the man may feel that his efforts toward safety are appreciated.

PRIZES FOR SUGGESTIONS OFFERED BY EMPLOYEES

The Peoples Gas Light and Coke Company of Chicago has for years encouraged the practice of suggestions from employees, not alone regarding accident prevention but regarding other working conditions. For all suggestions accepted a small cash consideration is given. The men making the most valuable suggestions during the year are given a more substantial prize. During the three-year period ending Dec. 31, 1921, 659 suggestions regarding accident prevention were received from the employees. Of this number 377 have been considered practical and accepted by the company. This is the kind of safety work that is practical and that pays, for in order to make the suggestion the workman must have safety in his mind and thinking safety is practical safety and practical safety pays dividends.

Education of the foreigner is another important factor in accident prevention. Not only does it lessen the liability of accidents to himself and his associates but it assists in the Americanization of aliens, which is another of our present-day industrial problems. According to the Bureau of Industries and Immigration 70 per cent of the claimants under the Workmen's Compensation Law in 1919 required interpreters to represent them. It is difficult for workmen who have no knowledge of English to understand orders given by the foreman or read printed instructions and therefore they are more subject to the risks of their occupation than are others favored by an understanding of our language.

No plan for the prevention of accidents is complete unless it provides for our careful attention to practices and methods. The operating engineer should give the same consideration to practices and methods which have a bearing on the safety of employees as he does to other operating methods having to do with efficiency or economy. When plans for a new building or new installation are presented he should always review them from the viewpoint of safety. He should take cognizance of safety in all plans of construction or installation, for in doing so he not only assures safer operation but he may effect considerable economy by providing physical safeguards in the plans and first construction and by avoiding the necessity of making structural changes after the structure has been built or the installation made. An instance may be cited where recently a plant was badly damaged and some of the employees were seriously injured by the explosion of a compressor which was within the main plant. It was necessary to rebuild the plant and, profiting by the experience of the explosion, the compressor was installed in a separate enclosure outside the main building. Recently the newly installed compressor exploded and on this last occasion the damage was very slight, because it did not effect the main building and only damaged the enclosure in which it was located.

FIRE HAZARDS MAY BE AVOIDED

In construction and in operation many fire hazards may be avoided by a serious consideration of fire-prevention measures. This not only guards against the likelihood of fire damages but results in a saving of insurance premiums. Too often changes are recommended by a representative of the fire insurance company after buildings are completed or after repairs are made which either must be carried out at considerable expense or, if left undone, will result in higher insurance costs. Such developments are not uncommon in many otherwise wisely managed concerns.

An efficient safety organization is necessary in any large company, for it is by this means that the policy of the chief executive is to be carried out and results obtained in a businesslike way. The organization should be so complete that every workman knows that he is an active and responsible part. The chief engineer should keep in touch with his safety engineer in the same manner as he does with his other assistants. The organization, no matter how perfect it may be, will not function to give the best results unless the chief executive and his assistants have a sustained interest and keep constantly in touch with the work.

Let us not be misled, therefore, in believing that accident prevention does not pay. It does and pays handsomely, just how much can never be estimated in dollars and cents. It is easy to determine the money saving from the standpoint of compensation paid to nonproductive injured employees and damaged property, but who of us can set a value on a lost life, or a lost limb or eye? Our satisfaction in the knowledge that our efforts have saved a human life is of far greater value than all the dollars and cents saving we can show in operating cost sheets.

DISCUSSION

CHAIRMAN NAYLON: We have had the pleasure of listening to a paper which shows our problems from the standpoint of the engineer and operating man. That is a rather unusual combination and the paper has been particularly illuminating for that reason. We are very much indebted to Mr. Eustace.

MR. C. B. SCOTT (General Manager, Bureau of Safety, Chicago): If you have an organization within your own company for the prevention of accidents, and you see it as something set to one side of the operating organization, you have the wrong idea of what we are trying to do. The biggest problem we have today in this work is to tie-in accident prevention with operation! You will not learn anything here that you can take home and put into practice that will do as much good as to weave yourselves into your operating organization.

The safety man who does not know his chief engineer except casually and only sees him every week or so, and then just politely talks to him, doesn't know a lot of the troubles and problems of the chief engineer—he is not in intimate touch with him and he is not a very good safety man.

We get too far away from the heads of our operating department; we have not been intimate enough with them. Mr. Freeman of our bureau was going out to investigate a certain matter and he asked me what to do. My answer was: "You have to do but one thing, sit down with that man and find out his problems; go over them with him and try to settle them." It is not the owner of property I am talking about, but the man who has charge of production, the real operating man! You can do it when you have a man that sees that accident prevention is necessary—you cannot if you do not have such a man.

Take this idea and do what you can in your company; talk to your chief engineer; tell him this is what Mr. Eustace, chief engineer of the Peoples Gas Light and Coke Company said—he is the chairman of the central safety committee—that every chief engineer should occupy a conspicuous place in the accident prevention organization of his company.

FAILURE OFTEN DUE TO LACK OF CO-OPERATION

MR. CONNOR: I heartily endorse the statements of Mr. Eustace and Mr. Scott. Many of the failures of safety engineers are due to their lack of co-operation with the operating head—I had to learn by experience.

A very wide and important field for the safety engineer is in checking plans of construction—operating heads haven't figures as to costs of accidents. The safety engineer should be a man of ability, able to read blue prints, pick out weaknesses of construction insofar as they relate to accident hazards, and go over the details with the operating heads or constructing engineers, having the plans changed before construction gets under way. Changes can be brought about very readily at that time, whereas if the work goes ahead you will find it difficult to get them inaugurated after the material is ordered, cut to size and so forth—then it is a question of expensive changes. In our company we do that; in fact, we keep in touch with the drafting-room from the sketches to the tracings, and every tracing must be initialed by the safety department before it goes through.

MR. BEAUMONT: I would like to give a few accident statistics for the Peoples Gas Light and Coke Company which indicate the effect of Mr. Eustace's attitude toward accident-prevention organization. In 1919, when the safety committee was started, we had 3 fatal and 417 disability accidents; in 1920, 3 fatal and 337 disability accidents, a reduction of approximately 20 per cent; in 1921, 2 fatal and 288 disability accidents, a further reduction of 15 per cent; this year, so far, there have been no fatalities and 130 disability accidents—about 15 per cent reduction. In other words, disability accidents have just about been cut in half.

CHAIRMAN NAYLON: Your accomplishments have been noteworthy; you attribute what you have accomplished largely to the fact that you have a chief engineer who is tied in very closely to your operating department.

MR. BEAUMONT: There are three factors, one of which is that the chief engineer is interested in safety and his assistants have made it clear all along the line that they want attention given to safety work.

Secondly, the executives under him are supporting it very heartily. The other factor is personal contact with the various plants.

ACCIDENT PREVENTION SUBJECT TO AVERAGES

MR. MORRISON: I am interested because statistics are very necessary, in my judgment. Your work will gradually reduce the number of accidents during a period of years. You may have a number at intermediate periods, but do not blame the chief engineer or the operating manager because it is, like insurance, a question of averages. I have in mind a large gas and electric plant in New York that had a remarkable record for four years, yet in the last three or four months they have had a series of unfortunate accidents. An accident figure that is away down is like an athlete on his toes, ready to run 100 yards. He is fitted for that particular dash, but you and I know it is hard to maintain that condition 365 days a year, twenty-four hours every day.

CHAIRMAN NAYLON: An organization may go along with a material reduction in the number of accidents over a number of years, but unless you take into consideration the number of days of disability—which is the real answer to the severity of accidents—you are not getting an answer. One company may have 100 accidents a year, with a loss of time of two to five days, and another company may have twenty-five accidents with an average of fifty days lost time. Which organization is doing the better job?

When you get accidents down to a certain point it is like any other operating job, you become used to it and think: "Well, I am doing a pretty good job;" you are asleep and something happens. Whether it is accident prevention, production or maintenance work the minute you think you are doing a good job, watch your step—something will happen if you don't.

MR. MORRISON: My thought is that one company might have one fatality and another company might have twenty abrasions—the fatality is worse than the abrasions! It is possible to take the fatality and reduce the cost to dollars and cents in loss of time; take as a denominator, if you choose, the number of employees working 300 days a year—that, of course, puts everything on the same basis. It is rather difficult, in public utilities, to get the number of employees day in and day out, but it can be obtained, and you will have an exact method of computation.

NEED FOR KNOWN BASIC FACTORS

CHAIRMAN NAYLON: I do not understand why it should be difficult to get an average number of employees, but you say that one fatality is equal, perhaps, to twenty abrasions—twenty abrasions of what kind? That is the bug in the whole proposition. It is a question of opinion and ideas—you cannot get any three men to agree on such an idea.

MR. MORRISON: You might have a small utility company, employing twenty men, and if you have an accident there it is frequently costlier than in another plant where you have 100 employees—you would require a common denominator on 100 or 1,000 employees, simply to designate accident frequency. It is not very important, because one fatality may offset twenty or fifty other cases which are not so serious. In the

original schedule they assumed that one death was equivalent to twenty-five years' lost time, but that is a matter of judgment.

CHAIRMAN NAYLON: There is a crying demand for something which will be a real measure of both factors of the problem. Of course, you can get a fairly good measure of the efficiency of your accident-prevention organization on the basis of the number of accidents. If, in an organization of 2,000 men, they have only one accident a month or one every two months, it is pretty near conclusive that they are doing a good job, unless that accident is a fatal one.

MR. HELLMUTH: We are all convinced that we must have the co-operation of the operating department to be successful in preventing accidents—it is the man in the operating department that has to act, not the clerical force.

WRITTEN AND SIGNED AGREEMENT IS BEST

I would like to present a concise, concrete plan whereby it is possible to get co-operation. We tried to get in close touch with our engineers. They had numerous engineering conferences, and then we were invited to sit in with them. Eventually we reached an agreement with the engineers of the different departments and the safety engineers. It was drawn up and signed and laid out a certain set routine that must be followed in operation and construction.

It is all right to get in touch with your operating engineer and the chief engineer, but unless you have an operating agreement to do certain things, in black and white and not to be disputed, I do not believe the suggestion of getting in touch with the engineer is of any value.

CHAIRMAN NAYLON: It gives me a great deal of pleasure to introduce Mr. Bennett.

MINIMIZING PERSONAL INJURY ACCIDENTS

R. M. BENNETT, ILLINOIS BELL TELEPHONE COMPANY, CHICAGO

Interest of the telephone companies is focused on accident prevention for several major reasons: 1. We are morally and legally responsible for reducing the hazards of our business to a reasonable minimum. 2. Economy of production necessitates the training of our employees for accident prevention to prevent waste of manpower. 3. Our interest in our good name makes it necessary to safeguard our patrons and our employees. 4. The interest of our employees in furnishing a better grade of service is stimulated by our concern for their safety and welfare. 5. The community which we serve is benefited by the safety ideals taught through constant daily contact with our employees who are trained in accident prevention. 6. Accident-prevention training cultivates the minds of our employees in habits of thought and action which build character, improve judgment and make them more valuable citizens.

The subject of this paper includes two definite objectives to be attained: 1. Minimizing the number of personal injury accidents. 2. Minimizing the effects of such personal injury accidents as do occur.

MINIMIZING THE NUMBER OF PERSONAL INJURY ACCIDENTS

The accomplishment of the first objective depends upon: 1. Physical safeguards, constructing and maintaining a plant free from hazards to the employees and public and keeping tools and equipment in such condition as to avoid unsafe working conditions. 2. Safe working methods, standardizing and specifying methods of doing work which will result in a minimum of risk. 3. Training the force as individuals to have safety as a habit of thought.

The success of the second objective, minimizing the effect of such injuries as do occur, is dependent upon: 1. Adequate first aid and subsequent efficient medical attention to insure prompt and complete recovery. 2. Employment of the injured during the period of partial disability or convalescence, whenever possible, at work which will not retard recovery or cause pain so as: (a) To occupy the mind during this tedious period. (b) To keep up the morale of the injured and avoiding the formation of the habit of inactivity by continued idleness. (c) To broaden the employee's knowledge and experience in the business and increase his value. (d) To secure some production whenever practicable.

DISCUSSION OF METHODS OF ACCIDENT PREVENTION

The first requisite of success in accident prevention is that the executives of the organization believe thoroughly in the desirability of attaining these objectives. They must approach the problem with a thorough realization that the lives of their fellowmen are at stake. They must study the hazards and each personal injury must be reviewed with the idea of applying the remedy to prevent recurrence. A more uniform and effective policy, as well as greater interest in accident prevention, will result if the accident reports are reviewed in a conference of the supervisors responsible for the protection of those injured.

To avoid physical hazards the plant must be planned and built with the idea of safety in every detail; it must then be inspected periodically and maintained so as to prevent accidents. Such hazards as insufficient clearance of wires from power leads, rotten poles, unlighted stairways without handrails, and protruding nails are obvious and need not be itemized. Injuries resulting from tools are greatly decreased if they are of good quality, adequate to needs of the work, properly maintained and replaced promptly when defective. The surest method of obtaining these conditions is for the company to furnish the tools, require them to be frequently inspected and replace those defective.

SAFE WORKING METHOD AND TRAINING THE FORCE

Safe working methods prescribe the order of operations and the manner of procedure to avoid hazards requires constant review. For example, when replacing a pole in an existing lead, crossarms may be attached before the pole is raised but the additional hazard of the crossarms catching on route wires or tree limbs more than offsets the muscular effort of placing arms after the pole is in place. The use of a push drill for starting large screws for knob supports is a safe method, as contrasted with start-

ing screws with a hammer with the likelihood of splintering the knob and injuring the eyes.

The men in the organization who suffer the injuries are, or should be, the most concerned in preventing them. Is it not logical then that these men be the agency for the prevention of the accidents? But before they become active agents in this work they must realize their relation to it. It is necessary to demonstrate to them that they endure the pain and may be rendered incapable of supporting themselves, not to mention being a burden upon their dependents. They should be made to recognize that accident prevention is not merely a company propaganda but that they are the principal beneficiaries of safety work. Accident prevention is their game, but as individuals they can achieve but mediocre results; they must be a team with the whole executive organization, from the president down, supporting them. To quote one of our telephone men:

It ain't the poles nor instruments nor the rates the public pay,
But the close co-operation that makes us win the day.
It ain't the individual but the company as a whole
And the everlasting teamwork of every blooming soul.

Every successful team has a coach and a good coach feels responsible for having his team make a good score. He creates a team interest in the mind of each member, he teaches the fundamental principles and rules of the game, he shows them how to play, he keeps them in such constant training that they think and talk about the game whenever they come together. In this game the foreman is the coach, his workmen are the team and accident prevention is the goal.

KEEPING THE JOB FOREMAN UP TO HIS WORK

To carry out the analogy of the game a score or standing is the first incentive for training the force. In the Illinois Bell Telephone Company several divisions have developed charts adapted from an idea originated in the Ohio Bell Telephone Company. These charts group the employees under the various supervisors whose names appear along the left-hand margin. Across the remainder of the chart are columns for each month of the year. After each supervising foreman's name is drawn a solid line at the end of each month in which his forces have no lost-time accidents. If there is a lost-time accident the line is broken and the name of the job foreman, the number of accidents and the number of days lost are entered. The job foremen dislike to see their names on this chart and do all they can to create in the minds of their workmen the team spirit for an unbroken line.

How shall a foreman teach the workman to avoid injury? A common method has been to deliver a number of precautionary instructions—don't do this and don't do that. The weakness of this method is that after compiling a list of "don'ts" covering every accident which has been known to occur or which can be imagined, and the workman don't know which of the don'ts don't apply, and don't know which don'ts do apply to the job he is doing, he may be injured in a manner not covered by any don't in the don't file. A positive method of instructing workmen in the fundamental principles of accident prevention is more effective and less confusing.

The dictionary defines an accident as an event which takes place without one's foresight or expectation. Foresight is the attribute around which we may group our ideas in teaching the men accident prevention. The habit of looking ahead, caution and safe thinking are fundamental principles. The workman who has formed the habit of surveying his job and weighing the chances for accident in each operation very seldom gets hurt. About 85 per cent of personal injuries are directly traceable to lack of foresight of the injured.

What conditions must the workman foresee? The necessity for equilibrium and control, as two principal conditions, will serve to illustrate how positive instruction may be given workmen. It is a physical fact that a body will fall if a vertical line through the center of the mass is outside the base upon which it stands.

Ladders seem to be the most common tempters of workmen to disregard this physical law. More workmen fall from ladders than from poles. Why is this? Because it takes time and effort to climb down and reset a ladder and there is a big temptation for a workman, when near the top of a ladder, to work as far as he can stretch. The frequent result is that he finally gets his weight so far to one side as to cause the ladder to slip and a bruise, a sprain or a broken bone is the result. Another example illustrating maintaining equilibrium is a workman pulling on a hand line. If he places his feet together and pulls with all his strength he will fall if the load gives way. But if he spreads his feet so that his body will retain its equilibrium should the load give way he will suffer no injury. Control makes the workman master of the movements of his body and of the tools and material with which he works.

Wire is our most used material and the lack of control of it has resulted in the loss of sight all too frequently. It has been cut while under strain and the ends thus suddenly released have caused serious injury. How can a workman be sure that he is safe from such an injury? Assume that he is on a pole and cutting down a span with enough end to permit a splice; he can take hold of the short end with one hand and cut beyond it. He has control which will avoid the short end snapping back in his face. Or assume that he is cutting wire on the ground; he can make a loop, holding both sides of the loop in one hand while he cuts the loop with the other.

FORESTALLING DANGEROUS PRACTICES

Many a repairman has cut his hand while working on a desk set because he took some part of the instrument in the palm of his hand and tried to tighten a screw. The screw driver slipped, he lost control and the hand was cut.

The field foreman who is on the job, and understands the physical conditions of equilibrium and control necessary for safety, can foresee the conditions and coach the workman to survey his job with the idea of accident prevention uppermost in his mind. New men need more than verbal instruction—they need an example. The foreman who is a boss only, who wears his coat and dignity and keeps his clean hands, will fail to impress the workmen with the need for attention to the safe way of

doing things. He must get into the game with them frequently enough to show them his interest, give them encouragement and fix the idea he is trying to teach.

Frequent bulletins, such as those furnished by the National Safety Council and which apply to their kind of work, are helpful to foremen in keeping the safety thought in the workman's mind. In the Illinois Bell Telephone Company safety slogans are printed on the covers of the note books given to repairmen and installers for recording their job assignments and are before the man every time he refers to his book before starting a new job. The discussion of safety and first aid in meetings of employees' associations stimulates safe thinking and will point out to executives unsafe plant conditions and aid in developing safer working methods.

Our success in reaching the goal of accident prevention is dependent upon safe construction and maintenance of plant and equipment, safe working methods, convincing the workman of the need for foresight, good coaching and teamwork. It demands constant alertness of mind and body and frequent repetition of positive practical instruction presented clearly and concisely to keep the ideal of safety constantly before those who are liable to injury. It must be based on sound reasoning and presented so as to make safety a habit of thought and action.

FIRST AID AND MEDICAL ATTENTION

The first requisite for effective first aid is training, not of a select few but of every individual in the force. Those who are most liable to suffer injury should be vitally interested. The task of the executive is to furnish the opportunity for this training and it needs but little encouragement from the foremen to get the workmen to apply themselves and become proficient. Competitive first-aid teams increase the interest in this training and make it a game which develops teamwork and enviable skill. It is gratifying that so many groups of public-utility employees have well-trained teams. The Bell Telephone System has a well-defined policy of extending this training to all its employees. Last year, in one group of less than 500 telephone workmen, two received medals for saving life by first-aid methods.

First-aid training gives the workman confidence and makes him take the initiative in crises requiring this knowledge. He respects himself and is a credit to his employer. The first-aid equipment necessary for the field workman is simple for it is not expected that he will do a surgeon's job. He needs a trained mind, ready hands and a small pocket kit of disinfectant and bandages for most cases. The detail of the kit need not here be described but the important thing is that it be furnished to all who are likely to find need for it in their work.

While proper first aid saves many lives, expert medical attention is necessary in all of the more serious injuries. Arrangements should be made so that competent doctors are available at all times. It is easy to turn over an injured employee to the doctor and have the case off our hands, but here is where the real foreman becomes a valuable aid in recovery. His sympathetic interest insures frequent visits, to make sure

that the injured receives the kind of attention that adds to his comfort, keeps up his spirits and looks after the needs of his dependents. The friendship and attention of the "boss" while a fellow is helpless develops the kind of loyalty we all envy and, Mr. Foreman, can you do less and be a real man?

EMPLOYMENT DURING PARTIAL DISABILITY

Most injuries to workmen are not serious enough to prevent employment at some light work which will keep them in production without causing pain or retarding recovery. In the more serious cases the period of convalescence, when the workman is unable to resume manual labor, is frequently long drawn out and tiresome to the active man and unproductive to the employer. There comes a time when this man would like to do some work, provided it will not cause him pain or retard his recovery, if he but had the opportunity.

Every organization has some light work which may be given to the men. It is true he may not do it as well as an experienced employee but he is learning and he is getting an insight into some other phase of the business—he will be a more valuable employee in the future. He may disclose qualities under closer observation for which you have been seeking; at least, he will understand what others do and have a bond of interest which perhaps he will never have opportunity to develop otherwise. This alternate employment will keep him in the habit of doing his bit and he will return sooner to his former productivity without having formed the habit of inactivity which continued idleness develops in the less ambitious.

In conclusion, accident prevention is the workman's game and the executive is the promoter. The recovery from injuries depends upon trained assistance of his fellows, expert medical attention and brotherly interest of his supervisors.

DISCUSSION

CHAIRMAN NAYLON: We are indebted to Mr. Bennett for a corking good paper. The discussion will be opened by Mr. A. M. Williams, Supervisor of Safety and Employment, Michigan State Telephone Company, Detroit, Mich.

MR. WILLIAMS: Among the many interesting high spots in Mr. Bennett's excellent paper I have noted a few. First, his six major reasons in justifying our work in accident prevention, boiled down, are: 1. Responsibility for the safety of our men. 2. Cutting down production costs. 3. Good will of the public. 4. Morale of the force. 5. It is a part of our public service. 6. Americanization in its broadest sense, in that it improves citizenship and makes broader men out of those absolutely sold on safety.

Mr. Bennett has given us a good, clear sample of job analyses. He takes safety work to pieces and splits it up into two major heads: 1. Keeping all accidents possible from occurring. 2. Minimizing the effects of those that do occur.

Under the first subdivision we have: The safeguarding of the plant—there is a mental reaction that we will have to consider. It is all

right to make a plant safe, but when we are doing it we automatically suggest something to the employees, and suggestion is one of the best ways of securing constructive acts.

In specifying safe methods and selling the force on safety he hit the nail on the head. The only criticism or suggestion I might make would be that he did not hit hard enough on selling the force on safety. Salesmanship in all of its forms can be applied and if we can copy something from the National Cash Register Company's system let it be in selling the force on safety. If we have to charge accidents to anything it is usually due to the carelessness of the men, therefore 70 or 80 per cent of our accidents are chargeable to carelessness—70 or 80 per cent of our job consists in selling the force. It is the mental reaction of the man who is sold on safety that we want; we must sell him and keep him sold. The condition or the state of a man's mind is not constant; it does not stay put, it does not stay sold. A man may be sold on safety today and cancel the order tomorrow, especially if his boss "bawls him out."

We have been taking the safety job to pieces to analyze it, to get a better understanding of it. Let us go a little further and do the same thing to the men to whom we are going to apply the safety clothes. Let us take them to pieces, so we will understand them better and know more about them, their grooves and capacities and limitations, and then tailor our safety garments to fit the man—it is easier to change the garments than the man.

THE STRONG INSTINCT OF DESIRING TO PLAY

Mr. Bennett has shown us how they make a game of it and play safety on the scoreboards, and it succeeds because this brings into action one of the strongest instincts in the human race—the instinct to play. We have another strong instinct, love of family; that is one of the greatest factors the fellows use in selling automobiles, and we can use it here to make a fellow think in order to bring himself home safely at night. There are ten human instincts that a salesman can appeal to and talk about in getting his articles across and we can use all ten. Mr. Bennett called our attention to the "don'ts"—"don't do this, don't do that"—the negative method of instructing men and the positive method for selling them. It is an important point and well brought out, about which a lot might be said. It is the difference between leadership and bossing. A man may stand bossing on the job he is paid for doing, but his personal safety is his own affair, his own business. That is the feeling of the man, and that is the angle we have to approach it from. It has been so for hundreds of generations and we cannot get it out by talking to one generation. Suggestions about safety from the boss he will stand for, but orders as to safety, never. Even under the compensation act, which makes a man's safety the boss' business, with the average man the old feeling about his personal safety being his own business still exists.

The mind has another angle—if we are told definitely to do a certain thing, without being given a reason, we start digging up reasons why we should not do it. The more we are commanded, the harder we

dig, but suggestions slip under our skin and we act on them automatically, because suggestions come from friends and we do not challenge them. If something is done before us, and we watch the act it does not arouse antagonism in our minds and we will do the thing in the same way. That is why a safe workman in a crew of new men is so valuable; the new men will do their work automatically the same way, because they are doing the same work the other man did.

THE CARPENTER WHO SOLD HIMSELF ON HIS HOUSE

Another point that strikes a keynote in selling safety is enthusiasm. A good many years ago I was riding along a road with an old carpenter and as we stopped in front of a house he told me about it. He built it and during the building he sold himself on it. He was the architect and builder and as he worked his mind revolved around the problems presented—he was sold on it. If we could get safety across to our men and secure their mental reaction as thoroughly as this man was sold on his building our job would be well done.

CHAIRMAN NAYLON: The discussion of Mr. Bennett's paper will be continued by Mr. Schaffer.

RESULTS INDICATE EFFORT EXPENDED

MR. K. D. SCHAFER (Division Construction Superintendent, Ohio Bell Telephone Company, Columbus, Ohio): Results obtained in accident-prevention and first-aid work usually indicate the effort that has been expended, just as in other phases of our business. I have found, however, that considerable effort can be expended without obtaining much in the way of results and I have also found there is considerable difference in introducing a new method of handling some one or more phases of our work and in introducing accident-prevention and first-aid work. The difference is chiefly due to the fact that the new working method replaces one that has formerly been used and the old one is discarded, while accident prevention must be considered and kept in mind in connection with the performance of all work, and this done without serious interference to that work. First-aid work is taught to those who may have use for it and the occasion for such use rarely occurs—if our accident-prevention efforts bring proper results—so that the training cannot be stopped after an initial course of instruction has been given, but must be carried on at frequent intervals to keep the methods fresh in the employee's mind.

The paper under discussion devotes a short paragraph to the necessity of the executives of an organization believing thoroughly in the desirability of attaining the objectives set forth. I know the executives of the company with which I am associated and I believe the executives of all companies in the Bell Telephone system are thoroughly convinced on this point.

COMPANY FURNISHES STANDARD TOOLS

The question of physical safeguards cannot be disposed of quite so readily. Telephone companies have always furnished the majority of the tools used by workmen and companies in the Bell system are now replacing the tools that have heretofore been personally owned by em-

ployees, so that the standard and condition of these tools can be governed by the company. The proper use and replacement of tools is a big factor in accidents and as the workman is the man who uses the tools and is also the man who will first know of needed replacements the proper training of that workman will have everything to do with the minimizing of accidents from the use of tools.

Hazards created by improper plant conditions can be grouped into three classes:

1. Those that can readily be corrected without a large expenditure of money.
2. Those that require reconstruction of a portion of the plant and will require a large expenditure of money.
3. Those that require the co-operation of another party to correct, such as conflicting lines of telephone and electric light companies. The knowledge of these conditions comes to the executives of the company from the employees and here again the proper training of the employee is involved.

The question of prescribing safe working methods is one that has been given a great deal of consideration and Bell system specifications covering various classes of work provide the detail of procedure in many instances. However, there are no instructions that will cover all of the situations to be met and again it is a question of employees so trained that hazardous working methods will not be attempted.

The fact that Mr. Bennett has given to the subject "Training the Forces" about five times the space given to all the other subjects helps to emphasize the point I have been trying to bring out: Everything else that can be done will not bring results unless the workman is thoroughly trained and, as usual, that which will produce the best results is the most difficult to attain.

HOW LOYALTY OF EMPLOYEES IS SECURED

The loyalty of Bell Telephone employees has long been a matter of wonder to persons outside the business and this loyalty is one thing that makes it difficult for the employee to keep accident prevention in mind. Do you think that a man who willingly starts out in the middle of the night in freezing weather, when poles and wires are covered with ice, and works night and day as long as he can fight off sleep, is going to give much thought to hazards he may encounter? I do not mean to say that our employees work under such conditions ordinarily, but they do it whenever occasion demands and that spirit is present in their everyday work—the spirit of getting the job done. It is difficult to get these men into the habit of considering whether their method of performing work is a safe one.

It is true that the foreman is the coach of the team when work is performed by a gang of workmen, but it is impossible for a foreman to personally see every move made by the men under him, and a considerable number of our men work individually or in teams of two without the direct supervision of a foreman.

Perhaps I may seem to be trying to prove that accidents cannot be prevented in telephone work, but I am only citing some of the difficulties we have encountered in our efforts along this line. Our first efforts were

along the lines of issuing precautionary instructions and, while some improvement resulted, numerous accidents continued to occur. A continuation of this policy would soon have resulted in the maze of "don'ts" mentioned by Mr. Bennett.

We are now working with the idea that everyone—superintendents, supervisors, foremen and workmen—must continually keep accident prevention in mind, but this is not so easy. If we were running the telephone business primarily for the prevention of accidents we could have our slate clean every month, but it happens that our first thought is the giving of service, and I admit that accident prevention is frequently crowded completely out of my thoughts, and so it is with all others in supervisory capacities. If we who are not supposed to have single-track minds cannot keep this matter before us and at the same time do our work how is the workman to do it? I feel that the answer is "more training and then still more training."

TOLD 'EM WHAT HE WAS GOING TO TELL 'EM

The story of an Irish lawyer who was asked how he always managed to get a decision from a jury rather illustrates what we have to do too: "I make 'em understand," he said. "First I tell 'em what I'm going to tell 'em, then I tell 'em; and then over and over again I tell 'em what I told 'em."

We now have a man in each division whose entire duty is accident-prevention and first-aid work and it is one of his jobs to help keep all the rest of us thinking of it all the time. When we are all so trained that we can constantly keep accident-prevention in mind and still perform our work our goal will be reached.

In taking up the discussion of the second phase of Mr. Bennett's paper, "Minimizing of the Effects of Personal Injuries," the factors involved have been very clearly and concisely set forth. In our training work we found the first classes were interested and really enthusiastic and the individuals attending these classes were proficient after completion of their training. In subsequent classes the interest rather lagged and in spite of team competition we are finding it difficult to train every employee in first-aid work. This, however, is our goal and we expect to reach it and it should be done by every employer in the country.

The interest shown by supervisors and fellow employees during the confinement of an injured or sick employee has considerable bearing not only upon the recovery of the injured one but upon his attitude toward the company and his job when he returns to work. If he really feels that his employers and fellow employees are interested in him he wants to stick with that kind of a crowd, and that feeling means a satisfied, loyal employee.

OVERCOMING SUSPICIONS OF INJURED EMPLOYEES

In most serious injury cases the workman is anxious to return to some kind of work as soon as he is able, but there are some cases the handling of which require considerable tact to prevent the man from remaining idle when he is well able to perform some work. I have in mind the case of a lineman who received a serious injury to his kneecap

the second day he was employed by our company. The injury resulted in a stiff knee and he was laid up for almost a year. The doctor recommended that he be given light employment, but the man claimed that his knee pained him so much he could do no work at all. After several interviews he finally agreed to come to work, but I found that he suspected that our object in getting him to return to work was that we could consider him recovered and then discharge him. This happened several years ago and the man is now a satisfied employee in the stock room. In this case the man was a stranger in our organization and while he was visited regularly during his confinement, he was evidently not made to feel that we had a real interest in him.

Accident-prevention and first-aid work seem to me to be first and last a question of proper training for everyone connected with the organization, from the highest executive to the lowest apprentice—training that is difficult to administer and that can never be considered as done.

SERVICE MUST BE MAINTAINED IN AN EMERGENCY

CHAIRMAN NAYLON: The absence of the words Safety First in Mr. Bennett's paper and Mr. Williams' and Mr. Schaffer's discussion is pronounced. I don't know whether it was deliberately intended to leave those words out or because, in their sub-conscious minds, they realize there is no place in the telephone business for Safety First. Our slogan, in the telephone business, is "Service First." If we can give service, we are glad to give it with safety, but if we cannot give it with safety we give it anyway. You can imagine, during a bad sleet storm, a bunch of linemen going out and trying to give service and at the same time thinking Safety First! As a matter of fact they go to the job thinking of service and after it is done if they think about safety all well and good.

Another thing is very important. In spite of the tremendous increase in the hazards of our business during sleet storms I have yet to find, over a period of thirty years' experience, more accidents during the restoration of service than at any other time. Why? When people go out with the idea in their mind of restoring service and getting it back to normal, they are unconsciously more careful than they are when they are doing a day-to-day job.

There is one more point to be brought out. I don't care whether you are listening to a paper in the Rubber, Chemical, Medical, Steam Railroad, Mining or any other Section, you will always hear it in the Public Utilities Section, and that is the first responsibility of employers is to furnish a reasonably safe place for a man to work. What is a reasonably safe place? In our own business we have poles to support wires in districts where we cannot afford to build an underground system.

No matter how careful we step a pole, in the imagination of some people, when the man gets ten or fifteen feet above the ground he is in danger, but having stepped the pole so it is suitable to the thin man or the tall man or the short man or the fat man it is reasonably safe. When we get it up it does not take much imagination to go a step further and say that while that is a reasonably safe place we could stretch a pair

of stairs up on that pole. While we try to give our men a reasonably safe place to work still there may be spots between New York and San Francisco where they are not reasonably safe, yet, as I profess to know the business, and climbed poles in Illinois twenty-five years ago, climbed poles in New Jersey thirty years, as I see it there are only two lines of business more hazardous than being a telephone lineman—one is that of a barber and the other is a floorwalker in a department store. That is how hazardous I think it is to be a lineman today.

THOUGHTLESSNESS CAUSES ACCIDENTS

A lot has been said about selling safety to the boss and then going on down the line. Something has been said about 75 per cent of accidents being caused by carelessness. I am not going to say much about that but I think we ought to put a soft pedal on the word "carelessness"—"thoughtlessness" is a better word.

Two things have happened in the telephone, water, gas and all public utilities business; in the first place we have a different type of men in our employ. In a meeting of this kind—where we have linemen, splicers and installers—during off hours or business hours they will sit down with twenty-five or thirty college men and I defy you to pick out the college men. Another thing is the changes that have been made in the bosses. That was made very clear to me by an incident that happened at Montclair, N. J., twenty-odd years ago. At that time all the trunk lines to New York went down Bloomfield avenue, crossed the trolley diagonally, and then on down the railway—open wire trunks, No. 12 copper. I think we were a step or two in advance at the time, because on that particular line the electric line was above us.

On looking for trouble I found the circuit was down—it was a very important circuit, because in those days we had few circuits between Montclair and New York and they had to be in service all of the time—I found the line down right over the trolley and the railroad. I called my boss up and said: "I have located the trouble on Bloomfield avenue; the wire is down over the trolley." He answered: "What the — are you telling me for?" And I said: "I thought maybe you would send someone over to help me out." If a lineman here can think how one man can put an open trunk line up over a trolley I would like to have him tell me. I have hired hundreds of men and I have put that question to them casually, but no man has ever been able to tell me right off the bat "This is what he should do." Of course, they could do it if they had time to draw a sketch, but offhand they could not.

This is what I had to do: In the first place we always carried long lines—they were at least one section long—and I had to get this line across the trolley and the wire stretched straight out, so as not to be electrocuted myself; I kept it there by means of the rod. Then I cut it through on this pole (indicating) and then cut it through on that pole (indicating) and the job was done. That was all right in those days, but today if we had a supervisor or a desk man who would even permit a man to try to do a thing of that kind we would tie a can to him.

MORE PUBLICITY NEEDED

MR. HENKLE (Peoples Gas Light and Coke Company): It looks to me as if our committees are having trouble getting a rise out of the men, and if we follow the lines of our national pastime I do not believe there is a man that is not red blooded enough to get out and root for his own team—throw off his coat and do a little shoveling. Bring out the scoreboard and list every one of the companies that shows a membership; it might be well to even go so far as to publish the men on the team; get it circulated and bring it forth. If our safety engineers are not co-operating in bringing forth the point, and keeping it in our minds, not only in these meetings but at home, the teams will have an opportunity to watch the scoreboard when the bulletin comes out. If the coach does not do what is right we will fire him and get a new one.

I don't know that it is a salesman's proposition nearly so much as a coaching or a trading proposition, right straight through. It is the human element after all and the first question, I think, is to put it up to ourselves: Are we full-fledged safety men? Some of the systems in the telephone business that have secured the best results are those that use a scoreboard. I don't know of any other or better way to accomplish results in accident-prevention work than by introducing this element in it and publishing the results periodically.

The section then adjourned.

Joint Meetings of the Public Utilities and Electric Railway Sections

August 29 to 31, 1922

J. F. NAYLON, Chairman

Division Equipment Superintendent, New York Telephone Company,
Newark, N. J.

TUESDAY MORNING SESSION

CHAIRMAN NAYLON: This is a joint session of the Public Utilities Section with the Electric Railway Section; no formal business will be transacted except the appointment of Nominating Committees by the two Sections. For the Utilities Section I have appointed Mr. H. M. Webber, Mr. H. B. Harmer and Mr. W. H. McPherson; their report to be made after the meeting tomorrow.

MR. B. D. HASKINS (Chairman of Electric Railway Section): As the Nominating Committee of the Electric Railway Section I will appoint Mr. A. J. Van Brunt, Mr. Samuel H. Reid and Mr. William R. Lloyd. We would like to have the Committee report at our meeting to-morrow.

CHAIRMAN NAYLON: We have a very comprehensive program and I am anxious to push it through with as much snap as possible. The first paper is by Mr. Charles E. Morrison. I feel that we have a real treat here for us.

PROGRESS IN ACCIDENT PREVENTION IN PUBLIC UTILITIES

**CHARLES E. MORRISON, VICE-PRESIDENT AND GENERAL MANAGER, UTILITIES
MUTUAL INSURANCE COMPANY, NEW YORK CITY**

Perhaps the simplest way in which to develop a theme, with the foregoing as a title, would be through a careful comparative statistical analysis of conditions as they existed among the public utilities of say ten years ago and as they exist today and, in a measure, this method will be adopted. But, on the other hand, it may prove more interesting and instructive if we treat the topic in rather general terms and try to discover whether some of those basic, underlying principles which maintain in all accident prevention work do not apply in proving our premise.

I think it safe to say that accident prevention, as now understood and practised, is of comparatively recent growth and that each of us will concede the deeper significance which attaches to the expression than

was the case even in the very recent past. It is true, the public utility executive has always realized, perhaps in a rudimentary way, that it was inadvisable and costly to electrocute, asphyxiate, or run over one of his own employees, or one of the public, but I am absolutely safe in saying that therefore, at least, he felt more concerned over accidents to those outside his organization than to those within. The reason is, of course, obvious, for immediately an accident was translated into financial or economic terms that which was apparently least costly was naturally the least to be feared. And it was only human, since all business is based on economic laws, and an executive's success or failure depends upon whether the last line in the balance sheet shows a surplus from operations or no surplus at all.

The great incentive then to accident prevention, both in public utilities and in industry, was the realization that accidents to the public or the loss of an employee meant the loss of money, and perhaps this became more distinct and concrete when the states, one by one, began to penalize industry for accidents to its employees through workmen's compensation acts. We all remember, not so many years ago either, when the insurance carrier, on notice of accident to one of our employees, would immediately start to establish legal objections to all liability or attempt to barter with the poor unfortunate or his dependents for the cheapest settlement that could be made. Thank God, that day is gone and may He have mercy on the souls of those human vultures who used the ignorance and gullibility of some of our less fortunate brethren to profit at their expense! And may we not take the time to parenthetically remark that such a change in conditions represents progress of the most substantial character.

ACCIDENTS NOT ACTUALLY NECESSARY

There can be no doubt either that these questionable practices were a very vital and potent factor in inducing the states to gradually impose compensation laws, in order that such vicious practices might be eliminated and that industry itself should be held, at least partly, responsible for accidents incurred by employees. In some states the degree of this responsibility is represented as two to one, the employer assuming to pay two-thirds of the wages received by the employee, while in other jurisdictions this is materially reduced. When these acts became effective, therefore, industry in general, and the public utilities especially, because of the heavy burden due to the more hazardous nature of their work, began to consider a little more carefully whether it was actually necessary to have so many accidents, with the consequent payment of so much money in compensation indemnities, began to study ways and means to reduce them.

You will see from this, then, that the original and primary motive was economic in its application. While it is true many kindly disposed, broad-minded executives were prompted by the thought of humanity and the reduction of suffering, nevertheless the majority had not awakened to the fact that sympathy may be legitimately capitalized and made to yield very large dividends. It was some time, too, before accident pre-

vention was recognized as a very large contributing factor to the economy of operation through the elimination of delays to men and machines, the reduction of labor turnover, and those thousand-and-one things that will readily suggest themselves to us on a moment's thought which, either directly or indirectly, tend to interfere with the smooth running of an organization consisting of men and materials and result in a decreased efficiency. This was, perhaps, particularly emphasized by time studies inaugurated by a number of engineers, which demonstrated clearly the very large losses due to accidents and interruptions of every kind, and the economic fact was crystalized in the words of former President Woodrow Wilson when he said: "We must hearten and quicken the spirit and efficiency of labor throughout our whole industrial system by everywhere, and in all occupations, doing justice to the laborer, not only by paying a living wage, but also by making all the conditions that surround labor what they ought to be. And we must do more than justice. We must safeguard life and promote health and safety in every occupation in which they are threatened or imperiled. This is more than justice, and better, because it is humanity and economy."

IMPORTANCE OF PREVENTION SPIRIT

Let us turn now, for a moment, to the past. In reviewing some of the records of the N. E. L. A. in connection with accident prevention to secure concrete evidence, I was very much startled at what I found. In the first place, do you realize that this association, which I take it is typical and representative of all the national public utility organizations, did not, in any substantial way, take up accident prevention work prior to 1914? In that year the Accident Prevention Committee of the N. E. L. A. made its first annual report. Do you appreciate this, its first, and that only eight years ago? At the convention in June the committee displayed the first exhibit the association had ever had, consisting of photographs, safety data and various appliances. It showed a film for the first time. In the report it was noted that safety was arousing the interest of industry in general, that education was proving effective and that under organized effort two out of three accidents might be eliminated. Comparative statistics were presented showing the per cent of accidents due to negligence on the part of the companies and the per cent of accidents due to negligence on the part of the employee. It also very briefly cited one or two examples where accident prevention had actually decreased the number of injuries.

It was said then, and it holds equally true today, that "The greatest factor operating toward the prevention of accidents is not the prevention device but the prevention spirit," and it was also indicated that accident prevention may be justified on the ground of elimination of human waste, even if not from the humanitarian standpoint. How far have we come along the road since then? Let us skip the intervening eight years and see what sort of a report the accident prevention committee of this same association brings in at the forty-fifth convention, held in Atlantic City

in May, 1922. When I read this report I was reminded of the lines of Robert Louis Stevenson in which he so neatly says:

This world is so full of a number of things,
I am sure we should all be as happy as kings.

In contrast I wonder why the committee has seen fit to adopt a tone of pessimism as to the progress and accomplishments that have been made. Let me first quote their premise: "Primarily, accident prevention has for its purpose—(1) Increased efficiency, (2) elimination of waste, (3) conservation of cash, (4) cutting of production, (5) saving of life, (6) promotion of better health, (7) reduction of mistakes and accidents and (8) development of standards of design, construction and of operation, distribution and maintenance methods." In a word, economic and humanitarian principles.

COMMITTEE MADE VALUABLE REPORT

From their report it would seem as though the committee felt that little had been accomplished, but I think their findings and the facts contradict their own statement. Let me quote: "For many years the Accident Prevention Committee has presented practical and helpful suggestions for the elimination of industrial accidents [in which we concur], yet its experience shows that in many instances comparatively little has really been accomplished in the way of reduced accident costs [which we do not accept]. This unimproved record may be due to lack of interest. This remains unexplained."

Then the committee goes on and presents a report which for thoroughness and breadth of scope is far beyond the wildest dreams that any one might have had even as recently as 1914. Could any one have imagined a few years ago that in a decade accident prevention would have risen to such importance that a great and growing national industry, with \$4,600,000,000 of invested capital, would have the time and the desire to put its stamp of approval on a report like this, filled to overflowing with suggestions of ways and methods of procedure? These, for example, are some of the topics discussed in that report: "Resuscitation," "Economics of Accident Prevention," "Hydraulic Plants," "Fire Prevention," "Apparatus," "Illumination," "Grounding of Transmission Lines," "Devices and Appliances," "Health Promotion." Have we not come a long way since 1914?

As a concrete example of what I consider an indication of progress let me quote from an article in the July 22, 1922, issue of the *Electric Railway Journal*, by Mr. F. H. Hill, Vice-President and General Manager of his company: "The Elmira Water, Light and Railroad Company is a combination utility furnishing electric light and power, natural gas and street railroad service. The total number of employees is about 325. The company operates forty-eight miles of street railway lines, both city and interurban. Organized safety work on our property was begun about two years ago . . . It was really the rather selfish idea of reducing insurance premiums which promoted us to undertake this work. [Please note that it was economic pressure which brought this about.] Among the tangible results of our safety work has been a considerable reduction in

the number and severity of accidents to employees and a marked decrease in accidents to the public. The reduction in accidents to employees can be seen from the following table:

	Lost-Time Accidents.	Days Lost
1921	31	2,441
1922 (at rate of).....	14	160

"The accident record for 1922 is based on actual results for the first six months, multiplied by two. The effect of our good accident record is indicated in the rates per \$100 payroll on our compensation insurance:

Average rate for entire proper 1921.....	\$3.268
Average rate for entire property 1922.....	2,559
A reduction of 21 per cent.	

"As our payroll is in excess of \$400,000 per year the reduction in rates has meant quite a saving in our annual premium. (About \$2,800.) Another indication of the effect of safety work is the reduction in the cost of public accidents on our street railway system. For the past five years the cost has been as follows:

1917	\$10,831.60	1920	\$13,375.79
1918	17,881.47	1921	8,244.93
1919	25,563.34		

"The increase from 1917 to 1919 was no doubt caused by the increased traffic and congestion of the streets, due to the large increase in the number of automobiles. * * * The reduction in public accident costs on our street railway system during 1920 and 1921 is due to both the organized safety work and the use of safety cars. It is rather difficult to say just how much of the credit should be given to organized safety work. To sum up, I might say that organized safety work on our property has proved well worth while from many points of view. It has resulted in a reduction in accidents to employees, thereby decreasing the cost to us of compensation insurance and also greatly increasing the morale among our employees because of safer working conditions. Similarly a decrease in accidents to the public on our street railway system has occurred, with a great saving to us in damage claims and a reputation of safety for our street cars. To the manager of a public utility that has not yet undertaken organized safety work, I would say 'Begin at once. It pays.'"

SPLENDID RECORDS MADE IN SAFETY WORK

To indicate that this is not an isolated example may we refer to *The Nation's Health* which, in its July issue, says in commenting on the comparative statement showing deaths and death rates in the United States during 1919 and 1920, as issued by the Bureau of the Census: "The death rate from accidents in 1910 was 84 per 100,000 as against 71 per 100,000 in 1920."

This is a reduction of 13 per 100,000 or more than 15 per cent and, figured on the basis of a population of 100,000,000, represents an annual saving of 13,000 lives. I am inclined to believe from these and similar figures which show reductions in tuberculosis and typhoid fever that just as the latter are being steadily and consistently reduced through education and broader knowledge so, too, will accidents be prevented to an in-

creasing degree in the future as we began to realize how important it is to do so.

The *New York Times*, under date of May 21, 1922, refers to the case of a window cleaner who was fined \$20.00 under the industrial code for failing to wear a safety belt, as it "took too long to put on." He was sent to the Tombs because he was unable to pay the fine. Could this have happened ten years ago and does it not establish the fact that progress is being made through education, which must have its effect on us as public utility people, as well as on the public in general?

Industrial Management says: "One of the world's greatest movements—the crusade for safety in industry—has declined notably in the last year. In some organizations where safety departments have been cut down or abolished the 'retrenchment' has been more than counterbalanced by the added expense resulting from lawsuits, loss of time, breaking in new help to replace those injured or killed and by loss of morale." Will you note, please, that accident prevention is referred to as "one of the world's greatest movements"—and it is—and can you suppose for an instant that such statements are being broadcasted by a powerful magazine, going directly to the men with the authority, without having their effect in educating them to the need for safety? Doesn't this spell progress?

Let me turn now to some information very kindly supplied by the National Safety Council. The Western Union Telegraph Company published, somewhere in the '90s, a rule book which forbade the linemen to wear safety belts, but instructed them to tie themselves to the poles with a rope—if they thought such protection advisable or necessary.

GROWTH OF PUBLIC UTILITY SECTION

In the Council itself the Public Utilities Section has grown from a very small beginning in 1916 to a membership of approximately 250, and if we consider that a number of these members are large holding corporations, in some cases with many subsidiaries or serving a large territory, it is reasonable to assume that the figures would be greatly multiplied were they placed on an individual company basis or on the basis of the number of communities served.

It has been stated that the average cost of accidents on electric railways varies from 2 per cent to 17 per cent of the gross receipts, while, on the other hand, it is known that where intensive accident prevention is employed this has been reduced below the lower limit and in one case, for the year 1921, it was reported as only 7/16ths of 1 per cent.

Mr. B. I. Budd, president of a number of electric railways in and about Chicago, has said that because of his experience in operating with safety departments he would not undertake the management of any electric railway property if he were not permitted to have a safety organization. One of his roads sustained 17 accidental fatalities in 1917, 19 fatalities in 1918, 7 in 1919 and only 3 in 1920, and this in spite of the fact that it is an interurban line running through many towns between Chicago and Milwaukee and with many grade crossings.

COSTS INCREASED WITH SLOWING UP OF WORK

The Illinois Bell Telephone Company, with 13,000 employees, went through the month of April, 1922, with a single lost-time accident and that, without any question, is an achievement undreamed of a few years ago. There is a large gas company which, after several years of effort, succeeded in reducing its accident costs to approximately \$5,000 or about \$1.00 per employee per year. Accident-prevention work was temporarily discontinued for the period of a year, with the result that costs jumped to approximately \$35,000, or five times what they had been. By order of the board of directors activity was immediately resumed.

You will think, from these illustrations, that I am taking as my topic "Does Accident Prevention Pay?" and in a sense I am, for if I can prove that to you the balance of my argument may be presented in a few words. If we accept—and anyone who has ever been interested in accident prevention does accept it—that attention to safe practices means economy of operation, then it must follow as the night the day that those who fail to take advantage of it will be speedily passed on the highway of life by those that do. Our organizations and we ourselves are, in personal and business affairs, ever seeking to make the dollar go just as far as it can, and the manager or executive who won't save by accident prevention will soon have his place taken by one who will. It is a fundamental law as old as the eternal hills—the survival of the fittest.

Consider the matter from another angle: Comparatively few years ago there was little, if any, organized safety work. Today we have here hundreds if not thousands of representative men, from all sections of the country, who are interested, most of them as a livelihood, in this one topic. Do you imagine that that part of the younger generation which is going to make its mark is going to pass by all this accumulated data showing that accident prevention is an economic necessity? Never! If some of them do they will be left behind by those that do not. I venture to state that there isn't a man in the public utility industry in the United States but that knows something about accident prevention, and if this can be, and has been, accomplished in less than a generation, what may we not expect of the future when the hard-boiled variety has died off or been eliminated.

SAFETY EDUCATION MORE POPULAR EVERY YEAR

I can well understand the regrets some of us may have that accident prevention has not more quickly come into its own, particularly when, on the merits of the case, it seems to be so self-evident how valuable a factor it is to industry, but may we not have lost the perspective by our very intimate and close contact with the subject and are we not too easily discouraged when we fail to convert others to a principle that needs no demonstration to us?

Rome was not built in a day nor did the prohibition act become effective except through the peculiar mental condition of the country due to a world war. Neither will accident prevention be universally accepted and applied until we have had time to educate ourselves and others to the true significance of the movement. Let us stand off and view the

prospect, free from the distracting cares of a busy life, and I am sure each one of us will agree that the public utilities have moulded a statue, not a gargoyle; that we have made progress in accident prevention, and we will be forced to the conclusion also that we are but at the beginning of still greater accomplishments.

DISCUSSION

CHAIRMAN NAYLON: We are all very much indebted to Mr. Morrison for his splendid paper. Mr. C. B. Hardin, General Claim Agent, United Railways Company of St. Louis, Mo., was scheduled to open the discussion of Mr. Morrison's paper, but he is unable to be present. Mr. H. J. Bell will please open the discussion.

MR. HARRY J. BELL (Secretary, Chicago Safety Council): Until undertaking the organization of the Chicago Safety Council, something over two years ago, I spent practically all of my working life in the steam railway business, in the operating, claim and safety departments. I am without experience in the public utility field and may, therefore, hold opinions at variance with those entertained by some of you.

I agree in principle with every statement which Mr. Morrison makes. There is, of course, much opportunity for discussion as to whether safety was undertaken in the great majority of cases as a matter of humanity or one of economy—unquestionably the former was the original impelling motive. But now a combination of the two purposes is doubtless the controlling factor, and perhaps it is well that this is so, for to regard safety as a measure of economy accords it a greater permanency and a more businesslike place in the affairs of a company than might otherwise be the case.

It is my belief that we have only just scratched the surface of the ground in the safety movement and that more far-reaching results will be achieved in the next decade than in the ten years just passed. If you concede the accuracy of this statement then you will perhaps agree that the greatest accomplishment in the safety movement up to this time is that represented by the educational process which has gone on in the minds of the executives in industry and business in general.

Once the management of a public utility affords the safety movement its real support, properly backs up the work by expenditures commensurate with the probable returns and gets over the old-fashioned notion that safety is a fad, it is a comparatively easy task for a competent man to interest the employees and others who come in contact with the industry in the prevention of accidents.

SAFETY MOVEMENT IMPORTANT BUSINESS UNIT

I do not mean by this that the manager of a company simply formally endorses the safety movement and then entirely ignore it, but that he regard it as an important unit of his business and treat it in the same manner, and with equal importance, as the manufacturing, operating, engineering, transportation and other departments of the business.

The cost of safety and the returns it produces are both somewhat intangible, but a reasonable calculation will prove, I think, that any well-

operated safety department pays bigger returns on the investment, which is almost invariably small, than any other department of the industry.

It may be proper here to say also that safety, almost without the management knowing it in many cases, goes a long way toward developing proper relations between the public service corporation, its employees and the public. It is the unseen factor which makes for proper understanding and a better relationship in general.

Further proof of progress in safety development on the part of public utilities is provided by the fact that most if not all national associations in this field now have committees which devote their time and energy to consideration of this subject. That of itself demonstrates the high regard which the industry as a whole has for safety and speaks well, indeed, for its future.

Concrete evidence of advancement is contained also, it seems to me, in the credit allowances made by insurance companies for constructive safety work on the part of the insured. Emphasis is placed on its importance because of the scientific experience analysis by which insurance rates are determined.

TEACHING SAFETY AND FIRE PREVENTION IN SCHOOLS

The teaching of safety and fire prevention in the schools in many sections of the country represents progress of the highest order, second only perhaps to that of educational work among the employees, if, indeed, it is not of even greater importance. In this manner the most effective possible means is provided for the prevention of public accidents as applied both to children and adults.

The span of time between the boy in school and the man in industry is relatively short and it is reasonable to assume that the child who is taught safety in school now will be a better and safer workman when he enters industry.

This plan is now in effect in Detroit, St. Louis, Chicago and several other cities. It is almost invariably the result of efforts of the National Safety Council and the local Safety Councils in the larger cities of the country. The merit of the plan is more and more recognized every year and the arrangement is spreading quite rapidly. There is at first a natural antagonism to such a plan on the part of the school authorities, but the leading educators of the country now quite generally appreciate its worth.

You are all quite familiar with the National Safety Council, but I should like to refer briefly to the local Safety Councils of that body which are now operating in the development of the safety movement. They have done and are doing a great deal to prevent accidents both to employees and the public.

In the latter field they are particularly efficient, because of their work in the schools, through the press, public authorities and otherwise. They can and do accomplish results which the companies in numerous instances cannot hope to obtain, because they are civic organizations thoroughly representative of every interest in the community.

To the everlasting credit of the public utility business it should be said here that, in a very large number of instances, the public utilities

are supporting these organizations and actively participating in their work. In some cases they were responsible for the development in the first instance. Here, I submit, is very real progress.

Such institutions generally function as a part of or under the direction of the local chamber of commerce. This at once accords the safety council a prestige in the community that could not be gained in any other way. And, since the safety council, unlike a corporation, cannot be charged with any selfish or ulterior motive in its activities, it can and ordinarily does achieve results of first importance.

REMARKABLE PROGRESS MADE IN SAFETY WORK

There is but one answer to the question suggested by the topic of Mr. Morrison's paper, "Progress in Accident Prevention in Public Utilities." That is that progress has most assuredly been made in the prevention of accidents as applied to this industry. I have attempted only to mention selected high spots that readily occur to me. Much more might be said, both as to the accomplishments made and the urgent need for further achievement in the future.

Not the least important by any means in the shape of evidence of progress lies in the growth of the National Safety Council itself. And this development is paralleled by the healthy growth of the safety movement in general in practically all parts of this country and to some extent in foreign countries. The movement is now of such magnitude as to substantially assure future progress by virtue of the momentum it has already attained. This fact alone stands out as definite proof of progress.

It is my sincere hope that every man attending this great Congress will resolve here and now that not only will he accord safety the important consideration it deserves, but that he will strive diligently to cause his associates to similarly regard the matter. There is a quotation by Emerson that "Every great movement in the annals of the world is the triumph of enthusiasm." Surely this axiom applies with special force to a movement which has for its primary object the conservation of human life and limb, the greatest assets alike of individuals, nations and industries.

Let us all remember that safety is a man's job—there is much to be done and right-thinking, earnest men, such as you, must do your task with the conviction that safety is a service of the highest order—worthy of the best efforts of which you are capable.

CHAIRMAN NAYLON: Both Mr. Morrison's paper and Mr. Bell's are so excellent that there ought to be a very free and general discussion.

ANALYZING COST OF INSURANCE PREMIUMS

MR. W. C. BERRY (Commonwealth Edison Company, Chicago): When our insurance premiums increased to over \$50,000 a year, we started to analyze our claims to ascertain how much money, really, our employees were getting. In those days we were working under the common law and the Edison Company, through the generosity of our president, always saw to it that an injured employee lost no money during his period of disability. As a result, when we had a serious accident, we did not take

the matter into court; we made settlements. The insurance company contributed a certain amount and the Edison Company made up the rest. One day, when the premiums had gone higher than I thought they should go, I went to the officials of the company and said: "The insurance companies are paying these losses and we are doing nothing to prevent them. In other words, we are holding the sack; we are having more injuries and damage to property than appear to be necessary. I think we can save at least \$20,000."

At that time we organized our safety department with the late Mr. Gannett in charge. Mr. Gannett went into the matter heart and soul; I believe he had 270 meetings in one year—the majority being held at night. He was an untiring worker. The reduction in our premium cost the first year was \$40,000, and it kept on increasing each year. In 1914 we had the worst year in the history of our company; our losses were \$90,000 and we had twelve deaths. Then we got busy and organized safety councils, intermediate safety councils and executive committees. From that time on our costs have been reduced. The whole administration of the company, regardless of the increase, has not been over \$67,000 a year; our premiums used to be about \$215,000.

Last year we had a wonderful period of safety organization and suggestions running up into the thousands were made by the men. Those that met our approval were put into force. Last year we did not pay out a cent for injuries to the public and we have not a suit pending against us. The safety meetings that the company has had, we feel confident, have been the means of reducing the cost.

INSULATION OF BASEMENT SOCKETS

One thing I feel the safety organization should get into is the matter of notifying everyone about the insulation of basement sockets. Just the other day, at the Howard Theatre, a watchman got hold of a drop cord carrying 117 volts and was killed. Our company is making a campaign along that line.

MR. BEAUMONT (People's Gas, Light & Coke Company, Chicago): In speaking of the progress of accident prevention, there should be some special mention made of Mr. Bell's work. It was he and his associates who were particularly responsible for the safety textbook which is to be used in the public schools of Chicago this fall. Safety is a matter of education and certainly this is a very forward step in safety education.

MR. MACLACHLAN: In connection with Mr. Morrison's paper (and I want to congratulate him very highly on the way he presented it) he mentioned the work on accident prevention of the N. E. L. A. In our report we were a little close up to the picture; we may be a little too pessimistic, but we are all interested in prevention. In the N. E. L. A. we are not always dealing with accident prevention men and some of us, who are in touch with utilities that are not represented here, are inclined to be pessimistic. In a great number of utilities there has been tremendous progress during the last eight or ten years, but in the matter of design and operation we have a long way to go before we can sit down, perfectly satisfied. The scheme that has been suggested within the last year or so of putting it up to the foreman—if he has an

accident it may be a holiday without pay for him—may put accident prevention away to the top of what it is at the present time.

SAFETY POSTERS AND THEIR USES

MR. BRADLEY (Safety Engineer, Milwaukee): You may be interested in seeing the posters which our company is using. Our idea is to post one of them on the roadside within a few feet of the edge of the concrete, on an interurban highway intersection—putting it back far enough so that there may be time for the mental reaction of lowering the speed of the car to take place after the driver of an automobile has seen it. As you see, this ties up with the campaign of the A. R. A., but instead of showing a steam locomotive we use an electric interurban train. Our idea is to put the poster low enough so that it will be caught by the headlight of the car in the evening; of course, it will be seen in the daytime.

CHAIRMAN NAYLON: I was very much amused at Mr. Morrison's reference to the rule that he recalled as being in effect in the Western Union Telegraph Company a good many years ago, forbidding linemen to use a body belt. If by any possible chance in those days a lineman did use a belt he would not only have been disciplined by his company but he certainly would have been ostracized by his associates. The next paper is by Mr. Garrett T. Seely.

THE FINANCIAL SIDE OF ACCIDENT PREVENTION

GARRETT T. SEELY, VICE-PRESIDENT AND GENERAL MANAGER, PENNSYLVANIA-OHIO ELECTRIC COMPANY, YOUNGSTOWN, OHIO

Furtherance of the cause of accident prevention primarily is to be considered from the humanitarian viewpoint. Efforts to reduce to a minimum accidents in industry, on the highways and in the homes are efforts directed toward the prevention of the deaths or suffering of individuals. That is the basis on which the movement for accident prevention started; that is the basis upon which we must continue to build.

The humane aspect of the work is the prime essential. Death and suffering in themselves cannot be measured in monetary units, but there is a corollary to deaths and injuries and accidents as a whole that must be measured in dollars and cents. This is the economic loss caused by the interruption to the usual occupations of those injured, the loss to industry through the deaths of workers, the utter waste of property needlessly destroyed.

This economic loss cannot be measured with exactness, but it mounts into staggering sums of hundreds of millions of dollars each year. Payments for loss and damage to property and injuries to persons by the steam railroads of the United States in the year 1920 alone amounted to \$199,591,261; the total annual accident cost in all lines of industry and business has been estimated at \$1,500,000,000. It is an economic loss to the entire people and part or all of it must be paid for through the companies experiencing the accidents that cause the loss.

COST OF ACCIDENTS TO PUBLIC UTILITIES

A somewhat detailed consideration of these dollars-and-cents losses, of this financial side of the accident-prevention work, then is fitting. For the purpose of this discussion the cost of accidents to public utilities alone will be considered, adequate figures to include the whole field of industry not being available.

Every cent spent by public utilities for operating expenses, taxes and interest is devoted to something productive, with the exception alone of those sums expended for accidents and insurance. The money spent for maintenance restores the physical property to normal condition, providing new tracks, equipment, poles, ties, wires, insulators and the like; the money expended to produce gas or power yields something that is salable; the sums disbursed in wages produce that which is salable, or do some constructive work; the taxes paid, inequitable and burdensome though the portion placed upon utilities may be, secure fire, police and governmental protection. Interest and dividends paid make it possible to obtain new capital for improvements and extensions; but the money expended because of accidents cannot in any way be considered as productive. It is a severe drain on the earnings of the industry—it is irretrievable waste.

In attempting to ascertain the actual cost of accidents of all classes, including legal and claim department expense chargeable thereto, it was found that little published information was available. The United States Census Bureau's report on electric railroads gives the cost of accidents for 1917, but no figures for earlier or later years were obtainable. An excellent and complete report on the cost of accidents on the steam railroads from 1897 to 1920, inclusive, is contained in a publication entitled "Railway Statistics of the United States of America for the Year Ended 1920," prepared by Slason Thompson, Bureau of Railway News and Statistics, Chicago. The information bearing on our subject obtained from these two sources will be given in detail later.

GOVERNMENT REPORTS NOT COMPLETE

No governmental reports or compilations prepared by national associations were available to show the accident costs of water companies, telephone and telegraph companies, gas companies, electric light and power companies, interurban railway companies or city street railway companies.

Therefore, to secure sufficiently comprehensive data on the accident costs of the various utilities, several hundred letters were sent to representative companies in all parts of the United States. These letters asked for the total cost of accidents and damages, including expenses of claim and legal departments, and the gross earnings of each of the companies for the last five years. The generous response to these hundreds of questionnaires made possible a study of the subject that might be accepted as truly representative of the utilities of the country as a whole.

In the study made of the statistics obtained, the averages for the last five years were taken rather than the figures for one year, as it was felt that such averages would reflect more accurately the conditions that

actually obtain. A careful effort also was made to segregate the earnings and accident costs of companies operating more than one class of utility, so that the grouped figures for each classification would be representative.

The gross earnings of all utility companies increased at an abnormal rate during this five-year period, due largely to rate increases. The cost of settling accident claims also increased greatly, because of the lessened value of the dollar.

NOT ALL PUBLIC UTILITIES ON SAME BASIS

The amount of money and the percentage of gross earnings expended because of accidents vary widely with the different classes of utilities. They vary almost in direct proportion with the degree of contact on the part of the public with the commodity sold or the equipment used in rendering service while such commodity or equipment is under direct control of the utility. They also vary in proportion to the extent that the business of the utility is conducted on or across public streets or highways.

As is to be expected, the water companies and the telephone and telegraph companies have the smallest number of accidents, both to the public and their employees, and the lowest costs in proportion to earnings of all utilities. There is nothing hazardous in itself about the commodity they have for sale or the means of rendering service. Their mains and pipes and wires and equipment in general are well removed from normal contact with the public.

To a somewhat lesser degree this also is true of the gas companies. Their commodity does present some hazards of fire, explosion and asphyxiation, but their pipes or conductors, or the vehicle transporting the commodity, are entirely underground or built in walls and floors of buildings or firmly attached to permanent structures. The point of delivery of their commodity usually is at the entrance of a building, where practically all responsibility of the utility ends. The utilization of the commodity is in the hands of the consumer and service is affected only to a minor degree by weather conditions and not at all by traffic on the streets or by any such public interference.

Electric light and power companies are next in low costs of accidents. They render no service openly on the public streets and the commodity furnished is carried either in underground conduits or in insulated wires high enough above the streets to be away from the public. Poles, wires and insulators may fall and storms may create undue stresses, but the public, under normal conditions, does not come into direct contact with the vehicle carrying the commodity.

MEASURE OF RESPONSIBILITY IMPORTANT FACTOR

Transportation companies are engaged in a business that is most hazardous to the public and to employees. Generally speaking, the business is the carriage of human beings or material articles and the company is responsible for their security from the time the persons present themselves or the articles are turned over to it until delivery at their destinations.

Steam railroads are almost entirely on private right of way and grade crossings in congested city and rural districts are rapidly being eliminated. Collisions and derailments are the most general sources of accidents. Elevated or subway electric lines carry passengers only, but operate their cars either above the street level on isolated structures or below the street level and their type of construction is such as to reduce accidents to the minimum.

Surface electric lines have the most intimate contact with the general public and, accordingly, they have the greatest accident cost. Their business is chiefly the carriage of human beings and these are carried in light cars in the midst of dense traffic, the cars threading their way among pedestrians and rapidly propelled vehicles, which are under the control, many times, of irresponsible individuals.

With these varying conditions in mind, let us turn to the consideration of some of the actual costs that the various utilities have had to meet and see in dollars and cents how important is the "Financial Side of Accident Prevention."

STEADILY RISING PERCENTAGE OF GROSS RECEIPTS

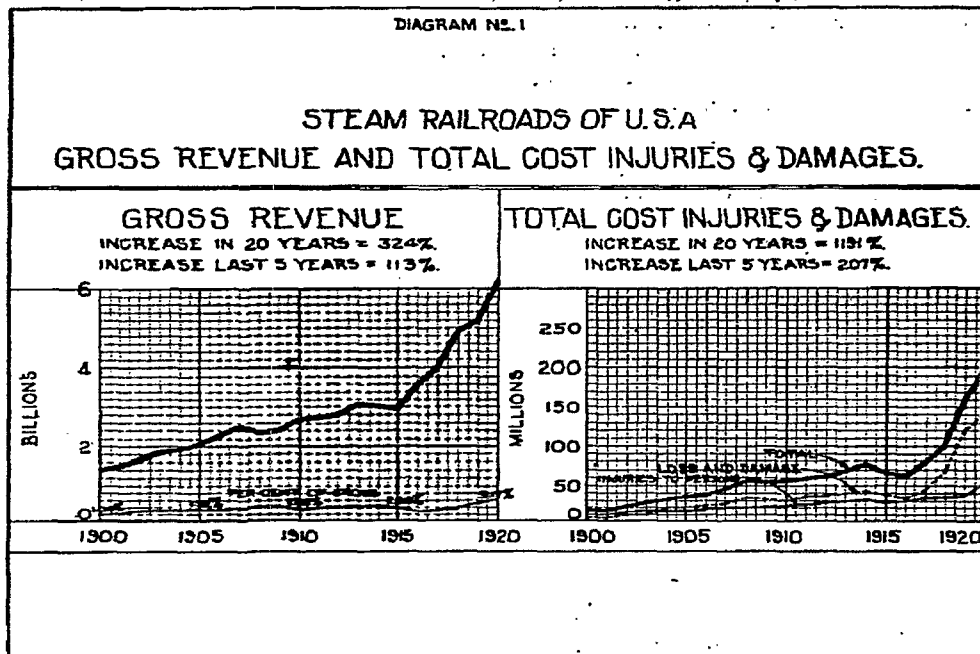
As has been stated, a complete compilation of the cost of accidents on steam railroads was obtained from the 1920 issue of "Railway Statistics of the United States of America." The tabulation below (table I) shows payments on account of loss and damage and injuries to persons, the gross earnings and the proportion of each of the above items to gross earnings for each fifth year from 1900 to 1915 and for each year from 1916 to 1920, inclusive. The loss and damage items include payments on account of loss and damage to freight, baggage, property and live stock. The injuries to persons include costs of accidents to employees, passengers and the general public. The same statistical information is dealt with in graphic form in diagram I.

TABLE I
Steam Railroads of United States—Payments on Account "Loss and Damage" and "Injuries to Persons" and Proportion to Gross Earnings

Year	Earnings	Amount	Per Cent of Gross	Amount	Per Cent of Gross	Amount	Per Cent of Gross
1900	\$1,487,044,000	\$ 7,055,622	.474	\$ 8,405,980	.565	\$ 15,461,602	1.04
1905	2,082,482,000	19,782,692	.950	16,034,727	.776	35,817,419	1.72
1910	2,750,887,000	30,984,854	1.127	23,665,488	.866	54,650,342	1.98
1915	2,956,193,000	37,947,468	1.284	27,090,222	.916	65,037,690	2.20
1916	3,679,989,000	31,274,827	.850	30,156,759	.819	61,431,586	1.66
1917	4,074,672,000	44,079,992	1.082	34,109,331	.837	78,189,323	1.91
1918	4,969,910,000	66,300,736	1.334	34,229,536	.689	100,530,267	2.02
1919	5,231,750,000	117,671,790	2.250	38,238,803	.731	155,910,593	2.98
1920	6,300,160,000	142,227,070	2.260	57,364,191	.910	199,591,261	3.17

In 1900 the gross earnings of all steam railroads were \$1,487,044,000. Loss and damage amounted to \$7,055,622, or 0.474 per cent of the gross earnings. Injuries and damages to persons cost \$8,405,980, or 0.585 per cent of the gross earnings. The total cost of accidents of all kinds amounted to \$15,461,602, or 1.04 per cent of the gross earnings.

It will be noted that the cost of loss and damage to property was less than the cost of injuries and damages to persons.



RECORD FOR FIFTEEN YEARS

In fifteen years, or in 1915, the gross earnings had increased to \$2,956,193,000, or practically 100 per cent, while the loss and damage had increased to \$37,947,468, or more than 400 per cent, and injuries to persons had increased to \$27,090,222, or more than 200 per cent. The combined cost increased from \$15,461,602 to \$65,037,690, or more than 300 per cent, while the percentage of gross earnings thus paid out increased from 1.04 per cent in 1900 to 2.20 per cent in 1915.

In 1916, 1917 and 1918 there was very little change in the percentage of gross earnings required to meet these costs, despite the fact that the gross earnings increased greatly.

In 1920, while the gross earnings increased to more than \$6,300,000,000, the loss and damage costs had risen to \$142,227,070, or 2.26 per cent of the gross earnings, and the cost of injuries to persons had increased to \$57,364,191, or 0.91 per cent, making the combined cost \$199,591,261, or 3.17 per cent of the gross earnings. Thus, while in twenty years the earnings had increased from \$1,487,000,000 to \$6,300,000,000, or 324 per cent, the cost of loss, damage and injuries had increased from a total of \$15,461,502 to \$199,591,261, or an increase of 1,191 per cent.

The comments made with reference to the above situation in the 1920 report are as follows:

"Where before Federal control dispensed with the services of the most active attorneys engaged in fighting these claims, payments on their account never reached \$80,000,000 a year, last year they amounted to nearly \$200,000,000. Between 1908 and 1916, inclusive, the railways had held this parasitic growth in check so that in only one year (1914) did it exceed 2.4 per cent of the revenues. The total for 1920 is equal to more than 6½ per cent on the gross earnings of 1914! The advances in rates in 1918 and 1920 have whetted the appetites of the claim leaches, who never let go. The increase in payments for loss and damage is altogether out of proportion to the increase in business."

PAYMENTS MADE BY ELECTRIC RAILWAYS

While confined to one year and therefore not nearly so satisfactory as the complete data concerning the steam railroads, the following tabulation (table II), the information for which was obtained from the United States Census Report for 1917, is illuminating with regard to the amounts and percentages of gross earnings paid out by electric railways in that year on account of injuries and damages. The total gross earnings, total accident cost and the percentage of the latter to the former are shown by geographical districts.

TABLE II
Electric Railways of United States—Accident Cost, 1917

District—	Gross Earnings	Accident Cost	Per Cent
New England	\$ 68,399,091	\$ 2,883,646	4.2
Middle Atlantic	230,354,775	8,529,035	3.7
East North Central	162,091,962	5,465,417	3.3
West North Central	52,455,024	2,140,595	4.1
South Atlantic	42,426,736	1,455,076	3.4
East South Central	15,882,474	955,783	6.0
West South Central	20,166,036	887,217	4.4
Mountain	10,294,660	233,285	2.3
Pacific	48,079,048	1,193,377	2.5
Total	\$650,149,806	\$23,743,431	3.65

These figures are for all electric railways—city surface, interurban, elevated and subway lines. They show that the total cost of injuries and damages for 1917 was \$23,743,431, while the gross earnings for the same year were \$650,149,806. That is, 3.65 per cent of the gross earnings were paid out because of accidents.

A considerable difference in percentage is shown for the various geographical groups. However, the two groups showing the highest and the lowest cost both contain comparatively small numbers of companies and these variations are no greater than are shown between individual companies in approximatively the same geographic locations.

INFORMATION GLEANED FROM QUESTIONNAIRES

From the third source of information, the questionnaires sent out to several hundred of the representatives utility companies in all parts of the country, additional data was obtained, which, with the complete statistics of the steam railroads, enables us to see in what order the various classes of utilities come in regard to the relative cost of accidents.

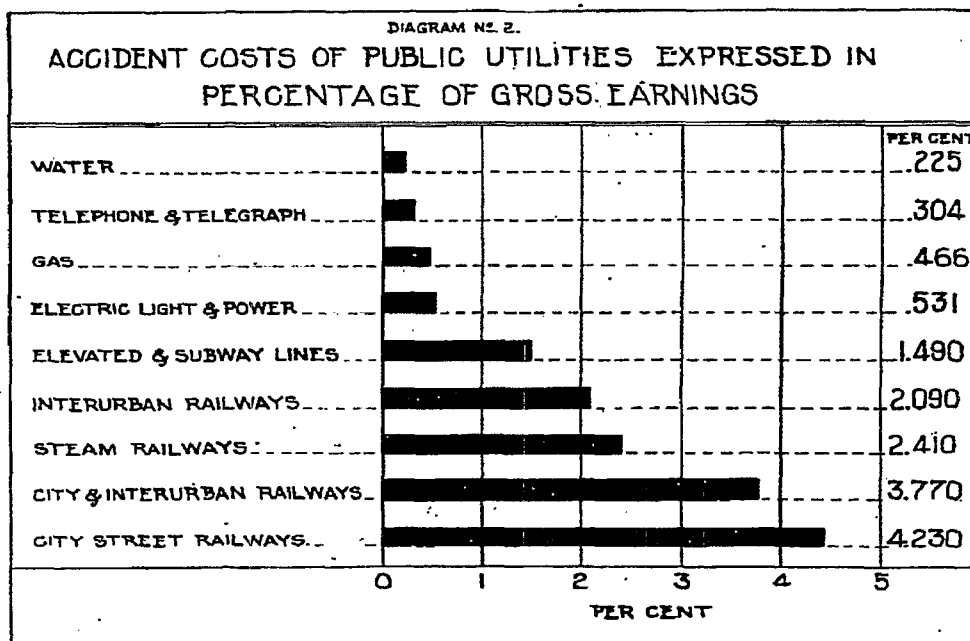
The large number of responses to the request for the gross earnings and accident costs was most gratifying. With these figures at hand it was possible to make comprehensive averages for a five-year period

and from this data the relation of the costs of accidents to the gross earnings for each group of utilities was determined. It is believed that responses were received from a sufficient number of companies in each group to make the results shown in the following tabulation (table III) fairly representative.

TABLE III
Accident Cost of Public Utilities Expressed in Percentage of
Gross Earnings

	—Average of Last Five Years—		
	Gross Earnings	Accident Cost	Per Cent of Gross
Water companies	\$ 6,961,896	\$ 15,713	0.225
Telephone and telegraph companies..	387,800,942	1,179,312	0.304
Gas companies	94,616,598	441,365	0.466
Electric light and power companies..	159,672,546	847,977	0.531
Elevated and subway lines.....	89,553,846	1,337,164	1.49
Interurban railways	20,329,306	425,773	2.09
Steam railways	4,940,000,000	119,120,000	2.41
City and interurban railways.....	41,122,343	1,551,424	3.77
City street railways	387,272,147	14,274,290	4.23

Note: Amounts shown above for gross earnings and accident costs are only for companies replying to questionnaires and do not represent total figures for the United States except in the case of steam railways.
The information shown in this tabulation is expressed graphically in diagram II.



The earnings and accident costs were separated strictly in accordance with the character of the service with the single exception of the item "City and Interurban Railways." Here the earnings and accident costs are shown for one group of companies operating both classes of service in

such manner that it was impossible to make a separation between city service and interurban service.

VARIATION SHOWN BETWEEN INDIVIDUAL COMPANIES

It will be noted that the percentage of gross earnings required to meet accident costs for water, telephone and telegraph, gas, and electric light and power companies are relatively small, for the reason that they are comparatively free from direct contact with the public, as set forth above, while the percentage for transportation companies are very much higher.

Among transportation companies that group whose business is the carriage of human beings in vehicles that are operated in public streets (that is the city surface railways) has the highest percentage of accident cost, while on the elevated and subway lines, whose trains are run upon isolated structures with no opportunity, under normal conditions, for the public to come into contact with moving trains, the accident cost is lowest.

In each group of utilities the individual companies showed a great variation between the companies having the lowest percentage of accident costs and those having the highest. A company having a percentage of accident cost higher than the average may not necessarily be operating in a careless or negligent manner, as the local conditions with regard to the pernicious activity of personal injury lawyers, the laws of the state relative to the liability of public utilities, and the local precedent set up as to the amount of judgments for various injuries have a most important bearing on the dollar and cents side of accidents but have no relation to the number or seriousness of actual accidents.

As an illustration: In two large cities, not widely separated, both companies efficiently managed, the cost of accidents in one is 2 per cent of the gross earnings and in the other 8 per cent of the gross earnings. Assuming a typical large company with gross earnings of \$5,000,000 a year, the difference between 2 per cent and 8 per cent in the cost of accidents is \$300,000 a year, which is equivalent to carrying charges at 8 per cent on \$3,750,000.

While it is natural, perhaps, to view the importance of the financial side of accident prevention from the percentage of gross earnings required to meet the cost of accidents, no company having a ratio less than the average should feel that it is doing the best it can, or that it is impossible for it to make further reductions in the number of accidents and thereby in the cost of accidents.

IMPORTANCE OF VARIOUS CLASSES CHANGES YEARLY

It is found that the relative importance of various classes of accidents changes from year to year. For instance, a number of years ago boarding and alighting from cars was the most serious cause of accidents on street railways, while accidents due to collisions with vehicles were not a severe drain. The use of doors at the entrance to cars which are kept closed while the cars are in motion, in place of the old open platform, has done much toward the elimination of step accidents, while the increasing number of automobiles used and the greater congestion in city streets

therefrom have made automobile accidents the most expensive class for street railways.

In considering the financial side of accident prevention an analysis of the amount of money expended over a period of a year or two years, classified as to the causes of the accidents, is illuminating and will be a better criterion by which to select the field for intensive work in reducing accident expense than the number of accidents occurring in any particular classification.

To this end and in view of the difficulty that has been experienced in assembling comprehensive data of the cost of accidents to utility companies, it might be to the interest of all concerned if it can be arranged to have the various national associations, or governmental agencies, assume the task of compiling complete information of the cost of accidents and analyzing it so that the way may be pointed more definitely than ever before for the reduction of this tremendous tax on industry and business.

HUMANITARIAN SIDE OF WORK COMES FIRST

In view of the facts stressed in the report of Mr. Thompson on the steam railroads and in view of the experience of every class of utility and industry, might it not be well to work for greater co-operation in combatting that insidious and extremely costly evil, the activities of the "ambulance chasing" personal-injury lawyer?

Always keeping in mind that the humanitarian side of accident-prevention work comes first, nevertheless let us not forget that the financial side is where we find the measure of economic loss; that whatever we may be able to do to reduce the number of accidents is so much accomplished toward eliminating utter, irretrievable waste, is so much won for the economic improvement of the entire Nation.

DISCUSSION

MR. BELL: Mr. Seely's paper is a masterpiece. It represents such a tremendous amount of research work that this audience owes him a rising vote of thanks for that wonderfully fine paper. I move we do so. [The motion was seconded and prevailed.]

CHAIRMAN NAYLON: The formal discussion of Mr. Seely's paper will be opened by Mr. Harry B. Lucas.

HARRY B. LUCAS (Treasurer, Philadelphia Electric Company, Philadelphia): Last year, in a few minutes talk, I stated to what an extent accident costs had risen. There are three potent factors accountable:

1. Increased wages—which is responsible for at least one-third of the increased cost.
2. Increased hazards—such as a greater number of automobiles and general transportation.
3. Increased activity of law firms making a specialty of public accidents.

The figures given by Mr. Seely are borne out by an analysis of those of our company. Since 1916 a general increase has been shown in cost of accidents.

From the tabulation much information may be gained:

Item No. 1.—Number of accidents, "no time lost." Notwithstanding the increase in working forces the accidents have not increased—irrespective of the insistence of reporting even the most minor injuries.

Item No. 2.—Decreased number of accidents, "time lost." This is gratifying as it shows a marked decrease in the years 1918, '19, '20, '21, even with a large increase in number of men employed.

Item No. 3.—Fatal accidents have not increased in number correspondingly with increase in employees.

Items 6 and 7 contain food for serious thought: Average cost per accident for five years (including no time lost), \$52.11; average cost per accident for five years (covering time lost accidents and fatalities), \$120.36.

ALARMING COST OF ACCIDENTS

Only men who deal with accident losses realize the meaning of these figures. Briefly every accident reported, however trivial, has a cost to us of \$52.11, or to be exact, a present cost of \$65.16. The average cost of the accidents, "time lost," is \$120.36; to be exact, a present cost of \$163.97. These figures are alarming. If we could but make employees realize that each accident costs us now \$163.97 and must cost them approximately a similar amount, the cause of accident prevention would make even more tremendous strides than formerly. That is the message the National Safety Council must put across.

ANALYSIS OF ACCIDENT COSTS							
	1916	1917	1918	1919	1920	1921	Total
1. Number of accidents—							
No time lost.....	431	532	426	407	529	508	2833
2. Number of accidents—							
Lost time	422	411	272	316	377	330	} 2163
3. Number of accidents—							
Fatal	4	7	9	4	6	5	
4. Total number of accidents	857	950	707	727	912	843	4996
5. Average cost per accident per year.....	\$28.39	\$44.20	\$55.64	\$60.62	\$61.06	\$65.15	\$52.11
6. Average cost per lost time accident per year	57.10	100.46	140.00	137.72	145.50	163.97	120.36
Item No. 7 includes fatal accidents with accrued liability.							

In your talks, emphasize the necessity of increased efforts on accident-prevention work, not only by calling attention to total cost of accidents but by hammering home the average cost of the individual accidents. Talk from the economic side only. Till within a short time I have been a firm believer in accident prevention from the humane side, but I am veering rapidly to the economic side. We can arouse the interest of *some* employers by presenting strongly the humane side, but we can arouse the interest of *all* employers by presenting strongly the economic side.

The knowledge of the harm caused by accidents to employees by reason of pain, suffering and monetary loss, may be keenly felt by the sympathetic employer, but sympathy is mostly passive, and the result is a spasmodic attempt at accident prevention, faintly supported.

RELENTLESS WAR MUST BE WAGED FOR SAFETY

Business is business, and is for money making. A dollar saved is one made, and that phase of accident prevention is, say what we will, the one most appealing to all.

From the figures given by Mr. Seely, supplemented by the few given by the writer, proof is shown of the relentless war which must be waged on accidents and from the economic side—a war where economy and humanity are equally triumphant. The success of the economic side means the success of the humane side. In all efforts toward accident prevention, feature strongly the economic side. If you can interest your subject to increased activity the humane side shares equally in the result.

Your figures may differ a little from those I have read, but we include the compensation of our beneficial association. The association formerly took care of the man from the moment he was hurt at full pay until he returned to work. Now, if he is entitled to 60 per cent compensation, the beneficial association takes care of the other 40; he always gets his full wages. That \$163.97 includes fatal accidents, with accrued liability.

The chairman of the workmen's board in Philadelphia, Mr. Harry Mackey, says that 86 per cent of industrial accidents in Pennsylvania are preventable and that 62 per cent of those reported last year were due to carelessness.

CHAIRMAN NAYLON: May I ask how you arrive at the cost of a no-lost-time accident at fifty-odd dollars per case?

MR. LUCAS: We took all the cases and figured it out; when we come to take the average of those wherein time has been lost it runs up to \$163.

MONEY TO PAY DAMAGES COMES FROM INCOME

CHAIRMAN NAYLON: Mr. Lucas has suggested that we ought, almost entirely, to concentrate our energies on the economic side of the question. That is perfectly all right if you are trying to sell accident prevention to the employer, but to my mind it is a very dangerous argument to use in talking to employees. The minute you start talking to them from a business standpoint you get into difficulties. You will probably get some real constructive good out of it, when talking to employees from a humane standpoint, to mention incidentally that this is costing real money and the money is coming from your company, but in any talk to employees of any kind of institution or industrial concern, where you magnify the importance of accident prevention from an economic standpoint, you make, to my mind, a real mistake.

MR. LUCAS: In spreading the gospel at this time, I was considering talking to employers and not employees.

CHAIRMAN NAYLON: There are two parts to our program. A great many of us have to use every possible effort to sell the idea to our employers. If we appeal to them from the dollars-and-cents standpoint, it is perfectly right and proper. A great many of us don't have anything to do with selling it to our employer, but use our energies selling it to

employees. The argument with them is the humanitarian one. The next formal discussion of Mr. Seely's paper is by Mr. G. T. Hellmuth.

TANGIBLE RESULTS ACHIEVED

MR. G. T. HELLMUTH (General Claim Agent, Chicago, North Shore and Milwaukee Railroad): The financial side of accident prevention has meant for the road that I am with, the Chicago, North Shore and Milwaukee Railroad, a saving in dollars and cents, for the years 1919, 1920, and 1921, as compared to the average for the four-year period prior to 1919, of \$57,700.50. This figure represents the difference between the average percentage of 2.50 for the earlier four-year period and the average percentage of 2.09 for the last three years. That saving is one of the concrete, tangible financial benefits derived from our work in accident prevention, but I count as much larger and equally susceptible of proof two other financial benefits obtained by us from accident prevention.

1. We all agree that proper relations with our patrons and with the municipalities through which we operate are vital necessities to the successful conduct of our business. We cannot expect to maintain such relations where, one after another, serious accidents occur in some or all of the towns or cities through which we run, such accidents sometimes involving people little known in the community, but quite frequently snuffing out the lives of people of prominence. Accident prevention for us has almost entirely eliminated this type of accident and the financial benefit is clear and positive.

"ROAD OF ACCIDENTS" NOW "ROAD OF SERVICE"

2. During the five years of the receivership period, preceding the year 1916, I was in charge of the claim department of the Chicago and Milwaukee Electric Railroad, and at that time there were comments of a character very unfavorable to the road. Women did not want to ride on it. It was getting into the newspapers with bad accidents and a good many people were inclined to look at it as the "Road of Accidents" rather than the "Road of Service," as it is now known. However, in 1916, the road was reorganized, became the Chicago, North Shore and Milwaukee Railroad, with Mr. Britton I. Budd as its president, and commenced intensive accident prevention. This work was not carried on without considerable expense. Gates were installed at many grade crossings, operating conditions were changed and improved, and this program has been continued up to the present day. Therefore, we add number three to the financial benefits listed, inasmuch as a great many more passengers will be carried on the road that has no accidents, or has the minimum accidents, than on the other kind that is always breaking into the scareheads of the papers with some calamity that has befallen it and its passengers or those upon its tracks or who endeavor to cross its tracks.

RESULT OF SPECIALIZING IN ACCIDENT PREVENTION

I think that if the increase in the gross income and the saving in the net income could be written in dollars and cents, the size of the figures would be startling, made up as it would be of the three items which I have indicated above. Feeling as I do, and knowing as I do, the value

of the work of accident prevention, I want to say to you that we can only realize its full advantage through systematizing our efforts. We must put someone in complete and exclusive charge of the work, and then let that man or men follow it up throughout the year and during all of each year thereafter. We can't and won't get results unless we specialize on our accident prevention and unless the work is carried on unremittingly.

I have devoted my discussion to our personal experience on the North Shore Line because Mr. Seely's paper has so ably and so thoroughly covered the general subject.

CHAIRMAN NAYLON: There is one phase of the financial side of accident prevention that was not touched upon by Mr. Seely nor in formal discussions; that is the intangible advantage from a financial standpoint of a force that has been drilled and educated in accident prevention and the increased production that results therefrom.

I have in mind the concrete case of an industrial concern, in the East, that served a very scattered territory. There were seven divisions and only two of the seven went into the work wholeheartedly. The two have made excellent showings—are far ahead of the other five. The point I want to make is this: The minute you begin to teach a man to do constructive things you make him a better lineman, a better fireman, a better man in his own home, a better citizen in the community at large. Those are some of the intangible advantages that were not touched on. They would represent real money if a value could be placed upon them.

ENLIST THE PUBLIC IN SAFETY CAMPAIGN

MR. SCOTT (Bureau of Safety): When Mr. Morrison presented his paper this morning on the progress in accident prevention in public utilities this thought occurred to me. As I study the trend of accident-prevention work, in the near future it will be toward some co-operative plan to eliminate those accidents which the public utilities now suffer and are caused by the negligence of the public.

If you were to ask me what you ought to do when you go home, along what line of accident prevention you can specialize in with the greatest profit to the industry you represent, with the greatest profit to the community you serve, I would say it were not to concentrate your efforts to those organizational methods of safety within your own company, but to take a broader view of safety and to lend your efforts as a citizen, as a public utility operator, or employee, to enlisting that interest on the part of the public that would finally culminate in a more careful public and a public more in sympathy with your efforts to educate them. If you live in any of the larger cities, if you are so fortunate to have in your community a local Safety Council, then you are indeed fortunate, because that is the vehicle through which you may best accomplish your work.

WHY SAFETY OFFICIALS ARE PESSIMISTIC

Mr. Morrison said that in the last report of the accident prevention committee of the N. E. L. A. the tone was pessimistic. It was pessimistic!

The other day a man came into my office from San Francisco. He had been East for several days and spent considerable money. He told me he had found a certain safety belt which he thought might suit his company and described it. I thought of the belt the accident prevention committee of the N. E. L. A. had standardized three years ago, had published specifications, and had printed a report covering the entire procedure. They mailed a copy of the report to all the public utility industries in the country. I reached into my desk, showed him a copy and said: "What do you think about that?" He answered: "That is just what we want. This is the first time I ever saw the specifications." The specifications and literature had been mailed to his company three years before, but were probably lying, dust-covered, in some desk or had been thrown away. I might venture to say that in your desk is a dust-covered copy of these papers, which you have not even read. That illustrates the cause of our pessimism—a lack of interest in the things you should know how to do, of getting information when you know where it may be obtained.

As I came into this room I heard another expression that caused a little flare of temperature in my body. It was said, if I am not mistaken, that accident prevention should be presented wholly from the economic point of view. Am I right or wrong?

MR. LUCAS: Right.

OVER-EMPHASIZING HUMANITARIAN SIDE OF WORK

MR. SCOTT: Mr. Lucas is wrong, absolutely wrong. But I think I know what he means. He means the humanitarian side of accident prevention has been over-emphasized; it has been ridden to death. At the time this program was prepared I suggested the subject that Mr. Seely presented; I wanted to go from this Congress to the executives of the industries in this country and take to them a paper from a man as well known as Mr. Seely; prove to these skeptics that they were overlooking an economic factor in their business.

We have failed to properly present the economic advantages of accident prevention to the executives of our companies. So far, Harry Lucas and I thoroughly agree. On the other hand, you can preach from now until doomsday to your motormen and conductors and track men about the dollars you save in accident prevention, and you will not get a response from them unless they understand that they have a personal interest greater than the financial interest in the work.

There are two distinct viewpoints of accident prevention, one of which appeals to men engaged in the business, which appeals to men like Homer Niesz, who has charge of the human element of the Commonwealth Edison Company. There is another and distinct viewpoint of safety that must be given serious attention by such men as Mr. Seely, by such men as Mr. Eustace, who are responsible for the balance sheet. To reach the different divisions of your organization you must use both of these plans, and you must use them for all they are worth. What I said does not reflect so badly upon Mr. Lucas after all, because there is not a man here who has more of human nature in his makeup than he has.

PRIZES OR BONUSES ATTRACT MEN

MR. LUCAS: There is a time coming, Mr. Chairman, when you will have to get the workman closer into this proposition, whether it be by bonuses or payments of some kind, so they will take a more direct interest in the financial returns of the company. You have vision, you know it is coming. There is too much unrest in labor. What is the country suffering from today? If the wage question is settled, something else will take its place, and I think, eventually, you will have the men participating in your profits. The minute they do so, they will be approachable on the economic side. I do not want to decry the human side of this problem.

MR. HOMER E. NIESE: We have had an opportunity this morning to listen to two exceptional papers. As Chairman of the Program Committee I had a small part in the preparation of the program, and I am delighted to have had the opportunity, in that official capacity, to place before you these papers. There is an intimate connection between the paper of Mr. Morrison, on the progress of accident prevention in public utilities, and the paper of Mr. Seely, on the economic side of accident prevention—the latter is the direct result of the former. We cannot expect to secure economy in costs of accidents in our business unless we are constantly making progress in accident-prevention work. It is the progress, the constant striving to accomplish results, that we are out for; namely, to so reduce accidents as to enable us to show figures on our balance sheets representing a small percentage of our gross revenue as our accident costs. I believe if we take the thoughts of those two papers, and their relation to each other, and continue to progress in accident-prevention work, we will continue to show a decrease in percentage of cost for accidents in our balance sheets when they are presented to our executives.

THURSDAY MORNING SESSION

CHAIRMAN HASKINS: The first paper on our program is by Mr. B. I. Budd. It is impossible for Mr. Budd to be present, and he has delegated Mr. Bridges to read his paper.

THE HUMAN SIDE OF OUR BUSINESS

BRITTON I. BUDD, PRESIDENT, CHICAGO ELEVATED RAILROADS, CHICAGO, NORTH SHORE AND MILWAUKEE RAILROAD

There is a trite saying that "There is no sentiment in business." Equally shopworn is the phrase that corporations are "soulless." The fact that so many representatives of large corporations and of big business enterprises are here today to discuss methods of conserving human life and limb is as complete a refutation as could be found of the challenge that corporations are soulless and that there is no sentiment in business.

I have been asked to present something to you on "The Human Side of Our Business" and in doing so I shall approach the subject from a

different angle than that usually taken at safety gatherings of this kind. By that I mean that I shall not dwell on the human misery caused by accidents, of the homes broken up, the widowed mothers and the helpless orphans which modern industry creates, the number of whom, happily, is being gradually and surely reduced year by year by the excellent educational work carried on by the National Safety Council. That particular phase of the human side of our business is well understood and fully appreciated by all who are engaged in this great work of accident prevention. It makes an appeal which no one can resist.

But there is another angle to the human side of our business which is closely related to accident prevention and which I think sometimes is not as much emphasized as it ought to be. Decent treatment by men in a supervisory capacity of those working under them is, in my judgment, as much of a factor in accident prevention as is the safety devices which we place on dangerous machines and on which we lay so much stress. I will go further and say it is a more important factor, because if workmen are not treated as thinking human beings by those having authority over them they are constantly in such a frame of mind that they will cause accidents in spite of all the safety devices and precautionary methods that can be adopted.

THE CONTENTED MAN IS CAREFUL IN HIS WORK

It is a common saying that "the best safety device is a careful man." I fully agree with that saying, but would add that "to make a man careful you must treat him in a way that makes him contented in his work, in a way that will make him glad to meet his foreman or superintendent rather than afraid to meet them. That is the human side of our business which I wish to emphasize.

Fear is one of the causes of accidents. Frequently we call it "carelessness," but if we look more carefully into the subject we may discover that the seeming carelessness was due to a nervous condition.

Those who have made a close study of accidents in a shop or factory have found that a frequent cause of accident is some trouble over which the workman was brooding at the time the accident occurred. The cause of the brooding may have been some family trouble, or some difficulty with a foreman or a superintendent, but it was sufficient to bring on a nervous strain that took the workman's mind off his work. How many times have you observed a workman, under the critical eye of a foreman, become so nervous and excitable that he scarcely was conscious of what he was doing. Some workmen are of an excitable temperament and it requires only some tactless act on the part of a foreman to put them in a frame of mind in which they are largely irresponsible.

Men in positions of authority have a great deal of responsibility in the matter of safeguarding the lives and limbs of workmen under them. In some respects they bear the same relation to the men under them that the father does to his child. A wise father does not exact obedience from his child through fear of punishment, but through respect. He must set a good example and win the child's confidence by kindness. A child in

constant dread of his father may, for a time, have respect for authority, but soon he will have little respect for the father.

THE FOREMAN MUST SET GOOD EXAMPLE

It is the same with the foreman or superintendent who seeks to enforce discipline by harsh treatment of the workmen under him. He loses their confidence, with the result that the character of the work itself usually is inferior and the danger of accidents is greatly increased. What is needed is a little more human understanding, or, in other words, a closer study of the human side of our business. Everyone who has had experience in dealing with men knows the effect of an accident on the morale of the working force. For a time, after the accident takes place, the shop or railroad is demoralized—fear has crept in and weakened the morale. So it is if men are in constant fear of their foreman or superintendent. The morale of the force is weakened and to that extent the danger of accidents increased.

I do not wish to convey the impression that I think men always should be patted on the back, or that strict discipline should not be maintained. Although I believe there is, and should be, some sentiment in business, I do not believe in sentimentality. My contention simply is that the cheerful manner, the sympathetic word, the kindly act will bring much better results than the gruff and domineering manner or harsh treatment.

In the electric railway industry, with which I am connected, the human side is of the greatest importance. Success in our industry is dependent on the goodwill of the public and the public forms its opinion of a company largely by the conduct of the employees with whom it comes in direct contact. It is of the greatest importance, therefore, that the employees of a company engaged in the service of the public be cheerful and contented in their employment, that they be courteous and polite to the customers of the company, that they, in fact, consider themselves a part of the company.

THE INFLUENCE OF SELF-CONTROL IN SECURING RESULTS

To produce such a spirit among employees it is essential that they be treated as human beings. If those in authority do not treat the men under them with proper respect, how can they expect the men to treat the public courteously and respectfully? How can a foreman or a superintendent, who does not exercise self-control when dealing with his men, expect to have those men exercise self-restraint when dealing with a troublesome, maybe an abusive passenger? He may daily preach to his men on the necessity of exercising self-control, but if he does not set them an example himself, his daily preachments will have little effect. Contentment comes as a result of humane treatment. It radiates from the employees to the traveling public.

It is essential that employees serving the public be in a happy and contented frame of mind. When they are, their good humor extends to their passengers. On the other hand, if the employees are grouchy and irritable, their manner irritates their passengers. Keep employees in a

contented and happy frame of mind and many of our troubles will disappear.

Human nature is much the same the world over. Seldom do we find a man so callous that he will not respond to a touch of real human sympathy. Seldom do we find a man who will not inwardly, if not outwardly, resent unjust or harsh treatment.

The brief message which I wish to bring to you men, most of you occupying positions of authority, is that the human side of our business is more important even than the financial side, because it is necessary to the financial success of our business that we establish and maintain good human relations. The more attention we pay to the human side of our business, the more successful will we be on the financial side. The better that our human relations are with the men who work for us, the safer will our operations be, whether on the railroad or in the shop or factory.

DISCUSSION

CHAIRMAN HASKINS: It is a very interesting paper and very ably presented. The discussion will be led by Mr. W. H. Boyce.

MR. W. H. BOYCE (General Manager, Beaver Valley Traction Company, New Britain, Pa.): I quite agree that there is sentiment in business. There are hundreds here today whose presence might testify to that fact. It is regrettable, however, that as yet entirely too many of the old-school-type executives are still in control and their methods provide the premises for the statement and belief that sentiment is lacking. As a corrective measure in the public utility business I propose for the consideration of the powers that be that they must not continue their past fallacious policy of not paying salaries commensurate with the responsibilities imposed in executive positions; this is the falsest kind of economy.

I recognize the financial straits in which the majority of electric railway companies find themselves and realize that all economies possible must be effected, but it seems to me, when the operating ratio is dangerously near the line of gross receipts, that is the time that they cannot afford to attempt to get along with cheap supervision, and certainly if this class of companies fail to pay the proper salaries the brighter minds and new blood will drift toward other lines of industry, where the salaries are more attractive.

What is the human side of our business? Falling back to the dictionary method, Webster defines "human" as: "Belonging to man; characteristic of man; having human form or attributes." Then, if we are to consider the human side of our business, we must consider that we are always dealing with man, no matter whether that man occupies the position of trainman, shopman, lineman, trackman, laborer—they are men and as such are deserving and appreciative of the treatment a man always has a right to expect and which a self-respecting man will always demand. Don't you men here for one moment get the idea into your heads that these men are vastly different than you! They have their likes, dislikes, ambitions, envies and desires. I would suggest, as the best means of fostering the human side of their business, that the head

of each concern be courteous and require of his subordinate officers and the rank and file of the organization, courtesy and a full recognition of all of the rights of the other fellow at all times.

NOT ALWAYS EASY TO INTEREST EMPLOYERS

Mr. Budd states that the human side of our business is well understood and fully appreciated by all who are engaged in this great work of accident prevention, and that it makes an appeal which no one can resist. Unfortunately for them, unfortunately for their employees and unfortunately for industry in general, there are men in executive positions who can and do resist that appeal; to them it falls on deaf ears, and they only become interested in the humanitarian side after their attention is forcibly brought to bear on the amount of the annual liability insurance premiums or their accident expenditures.

To make a man so that he will not be afraid but glad to meet his foreman, I would start with the foreman. I propose that for those companies that have not yet recognized, or especially stressed, this essential that the matter of treatment of employees be brought forward frequently at foremen's meetings.

I would suggest, too, as a means for the removal of part of the fear that a man may have of his foreman, that it be made a rule that no foreman have the right to hire and fire. Foremen should accept or reject an individual only after he has been assigned to the department by the employment agent; foremen should not have the right to summarily dismiss any employee. The employee should be required to clear through the employment supervisor's office. This would be the means of keeping a man in the service of the company provided he had been misfit, that is, if he could have been assigned to other kinds of work.

To eliminate some of the nervousness, I would suggest that careful attention be given to the fitting of the man for the position, not employing the first man who comes in for a position that happens to be open. There is just as much danger of trouble on account of filling a position with a man who is too well equipped mentally as there is in filling a position with a man who is below the standard mentally. This, of course, is a detail of the proper administration of your personnel department.

In many cases the employment and personnel should be under the supervision of the safety engineer, for the reason that the work and responsibility of these departments are so closely related. The safety engineer is always attempting to prevent accidents and knows that a careful employee is the best safety device that can be had. So why not make the safety engineer responsible for the securing and shaping up of the best safety devices—human and machine.

STUDY MEN THROUGH EMPLOYEES' COMMITTEE

Mr. Budd said: "How can a foreman or a superintendent who does not exercise self-control when dealing with his men expect to have those men exercise self-restraint when dealing with a troublesome, maybe an abusive passenger?" I would make this a positive statement and say: A foreman or superintendent who does not exercise self-control when

dealing with his men cannot expect those men, etc.; I mean to be just as positive as I know how.

Reference was also made to general statements concerning a closer study of the human side of our business. I say to you that the study of man is well worth your while, but to study him over a mahogany top desk, or from the window of your limousine, or from the books on the subject of what is in the worker's mind, will not give you even the elements of the education that you need. Study man at his work, in his home life and in his business life. I believe that one of the best means that you can provide for this study is through that safety valve, the employees' committee.

I do not consider any matter brought forward by any of our employees too trivial for attention and investigation. It makes no difference whether the matter is brought up by the local branch of the Amalgamated Association of Street and Electric Employees of America, the safety committee or a temporary shop committee of unorganized employees. In every man there is a portion of vanity, honesty, ambition and desire, and the boss who loses sight of those facts loses sight of the fundamentals which will provide a basis for his further investigation into the human side of our business.

Mr. Budd mentioned that it is essential that employees serving the public be in a happy and contented frame of mind. This applies as well to the employees in the factory or mill, if the employer desires to get the best service. The question, though, is how are we to keep employees in a contented and happy frame of mind? As I see it, the employer must be intensely human and not measure all of the defects of the employee by the rules laid down in a 200-page book or by the verbal report of some junior officer. And then, too, the employer, by reason of the milk of human kindness which his system contains, should do some things for the employee, not with the expectation that he is going to get back from that employee a certain number of hours or dollars in work, but do it for the employee because he would like to have those things done for him if he were in a similar position; therefore, I would suggest, you will not find it amiss if, when the thermometer gets down to about 10 below zero, you order hot coffee served to your employees who are working in cold places, or in extremely hot weather serve iced tea or lemonade to men who are working overtime on holidays or other days of extraordinary traffic.

STAND BY MEN IN TIMES OF PRIVATE TROUBLE

I would suggest that you provide a loan fund to keep your employees out of the hands of the loan sharks. You will be surprised at the good that a comparatively small amount of money will do towards helping your employees in times of trouble.

You will find that

If your heart is right;

If you are not a double dealer;

If you will take the time and trouble to learn what successful men are doing;

If you realize that methods in vogue in other branches of business may be applicable to men in your employ;

If you keep your ear close to the ground;

If you are human and realize that your success comes from human beings;

If you know that adverse employee opinion costs you money and causes accidents;

If you deal fairly and squarely with your employees;

If you don't permit favoritism to be shown;

If you feel and know that fair dealing draws men together and square dealing holds them together;

If you remember that a soft answer turneth away wrath;

If you recognize all the rights of others;

If you know it is more blessed to commend than to condemn;

If you play the game fairly—all cards on the table;

I predict that you will have gone a long way toward humanizing your business. These methods have gotten results for our company. I do not mean to say by that that our employees are always satisfied with what they get or that we are always satisfied with what we can give them, but our employees do know that when we make a statement about our financial condition or state that we cannot do certain things, these statements are facts.

We have at this Congress our entire safety committee, composed of seventeen employees—motormen, conductors, safety car operators, linemen, shopmen, trackmen—any of whom you are privileged to take around the corner in an attempt to verify or discredit these statements.

"DO YE EVEN SO UNTO THEM"

I would suggest as a means of removing some of the grounds that employees have for fear, that if the financial condition of your company will permit that you provide each individual with free life insurance, free medical examination, free legal advice, advice upon how to prepare and keep a family budget, free health and accident insurance, pensions for aged or disabled employees, and, above all, or probably below all, the foundation of this should be: "All things whatsoever ye would that men should do unto you, do ye even so unto them."

CHAIRMAN HASKINS: Mr. Boyce and the employees working with him have made a wonderful reputation on their property, evidently due to the advanced ideas and careful study of the questions involved.

THEORY MUST BE EXPRESSED IN ACTION

MR. S. H. REID (Bureau of Safety, Chicago): Some of you think Mr. Budd's a mighty fine theory, but I wonder how many know to what extent that theory which has been so ably, although briefly, presented, is in practice. Theory does not amount to much unless it can be expressed in action. Knowing Mr. Budd, as we do, it may be of interest to learn how he carries out his ideas.

With him it is no theory; it is his method of handling what to most people would be a very difficult situation. In the matter of human relations and courtesy, of proper conduct between superintendents and foremen and those under their supervision, you must begin at the top, and if it does not begin there, as it does in Beaver Falls, you will not get very far. The idea has been a success on the properties over which Mr. Budd has jurisdiction because he started right.

Very frequently an executive finds it necessary to call someone into his office. It may be for the purpose of reprimand, for a report on how a particular person is getting along with his work, or to discuss some new plan affecting his department. I want to tell you how Mr. Budd handles the men that go into his office, and why no one is afraid to go there. They don't go in fear and trembling; they know that the chief executive is a friend. After the business has been transacted—it may be necessary to administer a reprimand or a rebuke—Mr. Budd takes enough time to inquire after the health of the family; how is the wife and baby, how did you enjoy your vacation, how are you getting along with your department?

Mr. Budd may spend \$5 worth of time, but as a result the man goes out of his office and returns to his desk or his work feeling a little better than he did before he went in. His heart is a little lighter and he goes into his work with renewed zeal, determined to render, if possible, still better service.

MEN ANXIOUS TO WORK ON PROGRESSIVE SYSTEM

The executive has spent four or five dollars worth of time in his inquiring about what some people might consider trifling matters, but I am sure that he gets more than that amount back in extra service. If you talk to a trainman, shopman, a dispatcher, or anyone on the Chicago, North Shore and Milwaukee Railroad, and ask him how he likes to work for the company, you invariably get the very positive answer that he would rather work there than on any other road in the United States. I have been in the office of the superintendent, looking over the list of applications for employment, and noted letters and photographs from Ohio, Indiana, Pennsylvania, Kentucky, Missouri—all over the country. Everyone wants to work for that road. There must be a reason! One is that men on the road are recognized as human beings.

I don't know that all the properties in the country are as fortunate, in all respects, as is that of Mr. Budd's. We all have difficulties. The matter of proper relationship between the superintendent and foremen and those under them, in many places, is a very difficult one. The matter of courtesy to the public is a difficult one, but did you ever stop to think what a waste of time and energy it is to go before a meeting of employees and tell them that they must be courteous to the public, and then the man who is telling it, if he happens to be a foreman or superintendent, does not exercise the same courtesy? How far do you think that sort of talk will get you? Suppose the safety man on one of your properties gets the men together and tries to impress upon them the importance of courtesy to the public. It is useless unless that same courtesy

is practiced by the man in the head office and reaches clear down the line. It is a waste of energy and it won't work.

There are not many executives here today. The delegates are mostly safety men, so it seems to me that here is an opportunity for them to put the thing over. It is largely up to the safety man if he comes to the Congress; he gets inspiration, he knows what is being done elsewhere. The man in Pittsburgh, Cincinnati or Chicago does not have the advantage of this inspiration; he does not know much about it. It is up to the safety man.

Just what are the duties of a safety man? The man engaged in safety work, giving all or part of his time to it, has a feeling that it is his business to go over the property—whether it is a carbarn, a shop, an electric light plant, or some other property of the company—and shake a fire extinguisher to see if it is full, or stay around the place half a day and discuss some place that ought to have some kind of a mechanical guard. If this is his routine, I want to say to you that he has not caught the conception of his duties and opportunities. I grant that it is necessary to have fire extinguishers in working order, to see that they contain the required amount of tetrachloride, but it is equally important—and I don't know but that it is more important—that we have some kind of container that would hold a quantity of the milk of human kindness for the benefit of the foreman and the superintendent.

MOST EFFICIENT GUARD—ON A MAN'S TONGUE

On the question of guards, I grant it is necessary to have machinery properly guarded—no company has done its duty until that has been done—but you know many instances, as I do, where a guard is needed on the tongue of a foreman or a superintendent, and where it would do more good than it would around a slow-moving belt. Let us give a little more attention to the human side of this thing.

The safety man has a splendid opportunity to emphasize the importance of the human being to the superintendent and foreman. The big safety man is the one who will put it over; he is a bigger man than the fellow who thinks his duty consists in placing a guard around a piece of machinery or keeping a fire extinguisher filled. Think it over. It is mighty important for your future success in the safety work.

I want to give you a hint of some of the things that ought to be done. No superintendent or foreman should ever reprimand a subordinate in the presence of others. That ought to be a hard and fast rule for the government of every man having others working under him. The safety man has an opportunity to study things and instead of spending too much time on the matter of guards, pay more attention to the attitude of the foreman, the chief engineer and those fellows, and you will get further with your safety work than if you follow the other line. It will make you a bigger man.

CHAIRMAN HASKINS: We have all enjoyed Mr. Reid's talk. The next paper on our program is by Mr. J. H. Warnick.

CO-ORDINATION BETWEEN ENGINEERING AND OPERATING

J. H. WARNICK, ENGINEER, NORTHERN INDIANA GAS AND ELECTRIC
COMPANY, FORT WAYNE, IND.

The word "co-ordination" means to harmonize. It is the engineer's duty, in our organization, to harmonize all of the elements connected with the practical carrying out of the safety movement with the every-day operation of the property. How can this be done?

The manager of any gas or electric property must be thoroughly sold on the safety movement for the engineer to get very far. In any organization, where the engineer is subordinate to the manager, he must convince the manager through proper argument of the necessity for spending money in connection with carrying out his various recommendations. The most telling argument, from a selfish standpoint, is the presentation of statistics showing a saving to the company as well as employees over a period of years. The hardheaded business men who cannot visualize the distress to the worker and the latter's family due to an accident, even when the worker is paid under compensation laws, and who cannot visualize the economic loss to the company due to an accident, can be pulled across when the proper statistics are presented. As an illustration there is shown below the figures of one large gas company.

EMPLOYEE PERSONAL INJURY CASES

Total Cases Reported				
1917	1918	1919	1920	1921
947	963	514	583	527
Days Lost				
6,944½	4,455	2,476½	3,895	3,017
Fatalities				
5	4	2	1	2
Total Costs (Actual and Estimated)				
\$31,080.18	\$17,478.04	\$14,310.66	\$18,571.61	\$14,771.41
Per Cent of Increase or Decrease Using 1917 as a Base				
Total cases reported..+	.63%	—45.7%	—38.4%	—44.4%
Days lost	—36.0 %	—64.3%	—43.9%	—56.5%
Total costs	—43.8 %	—54.0%	—40.2%	—52.5%

Accident Ratios (Per 1,000 Hours Worked)

	1917	1918	1919	1920*	1921*	Average
Frequency (a)	.0711	.0934	.0639	.0782	.0660	.0745
Severity (b)	.5217	.4368	.3081	.5227	.3779	.4334
Costs (c)	\$2.3352	\$1.7138	\$1.7544	\$2.4924	\$1.8501	\$2.0292

*Compensation allowances increased from 50% to 60% in temporary disability cases. Fatalities, dismemberments, etc., increased proportionately.

(a) Frequency ratios: Number of accidents divided by total hours worked, multiplied by 1,000.

(b) Severity ratios: Total days lost divided by total hours worked, multiplied by 1,000.

(c) Costs ratios: Total actual and estimated costs divided by total hours worked, multiplied by 1,000.

Frequency and severity ratios exclude fatality loadings. Costs ratios include costs (actual and estimated) of fatalities.

Accident Ratios (Per 1,000 Employees)

	1917	1918	1919	1920	1921	Average
Frequency ...	193.73	259.39	131.59	194.78	173.24	190.55
Severity ...	1,422.18	1,212.51	634.02	1,301.37	991.12	1,112.24
Costs	\$6,364.97	\$4,757.22	\$3,661.45	\$6,205.01	\$4,855.82	\$5,168.89

In passing, I wish to emphasize the importance of keeping the proper statistics and of using them in publicity work to show everyone connected with the organization the progress being made. All other departments are operated on a basis of statistical comparisons. This is especially true of holding companies (comparisons being made between member companies) and the system has great value. I do not believe the men in charge of accident prevention and safety work have developed this part of their calling to as high a degree as is warranted. My thought would be to have the National Safety Council act as a central clearing-house and a statistical committee and work in conjunction with each company, so that all the companies could obtain the results of experience of the other companies in their particular undertaking. This would be very valuable information in furthering the cause and if used properly in publicity and propaganda work would have tremendous weight. Methods developed in connection with working out any form of statistics are quite different in the various companies, giving rise to ambiguous meanings when the statistics of one company are presented to another; they should be standardized and the nomenclature made uniform so that all companies in the Council would use the same system in making their reports to the statistical committees. It is very important that the safety engineer in charge of each company co-operate with the central committee of the National Safety Council in this matter and render all the assistance and help possible to develop complete figures that mean something in showing the progress of the movement so as to carry it on successfully.

SELLING THE ENGINEER

I assume that the engineer is sold fundamentally, as that is his natural ground—to consider the safeguards in the planning and erection of any engineering project. In public utilities he is responsible for the safety of the people served as well as for that of the employees. The engineer's work should start in the designing-room. Accident prevention is more readily controlled if due consideration is always given to the elimination of the personal element.

Safeguards should be automatic, as far as possible, and of a permanent nature. As an illustration, there has been developed in the gas industry, by one large contracting company, an automatic machine which controls the operation of the valves formerly operated manually in the manufacture of water gas. This machine is practically foolproof and in addition to

speeding up the production has eliminated the danger of blast-main explosion due to personal error on the part of the gasmaker.

All large public utility properties should have in their employ a competent safety engineer. Preferably he should be a man trained by experience in the character of the work with which he is associated and he should have a good personality, as this is a most important factor in obtaining co-operation from the working force. He should be diplomatic, a good mixer and one who is always welcome among the workmen. Frequent discussions should take place between the safety engineer and the chief engineer when planning new construction work, so that hazards may be prevented as far as possible. All completed drawings should be approved by the safety engineer, from his viewpoint, before erection work is started. The thought I wish to impress at this time is that the engineer, in designing plans for new construction work, should take heed of the past experience with reference to accidents and make efforts to eliminate the possibility of similar accidents in his designs. Sometimes a little thought given at this stage of the work will evolve a plan that is somewhat different than past experience has dictated. In many cases the plan would be more desirable if due consideration is given to the safe operation and the elimination of the possibility of accident hazards. This can be done by systematically educating the men in charge of designing work by frequent discussions with them and by the chief engineer himself being continually on the lookout for accident possibilities when approving any new construction plans, aside from the fact that they must necessarily be approved by the safety engineer. The co-operation of the construction engineer in carrying out the plans made in the designing-room can generally be obtained by the chief engineer showing a personal interest in the work as it progresses and by taking up with him any hazards that may have escaped the attention of the designers. A thorough discussion of these conditions will interest him in the necessity of building for safety of operation. Slight changes can be made at small cost during the construction period that will greatly increase the safety of the plant.

HOW TO INTEREST THE FOREMAN AND SUPERINTENDENT

The engineer in charge of the situation must make it perfectly plain to his subordinates and assistants that he is thoroughly behind the safety movement. He must place the responsibility on the shoulders of the heads of the various departments for the carrying out of the ideas and recommendations made by the safety engineer, after the chief engineer has passed upon same and decided that they should be carried out. This can only be done by having frequent inspections made by the safety engineer, followed by a formal report to the chief engineer, who in turn will follow the matter up and see that the recommendations are carried out as promptly as possible.

In the operation of any power or gas plant a great deal can be accomplished in the prevention of accidents by a systematic inspection of the property from time to time, covering all phases of the operation.

At one time I was superintendent of a gasworks where we developed a form of inspection that was very beneficial in not only improving the

efficiency of operation but materially improving the appearance, housekeeping and physical condition of the property so that fire and accident hazards were reduced to the very minimum. The form was so designed that the inspection covered certain parts of the plant daily, other parts weekly and some only monthly. The assistant superintendent, who was a technically trained cadet engineer and a man of high intelligence made these inspections. His reports were made formally to the superintendent in order to conserve his time. In this way things that needed correction and were not properly in order were brought to the direct attention of the superintendent. Orders were immediately issued to the foreman in charge of each department, insisting that conditions that needed correction, such as leaks in steam, oil or water piping, housekeeping, etc., be remedied as soon as possible. The foremen in the various departments would report back when conditions had been remedied and the cadet engineer, of course, would check up the matter through his daily inspection until all of the defects were corrected.

EXCELLENT RESULTS OBTAINED

In a short time the plant reached the degree of almost 100 per cent from the standpoint of safety, mechanical efficiency and cleanliness. It has been my experience that if the superintendent in charge of a plant insists on everything being orderly and the housekeeping kept up-to-the-minute that the moral effect on the men under him is such that he has a minimum of accidents. Employees simply cannot ignore the general conditions surrounding them if they are elevating and the defects show up immediately. On the other hand, laxity on the part of the executive in charge of the plant in the matter of general housekeeping and carefulness in following up of the maintenance of his property will give employees an excuse to become careless and negligent.

We also developed questionnaire forms covering the inspection of the vital parts of the plant when down for repairs, such as boilers, large units, generators and water-gas sets. The object of using these forms was to make sure that the mechanical parts of the unit were thoroughly inspected when down for repairs and the form was so designed that it would bring the matter to the attention of a high-grade mechanic responsible for making the inspection, who would determine what was necessary to put the unit in first-class mechanical condition before it would go into service again. Forms were developed by keeping in mind the fact that the unit should always go back on the line in the same condition as when new and the construction drawings were used in developing these forms.

I have also noticed that a great many gas plants rely entirely on the judgment of the foreman in charge of the boiler-plant and engine-room for inspections when such units are down for repairs. It frequently happens that many vital things are overlooked and when the unit is returned to service it is probably only in use a short time when the mechanical defect shows up and it must be let down again. In water-gas plants the general practice is to have a reserve unit for each active unit and with a follow-up system, such as outlined above, in the inspection of the vital parts of the plant when down for repairs the chances are very slight that the reserve

and active apparatus will not be in first-class mechanical condition at all times. Where maintenance work is not followed up, as suggested above, emergencies frequently arise and the plant does not run as smoothly as it should under normal conditions. Emergencies always give more chance for accidents than where everything is running along smoothly. The whole point is that we must train these men to look ahead as far as possible and anticipate trouble, thereby make the remedy necessary in time to avoid the possibility of an accident.

KEEP THE EMPLOYEES INTERESTED

The employee can only be kept interested through constant effort on the part of the management and the plant executives in educating them to the benefits of a reduction of accidents. The general practice is to form clubs, which are primarily constituted for educating employees along the lines of accident-prevention and first-aid work. In addition, it is well to intersperse these talks with social evenings that will keep their interest alive. Our experience has shown that it is preferable in the establishment of employees' organizations to insist on the employee contributing a certain share in the form of dues toward the maintenance of the organization, even though it is only a small amount—a man will always take more interest if he is assisting in its support. The meetings must be regular and the business should be conducted by the employees themselves. The officers in charge, as far as possible, should be men of superior intelligence. The general tone of conducting these meetings should be that the executives extend their moral and financial support as far as possible—they should only guide and steer the officers in charge so as to insure the meetings being successful. They should not take an active and leading part in the actual governing of the organization.

I believe that where it is possible to fairly distribute prizes for competition between departments in the maintenance of good accident records it should be done. A very important thing is to have the shop and plant inspections made by a committee of the employees who will work in co-operation with the safety engineer. Sometimes they will make recommendations that may sound somewhat impractical to the management, but there is no question but that 90 per cent of them are well founded and should be carried out immediately, backed to the limit by the management. In cases where it is not thought feasible to carry out a recommendation a frank discussion of the proposition should be made in the meeting, before the members of the club, and the management should give good and sufficient reasons for not wishing to carry out the recommendations made by the committee, so that they are thoroughly satisfied and not discouraged in making any future recommendations. In one company we found that we could not obtain the co-operation of one of our foremen, who was always more or less antagonistic to the idea and a hard man to interest along this line. His interest was never fully aroused until we placed him upon this committee. Now he is for accident prevention heart and soul and I believe he sees the full value of it, because he is in the position of not only finding the faults that exist in his own department but has the opportunity of finding faults that exist in departments

with which he has no connection. This is merely taking advantage of a psychological fact.

TRAIN EMPLOYEES TO REPORT ACCIDENTS

It is very essential that the employees be trained to report accidents, no matter how trivial, immediately upon sustaining same. In this connection first-aid equipment must be stationed at the proper places throughout the plant and kept in first-class condition so as to be available for immediate use at all times. In gas and electric work it is essential that drills for gas asphyxiation and electric shock be made frequently. We have found the best method to excite the interest in this work and to thoroughly instruct all the employees in the methods in use is to form competitive drill teams and offer prizes for the ones who are the most efficient. These drills must be made periodically, as they are far too important to be allowed to slide. The question often arises as to what to do in the case of a serious accident, where it seems as if the employee has been careless and negligent of the safety of those surrounding him. This is a very hard proposition to solve. All I can say is that it is a matter for the judgment of the executive in charge of the situation to decide. I have seen cases where very reliable and faithful employees, who have been with the company twenty-five or thirty years, have had a temporary mental lapse of control of their movements and do a disastrous thing which they knew was absolutely negligent, costing the company thousands of dollars in damages and, in some cases, exposing other employees to liability of personal injury or death. What can you do with such a man?

MEN WORKING UNDER STRAIN MAKE MISTAKES

I do not think that you should discharge a man in a case of that kind for most likely he would wish to be relieved of the character of the work that he is doing and the responsibility that it carries from that time on, as undoubtedly it would shake his confidence in himself. The only thing to do is to change his position until his poise and confidence have returned. This thing happens frequently in railroad practice. You hear of the signal-tower man who has been on duty for years and has never made a mistake causing a wreck, and we all know that the railroad engineer who is tried and true sometimes runs past a block signal because of this mental lapse—it is liable to take place at any time where men are working under a continuous strain and who carry great responsibility. It all simmers down to the point that I mentioned above. We must continually strive in our engineering and designing work to eliminate this personal element as far as we possibly can in handling of any dangerous operation.

On the other hand we have the relatively new employee who is continually having accidents which are simply due to the fact that he fails to think and who shows through several trials that he is never going to be able to do any thinking; in my opinion it is best to get rid of such a man. He is not only a menace to himself but to everyone around him and the longer you carry him the greater the liability.

A very important point that is frequently overlooked is the question of training new employees for responsible positions. In gas work particularly one must be very careful not to place a man in a position where he is handling a dangerous operation until he is thoroughly trained and broken into the job. He should be placed under the guidance of the most experienced men in the organization and frequently their judgment should be solicited as to when the man has demonstrated, in their opinion, that he is qualified to handle alone the position for which he is being trained. I am not one of those who believe in throwing a man into deep water and expecting him to swim without any lessons—the possibilities are too enormous from the standpoint of damage and personal injury in a great many of the operations in gas and electric work to trust a man until he is thoroughly trained and competent to perform the work required. This spirit must be developed and fostered among the employees, as far as possible, so that they will thoroughly realize the importance of taking a new man under their wing and assisting and guiding him to prevent any accident or personal injury until he is thoroughly acquainted with his work.

ACCIDENT PREVENTION AND LIABILITY FROM CONTRACTORS

It frequently happens in the general routine of power and gas plant operation that certain jobs or phases of construction work must be given to contractors, who carry the work on the property along with the regular working force. A very important point in the control of such a contractor arises that sometimes offers a rather difficult situation to handle, due to the fact that you have no authority over the men working for the contractor; they may be careless and cause an accident and become injured on your property while carrying out the work for the contractor, who in turn is doing the work for you. Their carelessness offers a bad example to your own workmen. Our method of handling such work is only to deal with contractors or subcontractors who comply with the state compensation laws and we take it upon ourselves to investigate the contractor through the State Industrial Board, which requires contractors or business concerns to comply with the Indiana Workmen's Compensation Act, Section No. 68. We obtain a certificate from the industrial board in accordance with form No. 19, which is shown below, this insures us that the contractor is complying with the act.

Industrial Board of Indiana (Workmen's Compensation Act), Form No. 19
 Certificate of the Industrial Board as to Employer's Compliance with Section 68 of the "Indiana Workmen's Compensation Act" by Insuring His Liability.
 The Industrial Board of Indiana hereby certifies that (Name of Employer).....
of (Address of Employer).....
 engaged in the business of (Designate Business).....
 at (Place of Business).....
 being subject to the provisions of "The Indiana Workmen's Compensation Act," has complied with Section sixty-eight of said Act, and has made proof to the satisfaction of said Industrial Board that said employer has insured (his or its).....
 liability to pay compensation in the amount and manner and when due, as provided in said Act, by a policy of insurance, issued by (Name of Insurance Company).....
of (Address of Insurance Company)....., a company authorized to transact business of workmen's compensation insurance in the State of Indiana.
 The certificate shall expire on the.....day of.....19.....
 Witness the Industrial Board of Indiana, this.....day of.....19.....
 Industrial Board of Indiana.
 By (Chairman)..... Attest (Secretary).....

In addition we have placed on the order for the work done the following clause: "The seller agrees to protect, indemnify and save harmless the purchaser from any and all liabilities arising from injuries to any person whatsoever employed in or about said work or otherwise employed on or coming upon the premises of the purchaser, arising from or by reasons of the performance of said work by the seller."

FIRE PROTECTION

Periodical inspection should be made by representatives of bureaus and authorities who are thoroughly familiar with fire underwriter standards, so that construction improvements can be recommended that will reduce the hazards and also the insurance rates at the same time. Of course it is necessary that fire-fighting equipment be inspected periodically, preferably by the safety engineer, to insure that it is maintained in a state of 100 per cent efficiency at all times. Sometimes the safety engineer can recommend advantageous changes in the locations of the fire-fighting equipment, based on his study of past experience, as it frequently happens that fire extinguishers and water pails will be placed at points that will be difficult to reach in the event the building should take fire. It is absolutely essential that avenues and aisles leading to the equipment be kept open. It should be borne in mind that entrances to a building are generally the places where one can first start to attack a fire and for that reason these are the logical points at which to locate extinguishers. Every situation should have a fire brigade, thoroughly trained and drilled frequently. These drills will insure the fire hose being kept in first-class condition.

I realize that a lot of the facts mentioned are self-evident to a great many men and have been told many times, but the very nature of accident prevention is such that these things must be reiterated and kept alive in order to be effective. The engineer in charge of any situation must be thoroughly enthusiastic, open-minded and willing to put forth every effort to follow up ideas or recommendations that are made by the safety engineer from time to time in order to render efficient co-operation. The management must be willing to back the movement financially and not quibble over minor expenditures and, lastly, a fine example to the workmen must be visible at all times in the equipment provided for their safety and welfare.

DISCUSSION

CHAIRMAN HASKINS: Mr. F. W. Fisher will lead the discussion on the very interesting paper just read.

MR. F. W. FISHER (Safety and Employment Manager, Rochester Gas and Electric Corporation, Rochester, N. Y.): On most of the properties with which I am familiar, the safety engineer is not by any means as responsible an executive or as well paid a man as the chief engineer or the operating superintendents, and I have seen men in my own and other companies cause trouble because of the failure of the safety engineer to appreciate his own status.

I view the safety division as a department, very much like that of transportation, subservient to all; if you have a committee through which safety work is handled (this committee is composed of operating superintendents whose judgments are deferred to, where it is possible to do so) the co-operation and discipline on which safety work is dependent comes very easily.

SHOW COURTESY TO COLLEAGUES

The thought I want to bring out is that it is not only our attitude toward the man below, whom we are responsible for and whom we can call down, but it is our attitude towards our colleague, who is very often a better man than we are—I am speaking now as a safety man—that is to be considered. Handle him in the right way, see that whoever is responsible for that district or department is consulted, see that he has a chance to check up on anything that you imagine needs improving. See that, through the safety committee, he has a chance to plan the extensions and improvements and changes that may seem necessary. In that way, in my judgment, you will build up a harmonious machine which will carry on the safety work.

Co-operation and co-ordination cannot ramify all over the map. You have to systematize; you have to get it down to bedrock. Co-operation often means that we can sort of temporarily waive the rule in order to help the other fellow—but there is a limit. That is why I wish to emphasize the necessity for a system in which the other fellow, who is responsible for the property, is adequately considered.

MR. WILLS MACHLACHLAN (Electrical Engineer, Toronto): Mr. Warnick has gone into a number of details and brought out a great many excellent points. I fully realize the value of statistics; as a matter of fact, very complete data is being compiled on properties for whom I do consultation work, but I would like to speak particularly of the work of the engineering department—primarily the designing department—in accident prevention. I have never been in favor of the safety engineer checking the tracings of the engineering department for accident prevention; as a matter of fact, it is not done on our work. Our whole duty has been to impress upon the engineering department the absolute necessity for accident prevention features being carried out in designing; allowing them to work out the details as they would those of an efficient plan or layout in any other particular.

GIVE YOUNG MAN PRACTICAL EXPERIENCE

That is important; I have been on both sides of the fence. I was in charge of engineering for a fair-sized utility and know something of how an engineer feels when someone else comes in and shows him where his design is wrong and how it ought to be fixed up. We should give thought to that feeling on the part of the engineering department before we attempt to tell them where their designs are wrong.

If we adopt educational means we can very often gain what we want without a fuss and without the trouble of checking their plans. We are trying this method in a large utility in Ontario, and their newer subs and their newer designs are thoroughly carrying out the idea of accident

prevention; not one of the plants have been checked by the accident-prevention department.

Another point is in connection with the engineering department. The work cannot all be done through education of the senior man, although that is important. One of the main features you can put into effect in accident prevention is to be sure not to put a boy, when he comes from college, on the drafting board until he has had at least a reasonable amount of experience on construction and operation. Too many of them are coming out of college and taking white-collar jobs on the drafting board; we know what their designs look like. I heard last night of a design for a substation where the only entrance and exit was in front of a switchboard with twenty-nine inches of clearance between it and the next structure. I do not think it would have been designed that way if the engineer had had experience in construction and operation.

TWO WAYS OUT OF EVERY SWITCH STRUCTURE

The work that is being done by some of the larger utilities on this side of the line is being started also on the other side—having men that come out of college go into the operating and construction departments for at least a reasonable time, say, two or three years, before they are put on designing. If this is done you will get better designing engineers, because in their construction and operation experience they will find the accident-prevention features that are being used, and they will learn what should be used. They will find that there ought to be always two ways out of every switch structure, because sometime someone will be caught there if there is only one way out.

So much for the work of the engineering department and some of the men in the engineering department. So far as the work of co-ordination between the engineering and operating departments, I think the only way of accomplishing that is through systematic discussion between representatives of each department. One utility that I have in mind has a committee on substations and a committee on overhead dealing with accident prevention. An engineer of the designing department, a representative of the construction department, and a representative of the operating department serve on each of these committees. When these three phases come together you get co-operation.

In a nutshell, my idea would be to get at the fundamentals and educate your men; have your engineering department carry out its designs in accident prevention, just as it carries them out in good, efficient operation; let your operating and construction departments do the same. If there is one bit of advice that I give the men working with me, it is that whenever you are in any of these departments remember you are a guest and conduct yourself accordingly; don't start dictating, because if you get the other fellow's back up you will never get anywhere!

The Section then adjourned.

PUBLIC UTILITIES AND ELECTRIC RAILWAY SECTIONS—LUNCHEON

TOASTMASTER NIESZ (Commonwealth Edison Company): This is a joint luncheon of the Electric Railway and Public Utilities Sections and we are indebted, for the courtesies extended by the Detroit Athletic Club, to Mr. S. C. Mumford, treasurer of the Detroit Edison Company. I wish to express our appreciation to Mr. Mumford.

Our first speaker is a man prominent in the electric railway industry, one who has built up a remarkable group of interurban and urban railways. I take pleasure in introducing Mr. Arthur W. Brady, President of the Indiana Union Traction Company.

ADDRESS OF MR. A. W. BRADY

Mr. Toastmaster and Gentlemen: The main purpose of any gathering such as this, the Eleventh Annual Congress of the National Safety Council, is to learn from the experience of others and to exchange views with people who have exercised their art under all sorts of conditions.

There is another purpose, however, which, it appears to me, is even more important: The encouragement that is engendered through association with those engaged in doing the same sort of thing that we are undertaking to do. This is necessary that we may have the heart to carry on our work.

To those of us engaged in the electric railway business, this is perhaps more important than is the case of any other industry in the country—no other calling is so closely, and on so large a scale, brought into touch with the people as is ours.

The latest figures showing the number of contacts it has with its patrons indicate that about sixteen billion passengers were carried upon the electric railways of the country during the year 1921—a figure so large that it is almost impossible to comprehend it. It means that, on the average, every man, woman and child in the United States was carried something like 150 times on the cars of the electric railways; that they handled sixteen times the entire number of passengers carried by the steam railroads.

Even taking the ten million automobiles registered in the United States, the figures of the National Automobile Chamber of Commerce of the United States show that the number of passengers handled by the electric railways exceed by 125 per cent the total number of supposed passengers of all kinds—not paid passengers but all persons—who were transported by automobile.

HAZARDS PECULIAR TO STREET RAILROADS

The electric railways, brought into personal touch with their patrons, deal with them on an immense scale and in a way you all realize, when you consider that every one of these passengers has to mount and dismount from the cars, in many cases in crowded streets, where there are opportunities for limitless causes of accidents.

Then, too, remember that the electric railroads, generally speaking, operate in the streets of cities; in many cases, the most crowded streets where pedestrian and vehicular traffic cause congestion to a frightful extent. Remember, too, that every one of these cars is propelled by electricity; that means the current must be transported to every one of those cars, largely over the streets, and that high-tension transmission lines must exist for that purpose. Then, too, there are the high-speed interurban lines, which do a business very similar to that of the steam railroads; moving over private rights-of-way chiefly, but to some extent over highways, at rapid rates of speed.

All of these cars, especially in the case of interurban lines, are constantly crossing intersecting highways with counter currents of traffic. So, I think it is almost self-evident, when these factors are taken into consideration, that there is no industry more interested in the promotion of safety than the electric railways.

Because of these factors, the electric railways must not stop with safe conditions for the sixteen billions of passengers, but must also look after the safety of many millions, perhaps billions, of other persons with whom it comes into contact upon the streets and the highways, in avoiding doing injury to them.

FIRST DUTY OF CARRIERS IS TO PROVIDE SAFETY

Many discouraging features are encountered by the electric railways in their efforts to promote the cause of safety. For many years we have attempted to teach our operating forces the importance and the need of exercising caution and to see that the cars carrying passengers are operated safely. It is the first duty of every common carrier—a duty which has rested upon it for so many years that the memory of man runneth not to the contrary—to safely transport the persons and property entrusted to its care. In their efforts to meet this duty the managements of the carriers have spared no effort in attempting to instill safety principles into the minds of their operating forces.

In the last twenty years a very different problem has arisen. Before that time there was danger from contact with people who were not our patrons—with those on the highways, at intersections, and with travelers and trespassers—but in later years the marvelous growth of the automobile has brought to us hazards which, at times, appeared to be insurmountable. The streets and highways have been filled with people not trained in safety methods, not recognizing the dangers of the high-speed machines which they control, and this condition, in turn, has developed another—a collision between an electric car and a motor truck, or even a passenger automobile, is very different from a collision between a steam railroad train and a motor car. It is discouraging to anyone interested in the accomplishment of safety to see to what extent the general public is careless, or at least indifferent, in the exercise of safety methods.

We have sought to impress upon the operators of our cars that they must not merely look out for the safety of their passengers, but they must guard against the negligence of the man, woman or child on the streets, whether operating an automobile or not. We have made every

effort to teach the public to practice safety methods but, so far, we have not achieved the success we would desire.

AUTOMOBILE ACCIDENTS BIG PROBLEM

Statistics published by the Automobile Chamber of Commerce show that between 1920 and 1921 the number of registered automobiles increased 13 per cent. According to impartial estimates the number of fatalities due to automobile accidents during the same period increased 20 per cent. Could anything more clearly indicate the need of awakening the general public to a realization of its shortcomings?

From statistics gathered by the National Safety Council, it is encouraging to note that the number of fatalities due to street car accidents from 1920 to 1921 went down; there was a decrease of practically 20 per cent in fatalities due to electric railway accidents. This is a very encouraging feature and reflects the work our companies have done among their employees. If the general public had shown the same interest the record for automobile accidents would have been vastly improved.

One of the most encouraging indications of future betterment is that this Congress, now meeting for the eleventh time, is actively and energetically attempting to combat the cause of accidents. It was a great privilege, this morning, to see the many gatherings held in this wonderful new technical high school; men leaving their companies, their own lines, and their own plants, and coming here to discuss, seriously and carefully, the way accidents are caused and the way they may be prevented. This matter of reducing accidents, this safety work, is not a thing of formulae and rules; it is not something of speechmaking or placards or things of that kind, useful and important as they are. It is something that all of us in the industries where accidents may occur must regard as one of the most important of our duties, both from a humanitarian and a utilitarian standpoint.

VITAL, ESSENTIAL PART OF BUSINESS

The matter of promoting safety must not be looked upon as simply an adjunct, as some kind of an appurtenance to the business that we are engaged in; it is a vital, an essential part of our businesses. We must put our industries in order, modernize and bring them up to date. Safety is something we must try to live, try to breathe; the subject is one that is alive and awake.

There is no truer proverb than that which says you "cannot teach an old dog new tricks." It is hard for people whose habits have become formed and crystallized to learn new things. But we have a new generation coming on, which is being brought into constant peril on the streets and elsewhere, and the opportunity certainly exists there to do a vast amount of good.

In the schools and elsewhere so much can be done that in a few years there will be a reduction in the causes of accidents of all kinds—much greater than you would believe when you consider the increase in the various classes of perils and hazards.

EASY TO START, HARD TO MAINTAIN PROGRESS

As I passed into the Cass High School this morning, I stopped for a moment to look at a sign displayed by the Department of Safety of the Detroit Police Department. I noticed on that sign the statement that, in 1920, the number of deaths upon the streets of Detroit was 240; the following year it was 134, something like a 45-per cent decrease. That is a striking example of what can be done. I don't know when the Department of Safety was inaugurated, but I presume it was not very far from the 1st day of January, 1921. You may never have been in a position where you felt it was necessary to lose some ten or more pounds by dieting; if you have, you know it is very easy to get off the first five pounds, the second five pounds is harder, and after that comes the real test. In the case of accidents it is the same thing. It is just as it is in connection with a power-house—you can stop the leaks here and there and bring down the coal consumption very rapidly for a little while, but, when you get down to the point where it is here in the city of Detroit, it is almost impossible to bring it down rapidly any further, if at all.

LESSON OF SAFETY CONGRESS

The lesson we learn from this Congress is not merely how safety organizations ought to be carried on, and where this or that remedy ought to be applied, but we should gain a feeling of hope and encouragement for the future; go home with the idea that in our organizations we must try to live safety; see that everyone in our organizations, not merely the men on our cars or in our shops are on safety committees, but that a live spirit of safety exists all through our organization, from the top to the bottom; that the subject is thoroughly alive, and that we are awakened to the importance of the subject.

Such statistics as I have mentioned are guaranties that we may reasonably hope, when another Congress is held, that we will find still further improvement has been made. As time goes on we may expect reductions in fatalities and in accidents in all of the hazardous employments that will make us rejoice, for the sake of humanity, that we have undertaken to do our small part towards making the operations of industry safer for every man and woman engaged therein.

TOASTMASTER NIESZ: The next speaker is known to many of us as the grand old man of the Detroit Edison Company. I do not mean by "old" to indicate age, but rather a term of endearment which we feel towards a man whom we know and love as men sometimes feel toward a fellow man. I take great pleasure in introducing Mr. Alex Dow, President, Detroit Edison Company.

ADDRESS OF MR. ALEX DOW

Mr. Toastmaster and Gentlemen: I do not think I have been libeled to any great extent by the use of the adjective "old." I am perfectly well aware, as any executive is, that the men have a nickname for him and I know that I am no exception—that various nicknames traveled around and had currency for a while. I know that the one by which some of them knew me, "Alex," was transferred a great many years ago

by the staff to a young daughter of mine, because she tagged me through the plant and every place. She adopted my pose and walk, with her hands behind her, stuck out her chin and nosed into the corners, and the name was transferred to her as being better entitled to it than I was—in late years my name was usually "the old man" and I recognize the friendliness of the title.

So much for myself. Now, a little for my friend, Mr. Mumford, who has put his heart very much into the work of this Congress. He is treasurer of our company and duly treasures what is put into his care and accounts for it as required by the corporation laws; he has been very active and for many years a member of the school board—so far as any one member of the board is entitled to credit for the building that you have been occupying, Mr. Mumford is entitled thereto. Community feeling is very strong in Detroit and to credit one member rather than the others would be invidious, but such credit as belongs to any one of them surely belongs to Mr. Mumford.

THE SUM TOTAL OF HUMAN HAPPINESS

Our accident-prevention work is in the hands of a safety committee and a safety engineer, and, like our so-called social work, it is made the business of every foreman—persons having charge of employees are held responsible for their safety! That phase of the work, however, which represents the study of accidents involving injury to limb or loss of life, falls into the hands, naturally, of the medical division, which is in Mr. Mumford's hands.

Mr. Niesz has been pleased to remark that the streets of Detroit are full of automobiles and Fords. I realize the distinction, but he did not make it quite as plain as he could. A certain gentleman in New York, some six or seven years ago, made the distinction much more clearly, more generally and less personally. He said, "Detroit? Oh, yes; oh, yes! That is where they build automobiles." A Detroit man who was with me at the time remarked: "Mr. So-and-So, we build a great many things in Detroit besides automobiles." He answered: "Yes, I have ridden in them."

I take it there is no dispute as to the object of all this effort which you represent—it is to add to the sum total of human happiness. Please note I said "sum total"; not merely to add to, but to add to the sum total; an account is always plus or minus, you know. The proper method is the reduction of preventable sickness, injury and accidents of all kinds imperiling the human body. As to methods, there is room for much discussion; as to purpose, there is none, and I want to turn my special remarks to that question of methods. The old poem that some of you know, speaking of the Power which controls all things:

"Many ways Thou hast fashioned,
All of them lead to the light."

Many methods are offered you; all of them tend in the same direction; all of them lead to good results. Some are better than others, yet it is the spirit that gives life, not the law; methods may obscure the

purpose, may even hinder it. For that reason some discussion of methods, in a broad way, is in order.

CARE FOR THE INJURED MAN; AVOID REPETITION

Speaking to the public utility men in this audience, I do not have to excuse myself for taking my illustrations out of my own experience, using terms with which you are all familiar. I have, for many years, been in a business which will persist, as long as human nature is what it is, in having its occasional and sometimes altogether too frequent toll of life and limb—in the business of distributing electric light and power. For many years I have laid down the law that two things should follow an accident, instantaneously or simultaneously. First, that the victim of the accident shall be, so far as possible and without regard to expense, restored to usefulness as a member of society. The question as to his merit is negligible; the moment he becomes the victim of an accident he is entitled to all that human knowledge can give him, in order to restore him to his status as a human being. That goes without saying. The question of law does not enter at all; it never did. Whatever could be done has been done.

As has been the experience of many another corporation that followed such a rule, some of the things that have developed in our own practice have been useful to other people and have been given by us, not as a matter of advertising, but offered where they would be of the most use, through the medical journals and the medical fraternity, so that the experience gained in the caretaking of our people might be used for the benefit of others.

The other duty, which must go on simultaneously, is to so arrange matters and circumstances that in the future similar accidents cannot recur; if the cause was an obvious mechanical defect, that defect should be remedied; if the cause was an incorrect method, that method should be revised; if the cause was carelessness—the everlasting, eternal carelessness of human nature—that such work as could be done to educate those others who might in turn become the victims of a similar accident, should be done in order that they might avoid it.

MANY MEN ARE ABSENT MINDED

That last is the most hopeless of all. People will be careless. People will slip for the moment, will continue to do so; people's thoughts will not be on their immediate work; their thoughts will be on personal affairs rather than the work in hand, on the next thing they are going to do instead of the present thing; be on the pleasant ideas and hopes of the future, rather than on the work immediately in hand.

There is an old story in the service, and I suppose it will live as long as I do, at least, of how I short-circuited the busbars in my own place one time. I had no business to do it; it was utter foolishness. I would have lost my eyes if I had not been wearing spectacles, and I was wearing spectacles, at that moment, by sheer accident—it was not my habit to wear them at that kind of work. I had been reading some notes and kept my glasses on when I did the next thing. The trouble, as I analyzed it, was that my thoughts were on the next operation and not on

the thing I was trying to do at the time, so that instead of, as I intended to do, short circuiting with a jumper the machine that I wanted to shut down rather suddenly, so I could do the next thing, I short circuited the wrong side of the switch and dumped the whole thing into my face. It took some time to clean me up afterwards, but then I was wiser.

Another accident, in which Mr. Mumford and I were parties, was where an automobile coming up from behind ran into the tail of my roadster and slid Mr. Mumford rather ignominiously over the seat onto the tail of said car, the car being pushed out from under him, so to speak. We discovered that it was due to the fact that the man behind had not observed my slowing down and my signal to him, but was watching a rather pretty girl on the sidewalk. The total damage, I think, was about \$100. A little further acquaintance with the young lady might have been worth \$100, but I don't think that the look that he got was worth the cost.

These cases, where a man is thinking of the next thing, where a man is thinking of something else, where a man's thoughts are at home with his wife and children, or where a man's thoughts are even with his prayers and hopes of heaven, are things that we will never eliminate. The absent mind is something that we must deal with in the individual and that, I am afraid, we cannot do much with. The others I have hopes of.

SAFETY SOMETIMES FOUND OUTSIDE THE CODE

Much can be said for method; much can be said for device, for expedient. But that is not all. It is there that I want to make my comments, which I hope will be of interest to you.

The orders in our service, running to the employees, embodied in a general order, are these: "When you find trouble tending to interrupt our service, if you know how to fix it, fix it; if you do not or are in doubt, leave it alone; call help and guard the place, so that no one will run into trouble until help arrives."

It is expressly stated that intelligent, meritorious action, tending to maintain the service, will be credited to the employee; particularly when a man does things outside of the range of his day's work; when he shows good judgment, knowledge and understanding all tending to maintain service—that will be credited to him. But the warning is equally explicit, "if you don't know, leave it alone."

I want to call your attention to a modification of the old saying by an ancient philosopher that "knowledge is power": I would like to put it to you that knowledge is safety. I would like to point out to you that only in knowledge does safety lie, and that with knowledge safety may be something outside of code, rule or method; that safety is what we are seeking, when it adds to the sum total of human happiness. In all the public utility industries we have a tremendous public dependent upon us. The maintenance of our service, even at some risk, is necessary to the sum total of human happiness.

OUT OF COAL—TORE UP A SIDEWALK FOR FUEL

Speaking from my own experience, the shutting down of a transmission line in order that a certain piece of work might be done, which

might be done with due care and with adequate knowledge without shutting down that line, may, especially if it is done without notice, cause many accidents elsewhere.

Going again into my experience, I recall the October evening of 1892 when the World's Fair was to be inaugurated in Chicago. You know, it was not really opened until 1893, but the celebration had to be in 1892 to observe the proper 100-year period of the Columbian anniversary. The outfit I was connected with had just got the lights going for the lighting of Washington Park. A tremendous crowd was there at the time and we were out of coal. That sounds familiar. We were supposed to have hard coal; we ought to have had hard coal; we ought to have had some kind, but we had only a little coal and it was not good at that. Owing to congested conditions, it proved to be impossible to get coal through at the last minute. Of course, someone had slipped his foot, but that is another story.

At half-past nine that night I had one man on each engine of the sets that had to be running—rather small engines in those days—doping bars with soap and water and anything else that came in handy. I had three men bringing in all the wood they could find—they had to tear up at least half a mile of wooden sidewalk. The police undertook to stop them tearing up the sidewalk and various explanations were made. These explanations not being satisfactory to the police, my line foreman, who was somewhat of a husky, said he would throw the cop in the lake if he did not keep his mouth shut. He took the sidewalk anyway!

The engineer of one of the contractors who was responsible for the engines, and the other engineer, who was responsible for the boilers, were insisting every minute that there was going to be a wreck. I said: "Wreck or no wreck, there will be three or four men killed in this place before I shut off the lights in that park. This may cost some thousand dollars in damages, but my men are taking the chance; you go where you are safe." We were taking desperate chances. We were disregarding such codes as there were, but we were remembering the greater law, the good of the greater number, the sum total of human happiness.

SAVED FOUR OR FIVE LIVES—COST \$500

Those were not the days of automobiles, but of carriages. The avenues around the big meadow in Washington Park were full, as I had observed, of horses and carriages, restless animals that danced every time the fireworks went off. There was the possibility, in the case of sudden darkness, of those animals stampeding and the crowd milling and trampling on one another. I disregarded, for the time being, every safety rule I knew. I kept boilers going that should not have been going; I kept engines going that threatened at any minute to wreck themselves.

I call your attention to that as a rather spectacular performance. I laugh at it now, sometimes, although it was serious enough then; nevertheless, the affair was condoned and we got away with it; the actual bill for repairs was not much more than \$500. If there had been an accident I suppose I should have had to take the blame. I suppose I will get credit on judgment day, when all the facts are known—not judgment day

in court. I might have been soaked for it in court. However, I knew just about what the engines and boilers would stand for and I hung on. It was just individual knowledge. I disregarded the code.

Of course, I was called on the carpet the next day. Mr. J. Frank Foster, who was then superintendent of the South Parks—a very clever and capable man—sized the thing up and said: "You did the right thing." I went away grinning like the cat that swallowed the canary, which went away, it is said, chuck full of canary and penitence.

LADDERS WERE SAFE BUT TOO HEAVY TO USE

I told you we had a safety committee. I think I will give them away, a little. The safety committee made a most unfortunate mistake in connection with a case where a man was hurt on a light service ladder. The side bar sprung, a step came out and the ladder came down—the man and the ladder were mixed up rather unusually, and the man was hurt. The safety committee considered the matter and said the ladders should be so constructed that they could not spread. They put an order through and had it approved, reinforcing all ladders with bolts; by the time they got through the ladders weighed so much that the men would not use them. Rather than carry one of those heavy ladders around the men would pile up a few packing cases. The ladders were there, they were absolutely safe, but the men would not be bothered with them. We got the bolts down to a reasonable number and cut them down from one-half inch (which would have held a locomotive, more or less) to the necessary three-sixteenths and the ladders again went into commission. That was one side of the story. We joshed the safety committee for a long time about it; you know, we are sort of a happy family.

Here is the other side—and this only happened ten days ago. Out Warren avenue, which is one of our principal thoroughfares in the village of Springwells, they are widening the road. In the course of their progress they brought a steam shovel to remove the great deal of the old roadbed before putting in asphalt. It worked entirely too close to the poles that had been set up there. Consequently, one evening ten days ago, at 6 o'clock, there came a hurry call that about a mile of poles had turned over into the street.

MAN WHO KNOWS JOB IS USUALLY SAFE

These lines were carrying the current for the street lights in the neighborhood. The poles tilted over until the street lamp brackets were only a short distance above the walk; until, in the middle of the span, any person walking or driving through could reach the dangerous wires with their high voltage.

The foreman who got the call knew it very well; it was a line he had built. He telephoned to guard the two ends; the answer came back that they were already guarded. He went there with an emergency gang, gathered from aroundabout, and concentrated on that point, and sized up the situation; then he refused to cut off the service. He said: "That is going to stop so-and-so and so-and-so (pumps and various things of that kind) and put the people in darkness; put the workmen in the dark."

He got out his trucks and put the power winches of two of them on two poles near the middle of those which had gone down. It was not a mile. It was a matter of some eleven or twelve poles that had turned over. He put blocks and tackle on each of the other poles, spread his men along them, and took them up on the power winches. He followed up on each pole and straightened that whole line without turning off the street lights or without interrupting the service.

He said: "My gang built that line and I knew no wire was going to pull loose." You can imagine what would have happened if a wire had come off an insulator or a pin had broken. He was sure of his material. He put the whole thing in order long before midnight and did it safely. It was contrary to rules made and provided and in the hands of a less skillful man it would have been exceedingly dangerous. He pulled it off successfully and restored service, then went his way until he reported that the line was straight. We got the story afterward and we will see that it is duly passed around as showing what can be done.

I want to call your attention to this: He disregarded what almost might be classed as a rule: that under such circumstances the service should have been cut off. He disregarded it with full knowledge, and the proof that what he did was safe is the fact that he did it, and did it without a hitch. In other words, the fact that it was done by a competent man, with competent help, shows that it was safe and yet, according to the ordinary code, it was unsafe.

"THE BUTCHER BILL WAS TOO HIGH"

To follow up the thought: We have in this State, and in most States nowadays, thank goodness, workmen's compensation laws. The history of the law in this is probably the history of the measure in every other State. It was very much opposed by manufacturers; it was opposed in good faith by many of them, who felt it would lead to more litigation than they had at that time. It took much missionary work to enable them to understand that a properly administered compensation act would put an end to litigation. It settled the relations of the victim of an accident with his employer then and there; that it distributed fairly the burden of accidents; that it tended, either by direct assessment or by increase of insurance rates, to place upon the careless operator the results of his carelessness, and thereby it tended to reduce the total number of accidents.

I had an acquaintance; I would not call him a friend—I respected him highly; but I shall not name him, and I might say also he is dead: he probably knows a good deal more than any of us by this time—whose operations were one of the factors most conducive to the passage of that act. He was clear-headed, honest and straightforward. He said: "This works of mine is going to have just so many accidents and with the kind of help I have to use you cannot do anything with them." The consequence, to put it in rather an ugly way, was that the butcher bill was entirely too high. He never quite got to the place of being cautioned or refused insurance, but his premium was high. He simply figured, "There is my premium; it is the insurance company's business to settle." He said: "This is one of the unavoidable causes." He said, quite truly, that

nothing in his line could be carried on without some accidents; he said it is just a case of balancing.

INDUSTRY MUST CARRY ITS BURDEN

I have no patience with the man who balances life and limb against his expense account. That is not the way to look at it. If the industry will not carry on safely, then there is something wrong with the industry. It cannot be carried to extremes. It cannot be overburdened with inspections and with rules of all kinds, but it surely can carry its own accident bill, and the moment it has to carry it, the accident bill tends to go down. It is quite true, as he said: "Look at the sea; there would be no one at sea if everyone played safe." It was said jokingly in my hearing, the other day: "If the United States Inspection Bureau had inspected Columbus' ships, when he started out to discover America, America would not be discovered yet." It is equally true, going a little further back, that if mother Eve had observed the safety code and had not eaten the apple, we would all be in a state of Edenic happiness. Wouldn't it be a dull world!

Without questioning that, on the one hand, over-codification is harmful, I insist, on the other hand, that the benefit of the doubt, the error of judgment—whichever it may be—must always be in favor of safety for human life and limb. In all our work, do not let us get down to code; do not let us have the letter that killeth instead of the spirit that maketh life! Do not let us burden ourselves by saying this is the way, the only way; there is no other way; this is the rule! Do not let it be the rule: Thus shall gods be made and he that makes them otherwise shall die. Do not let us become fossilized. Let us have a live code, if we are going to have one. Let us have an improving method. Let us always remember that it is the sum total we are working for, not the immediate transaction. Let us never forget for a moment that a given condition which is uncomfortable or unpleasant will always tend to remedy itself.

REACH THE POCKETBOOK NERVE

I would rather see a minimum of codification, a minimum of safety inspection, a minimum of public interference by state authorities in the ways of doing things and of compensation therefor, a good stiff law providing for the payment of liberal compensation without delay to the victims of accidents, whether they be employees or otherwise.

In other words, I should reach the person who can make the necessary corrections through the most sensitive of all nerves, the nerve that has one end in his breeches pocket and the other in his bank book—the pocketbook nerve. I am asking that too much weight be not given to rule and method; that it be not said that this is the only way; do it this way; if you do it otherwise, it becomes a misdemeanor, if not a crime. Say that the result is so; it has been proven that it can be done safely. Say that the man who knows how shall be given as much latitude as possible, but he is expected to operate with safety. The method is a matter for you to study, not a method for authorities to prescribe. If you fail, you will be judged by results and you must foot the bill.

That is my way of looking at it. Give each man a personal incentive—the pocketbook incentive, the corporate incentive—to greater safety by

placing the burden of the costs of accidents—liberally, strongly and immediately—upon those who could reasonably have been expected to prevent their occurrence. Do not establish a code which will have the force of law, or which will tend to become a hindrance; which will develop into a perfunctory inspection. We are overmuch inspected now. We have building codes and plumbing codes and our architects sit up nights studying out plans to avoid them. The code is put down, not the spirit of the code. Again, it is the "letter of the law that killeth and not the spirit that giveth life."

That is the way I look at it, especially in our industry. Progress and change of method is constant and it would be very unfortunate if we were burdened with an elaborate code, which would have the force of law, prescribing how everything should be done, and burden us with a force of inspectors whose business would be to see we did not evade the code.

HOPE IS IN THE NEW GENERATION

Our hope is in the children, the new generation. I do not know of anything more dangerous than a cub, just under the legal age, operating an automobile, unless it is the cub just over it who wants to show off before his best girl. The cub that wants to show off, like the rooster who wants to impress the chickens in the barnyard, is going to be with us so long as nature has so carefully provided for the perpetuation of the race. We can't get rid of him, and he must have his period of effervescence, so I suppose, every once in awhile, there will be the story of the 16, 17 or 18 year old boy who drove like the devil and had his best girl with him, and she was encouraging him all the time. If they would only break their own blamed necks, it would be bad enough, but usually they don't do that—they hurt somebody else and bust up daddy's car.

To divert a moment: The late John Dodge, who was responsible, more than any other man, for the development of the actual mechanical production methods used in manufacturing the cheaper automobiles, said one day in my hearing: "Keep away from a new Ford with a new driver behind the wheel. When you see one, turn up an alley. If it is a woman, climb a tree." Implying, of course, that the woman was a greater risk than the cub.

TEACH BOYS TO BE GENTLEMEN

After all, it is the youngsters we must get to. We must teach them not code, not law—law is something for a boy to break; a school regulation is something he can get around. We must inculcate in him a feeling of personal responsibility that there are some things no gentleman will do. That is what we want to teach and that is what our wiser school directors are doing. That is the spirit of the best so-called private schools and of the more enlightened public schools—the teaching of personal responsibility. As for myself, I know it works, because it was the code I was brought up on. I was brought up in Scotland, as my speech shows, and being born in Scotland is something you never get over. I burr my "R's"; my wife says that when I talk to a certain Scotch friend she has to take the kinks out of the telephone cord afterwards. I got one thing

out of my Scotch training, and that was the feeling of personal responsibility. I had the shorter catechism and the ten commandments licked into me pretty thoroughly and I knew them, but something else was put into me by word of mouth, by the expected scorn of my elders if I did not live up to it, and that was, commandment or no commandment, there were some things no gentleman will do. You must teach the youngsters that they have no right as gentlemen to risk the lives and limbs of other people; that they must always observe that higher courtesy which, after all, is the greatest spirit of good will to one's fellow men.

TOASTMASTER NIESZ: In closing this delightful luncheon, I think I am qualified to express, on behalf of the members of the two Sections represented here, their appreciation of the interest shown by the speakers to-day, as evidenced by their presence here, in the work being done by this organization, and do express to them our thanks for their words of wisdom and encouragement.

Rubber Section

August 29 and 30, 1922

H. T. MARTIN, Chairman

Manager, Health and Safety Department, The Fisk Rubber Company
Chicopee Falls, Mass.

C. F. HORAN, Vice Chairman

Hood Rubber Company, Watertown, Mass.

E. W. BECK, Secretary

Chairman, Central Safety Committee, U. S. Rubber Company,
New York City.

TUESDAY MORNING SESSION

THE meeting was called to order by the Chairman. Brief reports were made by the Chairman and Secretary, who stated that the Executive Committee had met four times during the year for discussion and decision regarding various industrial activities. The Bulletin Committee (E. A. Becker, Chairman) reported on its work, and the Membership Committee (E. L. Smith, Chairman) reported on the membership campaign which had been started with excellent co-operation from the Rubber Association of America and which had already brought in eight new members. The Committee on Health Hazards then presented the following report:

REPORT OF COMMITTEE ON HEALTH HAZARDS

ANILINE

$C_6H_5NH_2$, commonly known as "aniline oil." Formerly used extensively as an accelerator of vulcanization, and is gradually being replaced by less dangerous compounds.

Dangers: Absorption through the skin, by direct contact or by saturation of the clothing; through the digestive organs; absorption through the respiratory organs. Exposure need not be for a long time or to large amounts of aniline. Several fatal cases are on record where the exposure continued for less than three hours.

Symptoms: *Acute Poisoning*—mild cases: Pallor of the skin and mucous membranes, with slight cyanosis; a feeling of weariness and weak-

ness; head symptoms—vertigo, reeling, unsteady gait; deficient elasticity of movements; slow, labored speech; irritability (aniline “pip”); condition of slight inebriation, with loquacity, gaiety, and defective power of orientation; loss of appetite, constipation, and tense, rapid pulse.

Severe Cases: Dark blue to swarthy cyanosis; formation of methemoglobin; bounding pulse; “air-hunger” with great frequency of respiration; lowering of sensibility; obliteration of the reflexes; sometimes vomiting, strangury and bloody urine.

In the most serious cases: Sudden prostration; cold, pale skin, blue lips, nose and ears; diminution and even extinction of sensibility; moist, cold skin; small pulse; death in a comatose condition, sometimes after antecedent convulsions.

Subacute and Chronic Poisoning: Anemia; slowing of the pulse; disorders of digestion, such as eructations, loathing of food, vomiting, diarrhea, and eczematous and pustular eruptions on various parts of the body, especially on the scrotum; nervous symptoms, as general debility, headache, ringing in the ears, vertigo, restless sleep, disturbances of sensibility, often of motility; spasmodic poisonings are very rare. Anemia and retarded pulse are early symptoms.

The blood is of a brownish hue, but microscopically unchanged; occasionally the urine contains blood.

Measures of Relief: At the first symptoms of the poisoning immediate removal from the workroom to a cool, shady spot; removal of clothing; cool water on body; artificial respiration with oxygen; copious ingestion of milk; in cases of weakened heart action, stimulants (black coffee, or camphor, but no alcohol).

Methods of Prevention in Rubber Factories: Substitution of less-dangerous accelerator for aniline.

ANTIMONY

Usually obtained in the Rubber Industry in the form of Antimony Pentasulphide, or Golden Sulphide of Antimony, SB_5S_2 .

Dangers: It appears to be somewhat doubtful if all of the compounds of antimony are detrimental to the health of the workers in them. The antimony compounds used extensively in the rubber industry are somewhat insoluble in dilute acids, and for this reason are probably not serious hazards to the employees exposed to them.

Symptoms (of Antimony Poisoning, see above under “dangers”): Itching eruptions of skin caused by local irritation; inflammation of the mouth, throat and stomach; constipation and acute colic: In acute cases, diarrhea, albumin in urine, loss of strength, weakness of heart, vertigo and faintness.

Measures of Relief: Treatment of symptoms by physician.

Methods of Prevention in Rubber Factories: Sifting of compounds in closed containers; adequate ventilation in compound and mixing rooms; personal cleanliness on part of employee.

BENZINE

Called naphtha, gasoline, petroleum ether, benzin, petrol naphtha, canadol, ligroine and rigoline. This material represents a group of hydro-

carbons which distill from crude petroleum at various temperatures, usually under 135 degrees C. This material is used extensively as a solvent in the rubber industry.

Dangers: To persons susceptible to poisoning from this substance, the vapor of benzine presents some danger. The higher grades of benzine, because of their low boiling points, contaminate the air more rapidly than the lower grades.

Symptoms: The symptoms in cases of benzine poisoning vary greatly because the benzine used technically is a complex mixture and is not always of the same composition.

Acute Cases: Headache, vertigo, nausea, vomiting, cough, irregular respiration, drowsiness and deep sleep with coldness of the skin and complete insensibility: on awakening, headache, vertigo and depression, fibrillar twitching of the muscles, trembling as if from chilliness: benzoic acid is found in the urine.

The effects of acute poisoning from breathing moderate amounts of benzine resemble mild alcoholic intoxication, and in spreader rooms where employees are familiar with the condition they speak of it as "naphthā jag." Nine house painters who experienced the effects of using a quick-drying paint, containing large quantities of high-grade benzine, complained of dizziness, headache, spots before the eyes, dryness and choking in the throat and burning of the eyelids, while some also complained of nausea, vomiting, pains in various parts of the abdomen, and painful urination. Two had attacks of momentary blindness. One suffered from ulcers of the lips and gums. In several instances the worst discomfort came after leaving work, the dizziness and staggering coming on in the open air. Loss of appetite and a feeling in the morning of having been drunk the night before were the usual features in these cases.¹

Chronic Cases: The occurrence of chronic poisoning by benzine has been contested by a number of investigators. No cases of alleged chronic poisoning from this cause have been reported in the rubber industry. In those industries where chronic poisoning is said to have occurred, the symptoms have been headache, flashes before the eyes, ringing in the ears, psychosis with excitement and a state resembling drunkenness, sensory disturbances and hallucinations.

Measures of Relief: Removal of patient into fresh air; in severe cases stimulants like coffee or camphor; then cold effusions.

Methods of Prevention: Benzine (do not mistake for benzol) is probably the least dangerous of rubber solvents. Many of the symptoms of poisoning can be prevented by adequate ventilation of the work spaces. Where artificial ventilation is required, care should be taken to have the vapors exhausted below the "breathing zone" of the employees.

BENZOL

C_6H_6 , also known as benzene. The usual commercial products of Benzol are:

Pure Benzol: Clear, colorless liquid of a characteristic odor. Many of the cases of poisoning reported in the rubber industry are believed to have been due to the pure benzol.

Ninety Percent Benzol: So-called because in the distillation 90 per cent should distill over at a temperature below 100 degrees centigrade. It is composed of 80-85 per cent benzol, 13-15 per cent toluene, 2-3 per cent xylene, and contains as impurities traces of olefines, paraffins, sulphuretted hydrogen and other bodies.

Fifty Per Cent Benzol: This substance contains 50 per cent of constituents which distill below 100 degrees centigrade, and 90 per cent below 120 degrees centigrade; it is a very mixed product, with only 40 to 50 per cent benzol.

Solvent Naphtha: This material is called solvent naphtha because it is used extensively (especially in England) for dissolving rubber. It is free from benzol, but contains xylene and its homologues and other unknown hydrocarbons. Solvent naphtha is sometimes known in the trade as "benzine," which unfortunately often leads to its confusion with petroleum benzine (see Benzine) and to mistakes in accounts of poisoning.

Dangers: From absorption through the lungs by breathing, and through the skin; there seems to be some difference in the toxicity of pure and commercial benzol. The older reports indicated that the commercial benzols were more dangerous than the pure, but the experience of the rubber industry would seem to point that this conclusion is unfounded. There seems to be a direct connection between the boiling-points of these solvents and their power to do harm; the solvents of low boiling points appearing to be more dangerous than those of higher boiling points. This is probably due to the fact that the amount of vapor given off into the air is greater with the lower boiling-point benzols, and thus a larger dose is breathed by employees exposed to the material.

Considerable variations in individual susceptibility exist. So far as age is concerned the dangers appear to be equal to all ages. Females seem to be more apt to benzol poisoning than males. Vigorous, muscular individuals with rapid circulation and deep breathing are overcome by benzol fumes most readily. In hot, humid days, or in interiors where the air is hot and stagnant, poisoning is more likely to occur because of the greater volatility of the benzol under these conditions, and also perhaps of the increased pulse-rate, and hence the greater flow of blood through the lungs.

Symptoms: Acute Poisoning: In mild cases, cerebral disturbances, humming in the ears, giddiness, somnolence, a condition resembling inebriation, vomiting and irritant cough, slight flushing of the face. There is often euphoria.

In severe cases, symptoms on the part of the central nervous system, muscular tremor, like chilliness from exposure to cold; trembling of the whole extremities; finally, tonic and clonic spasms; euphoria, pale, livid skin; lips remarkably scarlet hued; blood bright red, thin. Discolorations of the skin, like those in aniline and nitro-benzol poisoning, are wanting in benzol poisoning.

In the most violent cases: hallucinations, delirium, protracted unconsciousness and death in tonic convulsions.

Subacute and Chronic Poisoning: Numerous spots of extravasated blood in the skin (petechize) similar to those of morbus maculosus,

together with severe anemia; hemorrhage from the mucous membranes—in women, from the genitals; fatty degeneration of the internal organs (heart, liver, kidneys).

Measures of Relief: Prompt removal of the patient into the fresh air; inhalation of oxygen.

Methods of Prevention: Rigid physical examination, including differential blood count and coagulation time, of all employees exposed to benzol each month. Reduction in white blood cells or increase in coagulating time (outside of reasonable limits) should call for change in occupation of employee. Workers should be free from any organic disease, especially of the kidneys or heart, which diseases tend to retard elimination. Exclusion of female workers from operations where benzol is used and adequate ventilation is not maintained. Ventilation by means of downward current of air. The velocity of the air current (toward the floor) should be not less than six feet per minute. Outlets for ventilating systems should be at the floor level. Because of the difficulty in localizing the benzol vapor, general room ventilation is recommended as being superior to the hooding of specified operations.

CARBON DISULPHIDE

CS₂, also known as carbon bisulphide, a clear colorless neutral liquid, used in the rubber industry usually in connection with sulphur chloride in the "cold cure" process.

Dangers: Entrance into the body in the form of a vapor through respiration, or in a fluid form through the skin. This material does heavy damage to the red blood corpuscles and to the central nervous system.

Symptoms: Acute Poisoning: In mild cases, marked stupefaction and a sense of intoxication; in more intense poisoning, pallor of the countenance, flaccidity of the arms and legs, even complete insensibility, obliteration of all reflexes, loss of consciousness, due to paralysis of the nervous system. With the inhalation of concentrated vapor there is a fatal result in a few minutes.

Chronic Poisoning: The earliest symptoms (first becoming manifest, sometimes after employment for a few weeks, but, for the most part, after months or even years) are headache, extending from the root of the nose to the temples, a sensation of giddiness and stupefaction, particularly at evening after the close of labor; later, pain in the extremities, muscular weakness with trembling, spasms or fibrillar twitching, also contractures, transient and permanent paralysis, with atrophy of the muscles; deafness; itching and formication on the skin, reduction of the reflexes, circumscribed and more extensive areas of anesthesia and analgesia; acceleration of the heart's action, nausea, vomiting, colic, alternate diarrhea and constipation, the latter condition prevailing in the later stages of the disease; emaciation, disturbance of the sense of vision, sometimes transient, but rare in the initial stage; retrobulbar neuritis, chroiditis central scotoma, disturbances of the sense of smell and taste. In respect to the central nervous system there is at first a condition of excitement, followed by depression; subsequently, very irritable, violent, and explosive temper, with hyperstimulation of the sexual instinct; later, its abnormal decline. After several weeks or months relaxation, melan-

choly, a dreamy manner, weakness and loss of memory, puerile enunciation, obtuseness.

According to Charcot, physisic disturbances occur in 87.5 per cent of the cases. Mental diseases under the semblance of acute mania and dementia occur with good prospect of recovery; the more severe forms appear in cases where there is hereditary predisposition. There has been observed also local evidence of the paralyzing effect of the carbon disulphide upon the parts brought into contact with it, especially in the fingers.

The prognosis, so far as the preservation of life is concerned, is favorable; as to the full restoration of health, it is unfavorable.

Dr. E. R. Hayhurst² gives the following concerning carbon bisulphide poisoning:

"Physicians in rubber districts are so confused with the multiplicity of poisons used in that industry that they usually style all patients 'rubber poisoned.' An attempt is here made to distinguish between them. Acute cases are to be distinguished from poisoning due to: (a) Aniline—sudden weakness of legs, sudden swooning, cyanosis of lips, pale or suffused face, air-hunger, strangury, bloody urine, methemoglobin, stupor, apt to continue for 24 hours or longer, and, if death does not occur, bladder irritation and skin eruptions may follow. (b) Benzine—usually begins with foolish prattle, laughter, shouting, trembling and jerking—'the benzine jag'—collapse, pallor changing to cyanosis, syncope, all with quick recovery in fresh air. (c) Benzol—is more of an irritant, shows slight flushing of face, followed by pallor, watery eyes, nasal discharge, coughing. When unconscious, lips are of scarlet hue, blood is bright red and thin, tonic and clonic spasms are present; symptoms are much worse and more prolonged than those due to benzine. (d) Sulphur monochloride—harmful only when it is broken up by moisture (steam) into SO₂ and HCl vapor. (e) Carbon tetrachloride—rarely poisonous industrially, but will produce symptoms similar to chloroform, with nausea, coughing, headache and pronounced excitement. Around tar and gas works: (f) Hydrogen sulphide—an irritant, producing watery eyes, running nose, coughing, herpes on lips, contracted pupils, slow pulse, Cheynes-Stokes respiration, tonic spasms, delirium and coma; breath smells of sulphides, also. (g) Carbon monoxide and illuminating gas poisoning—may, rarely, be confused with carbon bisulphide poisoning. Finally (h) acute alcoholism—the patient is rather less impulsive, and there is a different odor to breath; unconsciousness is not coma."

"Chronic poisoning shows itself principally in the history of the case. A period of several days or weeks of drunken jollity and excitement followed by depression, with paralytic, digestive and nutritive disturbances, is quite characteristic. The condition is to be differentiated from: (a) Lead poisoning, which is more common in rubber-tire and hard-rubber factories than bisulphide poisoning. Here the predominance of colic, constipation, vomiting, with peculiar pallor and blue line on gum, and lead in urine are diagnostic. (b) Mercurialism—trembling, salivation, gingivitis, diarrhea, and foul breath are characteristic. (c) Duchenne declared that time only would separate bisulphide poisoning from paresis, since death is not frequent in the former. This condition

and (d) locomotor ataxia, however, have characteristic pupil, reflex bladder and rectal disturbances and specific blood and spinal fluid tests. (e) Progressive muscular atrophy presents no digestive disturbances, while mental faculties remain good. (f) Hysteria probably cannot be differentiated symptomatically, but note especially signs of peripheral neuritis of toxic origin. (g) Many mild cases probably pass as neurasthenia. (h) Chronic alcoholism with neuritis exhibits cutaneous and muscular tenderness, features usually absent in CS₂ poisoning. Also eye symptoms are not prominent. (i) The dulled mentality, muscular weakness and slow movements, which accompany or follow chronic gas poisoning must be thought of."

Measures of Relief: In acute poisoning, removal into fresh air, warm baths, cold affusions.

Methods of Prevention: "Prophylaxis is usually easy. Workers should stand on raised platforms, not down in pits or low places. They should be selected, instructed, alternated and allowed only short applications at this work. They should wear impervious clothing, rubber gloves, and boots. Local exhaust systems; slatted floors with powerful exhausts beneath; fresh air from windows stirred up by electric fans; the process confined within special cupboards with apparatus for subsequently drying the goods, all handled mechanically—these are some of the various means employed to prevent poisoning. It should be remembered that clothes, hands, walls, floors, etc., become impregnated with CS₂ and that all need thorough and frequent cleaning. Especially should the hands and fingers be kept out of CS₂ solutions.

"Carbon tetrachloride is the natural substitute, having many advantages, but is more expensive. Yet it is extensively used in Ohio. Some patent harmless substitutes are also on the market. Substitution of other curing processes (steam, vapor cures with sulphur monochloride alone, sulphur chloride with carbon tetrachloride, etc.) have largely replaced the old 'acid' or 'cold' cure in rubber districts.

"In cases of acute poisoning, remove to fresh air, give warm bath or cold affusions, accordingly, as excitement or stupor prevails. The pulmotor may be necessary. For subacute or chronic symptoms the patient should quit work at once. He should be given nitrogenous food to prevent muscular atrophy, with such drugs as strychnine, quinine, phosphorus, iron, iodides and arsenic. For the muscular conditions, electricity (galvanism), vapor baths and massage are indicated."

CARBON TETRACHLORIDE

CCl₄, known as tetrachloromethane, and perchloromethane; a heavy colorless fluid of an agreeable aromatic odor. Used extensively as a substitute for carbon disulphide in the rubber industry.

Dangers: The dangers from the use of this material arise principally from the carbon disulphide which is present as an impurity in the commercial tetrachloride. So far as its poisonous qualities are concerned, carbon tetrachloride is to be preferred to most other solvents. It has the great advantage of being non-flammable.

Symptoms: For symptoms of poisoning by carbon disulphide as an impurity in tetrachloride, see "carbon disulphide."

Measures of Prevention: Use of carbon tetrachloride which is relatively free from carbon disulphide. Adequate ventilation. See prevention of carbon disulphide poisoning.

HEXAMETHYLENE TETRAMINE

(CH₂)₆N₄ known in the rubber trade as "hexa," and sometimes sold under various trade names. Used extensively as an accelerator of vulcanization. Is also known as Hexamethylenamine, Aminoform, Urotropin, Cystamin and Cystogen.

Dangers: The free phosphoric acid in the sweat of the employee appears to break down the structure of this compound, with the liberation of aldehyde compounds. The aldehydes, in turn, cause skin irritation, which, in most cases, rapidly clears up when the employee is removed from contact with the "hexa." In many cases, where the exposure is continued over a long period, secondary eczema which responds slowly to treatment is not unusual. Except for the skin eruptions and for the inconveniences suffered by the employees by frequent "lay-offs," this material is not dangerous; it has, however, been the cause of some labor turn-over within departments, as the employees object to constant skin irritations. Blondes are said to be more susceptible to the rash than persons of dark skin, this apparently being due to the difference in the chemistry of the sweat.

Symptoms: Intense irritation of the skin, usually beginning in the arms and legs and extending to the body, face and head. In severe cases, blisters filled with watery fluid result.

Measures of Relief: Change of occupation to process where "hexa" stock is not handled. Treatment of rash with alkaline washes.

Methods of Prevention: Substitution of other accelerators for "hexa"; personal cleanliness upon the part of employees, including frequent washings of hands and arms during the working-period, and shower-baths at the close of the shift; frequent change of clothing. Some rubber concerns have experimented with the use of bicarbonate of soda, and borax on the arms of the employees as a means of preventing (by neutralizing the acid of the sweat) the rash.

LEAD

The compounds of lead which are used most frequently are white lead, the basic carbonate; and litharge, the yellow oxide.

Dangers: Of the lead compounds used the most dangerous is probably white lead. While this material is more soluble than litharge, and quantity for quantity, is more poisonous, it is not so light and fluffy; and therefore from a practical standpoint it is probably less dangerous. Litharge is of much more importance than white lead because it is used more frequently and in larger quantities than white lead.

The lead is usually taken into the system in the form of a dust and is absorbed either through the respiratory system or through the digestive organs. It is likewise taken into the body by means of contaminated food and chewing tobacco.

Symptoms: Industrial lead poisoning appears as a rule in the chronic form and arises from continuous absorption of the most infinitesimal quantities of lead during a protracted period of time (weeks, months, and even years).

The beginning is insidious, with disturbances of the general health, a sense of weakness, decline of bodily strength; sallow, pale yellowish hue of the skin. Distress in the region of the stomach, eructations, lack of appetite, metallic taste in the mouth and fetid breath.

The blue line (blue-gray) discoloration of the gums, which however, may be absent, even in the course of a severe attack; lead colic with most obstinate constipation, retention of urine; plumbic arthralgia (lacerating, boring), occurring for the most part paroxysmally, chiefly in the lower extremities, more rarely in the upper, often interpreted as a symptom of rheumatism of the joints, frequently, fibrillar trembling of the fingers. Typical are the lead paralyses, of which disturbances of sensation (paresthesia and anesthesia) take the precedence. Paralysis generally affects the exterior muscles of the arm and hand, with atrophic manifestation; more rarely, the flexor muscles. Sometimes also there are paralysis of the extensors and flexors of the lower extremities or muscles of the shoulder. From experience it is known that those groups of muscles are especially affected which are most used in the occupational activity. Transient blindness, but also gradually progressive atrophy of the optic nerve; temporary loss of the special senses of smell and taste; violent, often fatally ending diseases of the brain (saturnine encephalopathy), sometimes preceded only by slight premonitory symptoms, as irritability and headache, ringing in the ears, insomnia; more often, slowly increasing mental disturbances precede; epileptiform convulsions, hallucinations; morbid changes in the blood vessels and of the heart and kidneys (contracted kidney); increase of blood pressure and granular degeneration of the red blood corpuscles.

Measures of Relief: Discontinuance of work in lead at the slightest symptoms of lead poisoning.

Methods of Prevention: Monthly physical examination of all employees exposed to lead hazard, examination to include chemical examination of urine and feces for lead. Sifting of lead should be done in airtight containers, and compounding and mixing operations should be adequately ventilated. Eating of lunches and the chewing of tobacco should be prohibited within the work-rooms. Lunch rooms, separate from the work-space should be provided. Facilities for frequent changes of clothing, shower compartments and hot water should be provided.

PARA-NITROSODIMETHYLANILINE

$C_8H_{10}N_2O$, a greenish compound sometimes used as an accelerator of vulcanization in the rubber industry. Where this material is used the employees exposed to its dangers sometimes suffer with a severe inflammation of the skin which increases in severity according to length of exposure.

Methods of Prevention: Personal cleanliness of the employee and adequate ventilation appear to be the best preventives. Change of occu-

pation will cause the rash to disappear, leaving no permanent effects. Where possible this compound should be replaced by some less-toxic accelerator.

PARA-PHENYLENE-DIAMINE

$C_6H_4N_2$, known also as paradiaminobenzene. Reddish crystalline leaflets, sometimes used as an accelerator of vulcanization, and sold under several trade names to the rubber trade.

Dangers: This is probably the most dangerous of all accelerators. Inhalation of the dust gives symptoms of a common cold with sneezing and depression. The irritant action of this substance is prominent; it produces skin affections, inflammation of the mucous membranes, more especially of the respiratory organs and sometimes inflammation of the kidneys. The general effect of para-phenylene-diamine is an irritant one upon the central nervous system.

Methods of Prevention: The dangers from this compound are by far too great to permit its use in the rubber industry. Other accelerators should be substituted for this material. Accelerators which are reddish in color, and are purchased under trade names, should be considered with suspicion until the absence of para-phenylene-diamine is proved.

SULPHUR CHLORIDE

S_2Cl_2 , known also as sulphur subchloride and sulphur monochloride, used with carbon disulphide, carbon tetrachloride, benzol or naphtha (usually with the first two) in the "cold cure" vulcanization process.

Dangers: The chief danger from this material comes from its being broken up by moisture (steam) into sulphur dioxide and hydrochloric acid, the latter material causing inflammation of the respiratory organs. When used in connection with carbon disulphide (as it usually is in the rubber industry) the dangers from the disulphide are more pronounced than from the sulphur chloride.

THIOCARBANILIDE

$C_{12}H_{11}N_2S$, known also as sulphocarbonilide. This material is manufactured by boiling aniline with alcohol and carbon disulphide, and is apt to contain as impurities traces of both aniline and the disulphide.

Dangers: When heated to vulcanization temperatures this material decomposes with the formation of thiocarbonil (phenyl mustard oil).

Symptoms: The fumes of thiocarbonil (see under "dangers") cause pallor, blueness of gums and lips.

Methods of Relief: Removal of patient to fresh air; treatment of symptoms by physician.

Methods of Prevention: Ventilation of press rooms where thiocarbonilide is used. Immediate attention to early symptoms, and temporary change of occupation.

Respectfully Submitted, C. F. HORAN, Chairman.

¹Reported by Dr. Alice Hamilton in "Disease of Occupation and Vocational Hygiene," by Kober and Hanson.

²"Diseases of Occupation and Vocational Hygiene," pages 40-41.

CHAIRMAN MARTIN: The first address on the program is by Mr. A. L. Rose.

TRIALS AND COMPENSATIONS OF THE SAFETY MAN

**A. L. ROSE, SERVICE DIRECTOR, KELLY-SPRINGFIELD TIRE COMPANY,
CUMBERLAND, MD.**

This paper is prepared especially for the young men in the service. It is not intended for our older members, for I do not presume that I can convey anything to the old campaigners, but I know full well that encouragement is often needed in the initial stages of the safety man's job and is not as readily extended as in some other activities. The salesman is patted on the back when he brings in the orders, the traffic manager can show savings monthly on freight bills and claims and is complimented, the engineer is supported by the evidence of his ingenuity and skill, but safety work is more intangible in results—it takes time to produce results and there are many obstacles and pitfalls in the path of successful achievement.

If I am able, at this time, to advance anything of encouragement, admonition or advice, any thought that will aid, or lend inspiration to the younger members of the Section, I will be content.

I shall, however, take advantage of the privilege to present this paper by offering to managers and executives a plan to promote safety and service work which consummates what I will outline as the objective of the safety man.

It will be necessary for you to bear in mind that I am speaking of safety work as including accident and fire prevention. I know there are trained fire-prevention engineers, but the resident safety inspector, the man who constantly patrols his plant, guarding against accident hazards, cannot fail to find the fire prevention matters entering largely into his field of duty.

SAFETY WORK ALLIED TO FIRE PREVENTION

These two phases of inspection are so closely related as not to be summarily divorced. You cannot do full justice to the safety of the people in your charge without considering their protection against injuries from fire, directly, or from panics, fright or frenzied actions arising from or prompted by the occurrence of fire. Thus you will train yourself to look for conditions that may cause fires and take measures to remedy them. You will learn that bare spots on electric conductor lines, or defective wiring, should not be permitted and that combustible material should not be in contact with steam lines; you will become vitally concerned in the safe handling and use of gasoline or other flammable liquids—in short, you will as time goes on, become as keen in preventing fires as you should be in overcoming and remedying accident hazards. This will lead you to think of, and become interested in, what should be done when, I was going to say "if," a fire occurs, but I'll say "when" because in a rubber shop a fire does occur in spite of your most painstaking and careful inspection and adoption of preventive measures. That is one of the trials. Then the fire doors must be in operating condition; employees must be trained in exit drills, and unobstructed access maintained to an adequate supply of fire apparatus, both interior and exterior, all of which must be ready for use at all times.

Maybe there is a plant fire department and that it is the duty of its chief to assume charge of the apparatus; perhaps that's not your duty and you think it's not your responsibility—but isn't it? When you assume the duties of caring for the safety of the employees of your plant you assume the responsibility of sending every employee home at night as sound in body as when he comes to you in the morning and, with a proper sense of that responsibility, you will not rely on anyone else for the knowledge that all these conditions are as they should be.

CO-OPERATION OF ENGINEERING DEPARTMENT VITAL

If these affairs are, by routine or organization chart, left to the engineering department, you must know for yourself, because the only time the engineering department interests itself in fire prevention and fire protection measures is when the insurance inspector comes around—and he may come semi-annually or even four times a year! Even then he, or his company, is cajoled into passing up or withdrawing recommendations on the grounds of impracticability or it is elected to pay the increased rate charges for the privilege of maintaining fire hazards that are a menace to human life. With all due respect to an honorable profession and an integral factor in industry, they do not make mechanical engineers and safety men in the same mold. And that is another one of the trials. Those of them who are technical safety engineers have been recast.

It is undoubtedly true that the cause of safety would have been benefited and furthered had more technically trained men been converted to and engaged in the work in the earlier days, but the splendid achievements in safety education of the past fifteen years will stand as a monument to the untrained men who have devoted themselves to the work. trained themselves and have set up and enacted standards of practice that may well be followed and will be the textbooks when safety courses are included in the curriculums of our technical schools. It should be an encouragement and incentive to you to know that many of the most efficient and prominent men in the service today were not technically trained. I am not sure you're not potentially better safety men if not hampered by T-square and compass and by the rote of technical training, unless such training has had the technique of safety. What I mean by that is: One of the fundamental factors of success is a facility to obtain, and retain, the co-operation of all others in your organization, from the chief executive of the plant to the humblest laborer. If the safety man is an engineer he will have his own ideas of design and procedure in construction and installation which he will, very naturally, wish to have carried out.

EVERY EMPLOYEE IN PLANT CAN ASSIST

Unfortunately, perhaps, but nevertheless generally so, the execution of his recommendation does not come under his control but comes under the jurisdiction of the engineering department—and who ever saw or heard two engineers agree! If the engineering department has to do the work you will get better co-operation and more assistance if you ask only that certain things be done and leave the design and method of

execution to them. You cannot carry on without the good will of this department; you will constantly need its assistance. This is not confined to that department, though: every employee in the plant can give you assistance. The greatest asset to a safety man is a sincerely friendly relation with those he comes in daily contact with in his work. There are other places besides a barrel where two heads are better than one. No one man can see everything and, if encouraged to do so, many of the employees will point out to you conditions or hazards that you have overlooked or do not know of. Encourage everyone to do this by giving your best consideration to every suggestion tendered you; if it is practical, show your appreciation, and explain why if it is not.

Another trial is with the old employee who has been on the job so long that he looks on every newcomer as a nonentity and resents any innovation or change on general principle. He is the one who opposes a safety measure because nothing ever happened before. If you haven't yet, you will, sooner or later, hear something like this: "We've been working around that fly wheel for twenty years without guards and no one has fallen against it and I guess we don't need to guard it now." You've probably heard this, too: "No one but me or my assistant goes near that engine or uses that ladder." Most machinists will resent guarding the shear of a planer platen. It requires a real demonstration, a horrible example, to convert such individuals and you cannot afford to wait for that, but are compelled to assert yourself and go over their heads; they must be protected against themselves.

DO NOT SHIRK YOUR RESPONSIBILITIES

Why, it isn't long ago I heard the head of the safety department of one of the largest railroad systems of the country use the defense "We've never had an accident there," when opposing a request by a municipal public safety committee for public protection and that at a point where his company's responsibility would be directly chargeable. He is a company man first and a safety man second. Do not permit yourself to waive your demand for needed protection because of a seeming company interest to avoid the expense. Have the courage of your conviction, adhere to your principles of duty, go on record to recommend or direct that the measure be taken and put the responsibility up to others. This will result in more action on your recommendations; the other fellow will not relish having that responsibility either. Stand by your guns if you know your recommendation is good; follow it through; keep at it until you see it accomplished. You will earn more respect from your superiors and a better reputation for a thorough safety man—that is the way to sell safety to your organization.

We have heard a lot about selling safety. Time was when a salesman was one who could sell something he didn't know anything about to someone who didn't want it or didn't need it. It's not so these days. Goods are sold on their merits and a successful salesman must have the confidence that his goods are right and that his customer should have them and be able to demonstrate this.

Industry is suffering now from some sharp salesmanship practiced during the war. Many very highly exploited goods, wrapped in gaudy

packages and with elaborate directions for their use, were offered to the then ready buyer. These were labeled "Bonus Plans," "Profit Sharing," "Production Stimulants," "Employee's Representation," "Work Councils," "Efficiency Surveys," "Foremen's Training Courses," and what-not; all aiming to cure the ills of industry in one way or another. Some of these goods proved to have merit, while many of them were nostrums and the simple, confiding industrial manager was stung.

ABANDONMENT OF SAFETY WORK PROVED VERY COSTLY

The doctrine of human engineering, so generally accepted during this period, has since then been renounced by many because of fallacious teaching, and managers have grown skeptical of any plan or idea calculated to promote the interest of industry in the future by a closer understanding between labor and capital. Personnel managers or industrial-relations men, efficiency experts, even employment managers and safety men were released at the first sign of depression in business, and safety work as well as other activities suffered in consequence. The error of curtailing on safety inspection has been proved by the immediate increase in accident frequency and cost. The pendulum is now swinging the other way and the necessity for consistent, practical safety work is being recognized now as never before.

From all the efforts of those who were trying to help others and those helping only themselves, and the sincere desire of industry to help itself and better conditions, there has also evolved a stabilizing factor in industry known as "industrial relations." I will not digress to any comment of this except to say it is not a new factor, but a new term for what was once known as "welfare." That's all, just the welfare of employees, which is, of course, mutually beneficial to employee and employer—and safety work was the first phase of welfare work in industry. That is what I'm coming to; call it welfare, industrial relations, mutual service, personnel service—what you will—safety is a big factor in it and the safety man's duties are so closely dovetailed that he is almost inevitably identified with it. It will be to your advantage to make the most of opportunities to participate in any of the functions of industrial relations; it will afford advantages in the study of human nature, the study of men, and bring you in closer touch with your fellow-workers. It will help in your conduct of safety work and make you more valuable to your organization. The human element is a large factor in your relations with the employees. The man who knows men, who can put himself in the other fellow's place, be logical and consistent, can control others or, as the expression goes, "handle men;" you need to develop your abilities in this direction and I want to make this most emphatic—you need it in your business—the personal touch.

The industrial manager in the past has been selected because he was either a good sales manager or engineer or practical shopman, but I predict that the manager of the future will be selected because he can handle men with the golden rule as his motto.

YOUR REWARD COMES THROUGH YOUR WORK

Your more definite and immediate compensation lies in the gratification from reduction of accidents and fires, not only on the attendant saving of cost but the alleviation of hardship and physical pain and suffering, and consequent increased happiness and in the knowledge that you are doing your part, contributing to the betterment of the minds and bodies of those under your charge. There is no more ennobling field of endeavor than that of helping your fellow men to cleaner and better lives. Your scope in this direction is unlimited and comparable, I may say, to even that of the physician or the minister of the gospel. I have not exaggerated the possible development of the safety man. He is the logical potential composite ideal to act as the medium between employer and employee. He knows, or should know, the minds of both better than can anyone else.

This brings me to the point of offering a plan to utilize this type of man in setting up a point of contact between him and the employees, a medium for self-expression of employees. There are plans in vogue to this end, such as works councils, employees' representation organizations and shop committees with varying results. I offer no argument for or against, but to the employer who has found such means unsuccessful, or who has been fearful to experiment and yet realizes the necessity of action in this direction, I propose: Divide plants of over 1,000 or 1,500 employees into divisional or district units. Assign to each district one person to act as the agent of an industrial relations or mutual service department; a man if with male and a woman with female employees. These agents should be selected with peculiar fitness and proper mental attitude to invite and command the confidence, friendship and respect of employees and have ability to judge merit and adjust affairs between employer and employee with mutual satisfaction.

SAFETY DIRECTORS ARE OBTAINABLE

They would also direct activities promoted in the interests of employees, such as education, athletics, and other recreational features. Accident and fire prevention could be efficiently included in the duties of these agents. Their offices should be located in their respective districts if the plant be so divided. They would be responsible to the plant manager or to a chief of department of control. Such a plan, with the right personnel, can accomplish all that is to be desired and overcome the objection to, or the possible menace of, shop committees or organizations of employees. It should serve the purpose of recreating the relationship between the employer and employee that existed when industries were small, when the employer was personally acquainted with each of his employees. There are many men and women now engaged in some of these activities in industry, or in closely allied service, who could readily adapt themselves to successfully conduct all these duties. It is, as I have tried to impress, a matter of personality, the exercise of tact, patience and perseverance, an innate, sincere desire to help your fellow man and an entire devotion to the cause.

DISCUSSION

CHAIRMAN MARTIN: Any discussion on this paper?

MR. E. L. HEWITT (United States Rubber Co., Footwear Division, New Haven, Conn.): Mr. Chairman, I am a mechanical engineer and safety man and I do not agree with the theories suggested in the paper. The whole tendency is to lose sight of the mechanical engineer's views. I do think they make mechanical engineers and safety men in the same mold. If you can balance their views I think it would be a very happy combination.

CHAIRMAN MARTIN: The next paper is by Mr. G. W. Cook.

VULCANIZERS

**G. W. COOK, SUPERVISING INSPECTOR, WORCESTER (MASS.) DIVISION,
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The vulcanizer, or "heater" as it is more commonly known, is a steam-pressure vessel used for curing or vulcanizing rubber. Employees working about these vessels are exposed to a number of hazards and may be injured more or less severely in various ways. For example, they may be burned by coming in contact with the hot metal parts, or scalded by hot water or steam; they may have their hands, arms or other parts of their bodies bruised, lacerated or injured in other ways while handling the heavy doors or covers; the doors may be blown open by the internal steam pressure because of improper, inadequate, or defective door fastenings, and injuries caused in this way; the vulcanizers may explode violently and kill or injure many persons and, in addition, cause extensive property damage. One hundred or more vulcanizers may be used in a large rubber plant and there is an ever-present possibility of accidents from any of all of the above-mentioned causes. The explosion hazard is, of course, the most serious because of the extensive damage that is likely to result in case of an accident of this kind. Fortunately, vulcanizer explosions are comparatively infrequent, but since the prevention of accidents of the other kinds named is, to a great extent, within the province of the individual workman, I shall give chief consideration, at this time, to the means and methods for preventing explosions.

OPERATION OF A VULCANIZER

Let us follow the operation of a vulcanizer, carrying a pressure of sixty pounds and requiring thirty minutes for a heat. The material to be cured is placed in the vulcanizer and the door is closed and securely fastened. Steam is admitted to the vulcanizer pipe line through a reducing valve placed between the main steam line and the vulcanizer line, at a pressure of about 100 pounds. Steam enters the vulcanizer through a reducing valve which further reduces the pressure to sixty pounds in the vulcanizer. At the same time steam in the vulcanizer line is by-passed to the vulcanizer through a by-pass valve, in order to raise the temperature in the vulcanizer to the curing point as quickly as possible.

The steam-tender watches the thermometer and when the temperature reaches 300 degrees Fahrenheit (corresponding to a steam pressure

of about 60 pounds) he closes the by-pass valve. Steam then continues to flow through the reducing valve and maintains the pressure at sixty pounds. The steam condenses gradually and the condensation falls or flows to the bottom of the vulcanizer and is removed through a steam trap. At the end of the heat, or in about thirty minutes, the steam is shut off, the blow-off valve is opened, and cold water is sprayed into the vulcanizer (or the vulcanizer is flooded) to terminate the cure. The telltale or relief valve is opened and, all steam pressure being removed, the door is opened and the vulcanized material taken out. Thus the vulcanizer is subjected to sixty pounds steam pressure, heated to 300 degrees Fahrenheit, and chilled with cold water, several times a day and year after year.

VULCANIZER SHELLS AND HEADS

In order to prevent explosions the design and construction of vulcanizers should be the best possible. Although a vulcanizer is not directly exposed to the fire, as a steam boiler is, the service required of it and the treatment it receives are in some ways far more severe. The repeated application of pressure and high temperature followed by rapid cooling of the shell, cause intermittent strains and stresses that are particularly trying. The oldest and probably the most advanced branch of safety engineering is that which deals with steam boilers.

Vulcanizers should preferably be constructed according to the boiler code of the American Society of Mechanical Engineers, except the door or cover flanges and fastenings and certain other special features that are not covered by the present code. This means, in short, that the shell should be composed of fire box steel of adequate thickness and of known chemical and physical qualities, and that the longitudinal seams should be of the butt-strap type, properly designed for the pressure to be carried. The edges of the sheets should be formed to the curvature of the shell and the rivet holes either drilled full size or punched small and drilled or reamed to full size. The rivets should be driven by machine riveters and allowed to cool under pressure. The heads should be bumped to a radius not greater than the diameter of the shell and the corner radius of the flanges made ample according to the thickness of the metal in the heads. The progress of the work should be followed in the shop by a licensed boiler inspector and the completed vulcanizer should be tested and approved by the inspector before it is shipped.

I recently examined a battery of vulcanizers purchased only three or four years ago. They had been built to no code or specification and the quality of the material was unknown. The longitudinal seams were of the lap-joint type and the plates were not properly formed to the curvature of the shell. With our present knowledge of lap-joint failures, and the cause of them, there is no sufficient reason for using such joints on large pressure vessels, even at moderate pressure. The rivet holes in this vulcanizer had been punched full size and drifted and the rivets driven with air riveters. The heads were quite flat and the flanging had been done poorly and with a sharp-corner radius.

I also examined a new vulcanizer head that had a flat spot almost a foot in diameter where it was supposed to be curved. Heads of this kind have been found that were cracked all around the circumference and steam leaking through the crack, because the corner radius was too small.

Cracked heads have also been found on which repairs have been made by autogenous welding—metal having been flowed into the corner to build up a fillet. A good boiler inspector would not allow repairs to be made in this way nor approve them if already made.

Many vulcanizers are in use today that do not conform with the principles of good boiler-making and, unfortunately, others are being built at present that fall short of modern safety requirements.

FITTINGS AND SAFETY APPLIANCES

The safety of a vulcanizer depends to a large extent upon the installation of suitable fittings and safety appliances, properly arranged, operated and maintained. If the regular working pressure on the boiler exceeds that required for the vulcanizing operations or is greater than the pressure allowed on the vulcanizer, it will be necessary to provide reducing-pressure valves, as previously stated. When possible, however, one or more boilers should be provided for the sole purpose of furnishing steam for the vulcanizers, and should be operated at the pressure allowed on the vulcanizer. This will eliminate the use of reducing valves and the consequent possibility of excessive pressure in the vulcanizers, due to failure of the reducing valves from any cause.

It is now considered good practice to admit live steam to a large-diameter or long vulcanizer through several branch pipes into a corresponding number of openings located about twelve feet apart in the vulcanizer. This is for the purpose of avoiding excessive and localized temperature stresses which would result if the steam were admitted at a single point.

Whenever reducing valves are used they should be examined carefully and frequently and every possible precaution should be taken to keep them in proper working order. Furthermore, every vulcanizer should be provided with one or more safety valves, even if reducing valves are used, and these safety valves should be adequate in size to relieve any excess pressure promptly and effectively. As a matter of fact, the safety valves provided are often too small and if they work at all they merely serve as warning signals. Moreover, they are often placed in the vulcanizer heads, or near them, where they are likely to be struck and damaged by chain falls used for opening and closing the doors, or by other objects. In some heater-rooms the dust and moisture in the air will soon seal the safety valves shut if they are not tried regularly. Many valves have no levers by which they can be operated. It is unfortunately true that in some cases no one in the plant can tell when the safety valves last operated or at what pressure they are supposed to blow. I have found in a number of cases that cylinder relief valves were used in place of safety valves.

STEAM GAGES SHOULD BE UNIVERSAL RULE

Nearly every vulcanizer is provided with a steam gage and this should be the universal rule. The steam tender, however, usually relies on the mercury thermometer to indicate the proper curing temperature because this is more accurate and sensitive than the steam gage. As a result, the steam gage is often neglected. The glass cover becomes broken, the working parts become clogged with dirt and dust and the gage fails to indicate the actual pressure. The steam gage should be of first-class quality and should be kept in good working order and be frequently tested and compared with a standard test gage. A connection for attaching the inspector's test gage should be provided near the steam gage.

The steam trap used for removing the condensed steam from the vulcanizer should also receive careful maintenance and inspection because, like any other automatic device, there is always a possibility that it may fail to operate. On horizontal vulcanizers, bleeder valves should be provided in addition to the steam traps, and should always be opened before the doors are opened so that there will be no water in the vulcanizers if the steam traps fail to operate.

There are a number of valves which must be operated by the steam tender twice during every heat. Failure to operate them properly, or disarrangement of the valves which prevent them from operating, may cause serious results. Any valve will wear out in time and the service required of valves about vulcanizers is particularly severe.

I have previously referred to the by-pass valve and the reducing valve. If these are not closed tightly or if the seats become worn, steam will leak through them. If the cold water valve is opened under these conditions a water hammer is likely to result. Failure of the steam trap to operate and opening the cold water valve before relieving the pressure in the vulcanizer may also cause water hammer.

VULCANIZER DOOR ACCIDENTS

Vulcanizer doors sometimes blow open and cause serious accidents. Some of the causes of such accidents are worn or defective parts, improperly designed door rings or shell flanges and failure of the operators to securely fasten the doors before admitting steam to the vulcanizers. I recall one accident that resulted in the death of two men. The vulcanizer was used for vulcanizing hose and was of the horizontal type, with a self-locking door. The lugs were only partly lapped and when steam was turned on the door blew open and both operators were killed.

There is a total load of more than fifty-four tons on the head of a vulcanizer forty-eight inches in diameter and carrying a pressure of sixty pounds, and correspondingly greater loads on the heads of larger vulcanizers. The door fastenings must, therefore, be amply strong, properly spaced and carefully secured. With a door of the bolted type, because of carelessness or rough treatment, the entire load may be thrown on a few of the bolts, with the result that the door will blow open.

Long pipes are sometimes slipped over the handles of wrenches used for tightening the nuts on the cover bolts, to increase the leverage, or the

wrench handles are hammered with heavy weights. These practices are likely to result in stripping the threads on the bolts or in the nuts and in bending or weakening the bolts. On some vulcanizers the load on the eye bolts is transferred to pins and these pins are broken by overstraining the bolts. Sometimes the operators do not tighten the nuts uniformly, or the bolts are at an angle when the nuts are tightened and slip when steam is turned on.

There are a number of different types of boltless or quick-setting doors in use. Some of them are well designed and strong, but others are weak and unsafe. The lugs on some of them are found bent as a result of the pressure in the vulcanizers. One engineer told me that when he found bent lugs he turned them off square again, but this meant that they were made weaker every time the operation was performed.

Some door rings are made in two parts and are tied together with bolts. Theoretically there may be little or no stress on these bolts, but in practice the stress often is considerable and a number have been found broken. The failure of these bolts will cause the parts of the ring to separate and the door to blow open. In some cases, due to poor design or material, door rings have been found split across the line of the rivet holes or the flanges have been broken off.

Accidents of other kinds occur while opening or closing the doors or covers of vulcanizers. The doors are heavy and it is not an easy matter to handle them. Sometimes hinged doors on horizontal vulcanizers swing back against obstructions, such as an iron column, and under these conditions the operators may be pinched. If the covers are lifted by chain falls there is the possibility of accidents resulting from the breaking of the falls, chains or hooks. When the covers are raised by hydraulic rams and hung on hooks, care should be taken to see that they are properly hooked up so that they cannot fall. When the covers are hot, special care should be exercised in the handling of them to avoid painful burns. "Sleeves down," instead of "sleeves up," should be the rule when working about heaters.

The practice of putting handles on doors is good and should be universally adopted, because these handles would, in many cases, prevent hands from being burned or pinched.

STEAM AND WATER BURNS

Most vulcanizers are provided with relief valves or vents which are supposed to be opened to relieve the pressure before the doors are opened. The operators, hurrying to get the work along, sometimes fail to open these valves and when the doors are opened steam rushes out and causes burns, some of which are quite serious. The relief valves and safety valves are often situated so that when they are opened steam will blow directly in the faces of the operators. The steam traps sometimes fail to work. Hot water will accumulate in a horizontal vulcanizer after the blow-off valve is closed and before the door is opened. On opening the door the hot water will rush out and is likely to scald the feet and legs of the operator. Vulcanizers are usually set in battery and their blow-off pipes connected together.

An open vulcanizer should not be left with its blow-off valve open, because hot water and steam may be discharged into it from another vulcanizer in the same battery.

SUMMARY

The purchaser of a new vulcanizer should require that it be built in accordance with specifications based on the A. S. M. E. code, that particular attention be given to the design of the cover and shell flanges and that cast steel should be used instead of cast iron for all castings to be subjected to steam pressure. He should select a manufacturer with a reputation for doing first-class work and, preferably, one who has had considerable experience in building vulcanizers. He should have a capable independent or insurance company boiler inspector follow the progress of the work, one who will see that the specifications are rigidly adhered to, that the workmanship is of the best and that the vulcanizer is properly tested before it leaves the shop.

After it has been installed the vulcanizer should be periodically inspected by the man whose sole business in life is the safety of pressure vessels—that is, the steam boiler inspector. There is a possibility of corrosion where sulphur is used in vulcanizing and the inspection should include an examination of the metal to discover any deterioration from this cause. This kind of inspection does not, however, relieve the engineering or maintenance department of the factory of responsibility. Members of this department should inspect regularly the doors, rings, and bolts, the chain falls, and the safety valve, steam gage, reducing valve, traps and other appliances, and see that they are maintained in first-class condition.

I know that all these things are done in many of the plants represented by the gentlemen present, but there are plants where these precautions are neglected. I am familiar with plants where vulcanizers of unknown age are in use, and I know also that there are a great many vulcanizers that never have been inspected. There are probably in use today many old and poorly constructed vulcanizers that are dangerous and should be scrapped and a great many others that are deteriorating rapidly because of lack of proper care. In fact, I would be surprised if a careful survey of the vulcanizer equipment in any plant represented here today failed to bring to light some conditions that require correction to make matters entirely safe. (Stereopticon shades were shown.)

DISCUSSION

G. I. LYONS (United States Rubber Company): Mr. Cook, on slide No. 6 you showed a vulcanizer head with relief valve, with ring, that connected the door hook, and said it was in poor position. Later on you showed a vulcanizer head with three hooks. If I remember correctly the telltale was in practically the same position, but you said it was in a good position.

MR. COOK: The hook was good, not the radius of the relief valve.

MR. COFFEY (United States Rubber Co.): I would like to ask Mr. Cook to tell us what he would recommend as to where a relief valve be put on. (A stereopticon slide was shown.)

MR. COOK: I do not object if it was in this position (indicating), if the steam goes up straight.

MR. COFFEY: A vertical boiler.

MR. COOK: A safety valve blows off vertically—that other valve (indicating stereopticon view)—shows its horizontally (indicating), the tell-tale, see how that blows; that could be turned vertically and would not blow in your face.

MR. COFFEY: What I had in mind was a good place for a safety valve, so it would not be injured.

MR. COOK: We have discussed that many times. Some engineers have agreed that they should be in the side of the shell. In reality, it is only there as a warning signal. It is a question of how large the safety valve is; there is no standard capacity on safety valves; that is, we do not have a manufacturers' guarantee, but some day we will have a standardized safety valve. I believe there is no question but that it should be put in the side.

MR. BECK (United States Rubber Co., New York City): I would like to ask how often you would suggest popping a safety valve.

DIFFICULTY IN SECURING STANDARD SAFETY VALVES

MR. COOK: It is like testing the steps on a rubber mill, it is a question. If they were tested every day, it would not hurt them. It is a very simple thing, the trying of safety valves. In some heater rooms different material is handled and it is a fact there is a certain dust in the air that seals the safety valves. The greatest trouble with safety valves in a vulcanizer, as I have found, was that a sixty-pound vulcanizer will often be really eighty pounds. It is my opinion they should be tried; have them set at some known pressure and tested periodically to see, under pressure, what they blow at. It is not a difficult matter to close the vulcanizer and run the pressure up to the by-pass valve.

MR. F. R. McNABB: I would like to ask Mr. Cook if there is a definite resolution on a safety valve, when it should be opened and as to a given width; if they have figured out just the opening that should rise, in order to relieve the heater.

MR. COOK: There is no standard list of safety valves, but the makers have been doing a lot of experimenting. It has been found that two safety valves of the same make will vary; also two safety valves made by different manufacturers will vary; that may be due to difference in material and spring, I do not know. Two safety valves, of different manufacturers, of the same size, say 2½ inches, will be tested out in the lifting and a decided difference in the amount of steam they will release.

MR. McNABB: Only a given amount of steam can pass through a given opening.

MR. COOK: Yes. The only thing we can do is to accept the manufacturer's guarantee. That (indicating stereopticon view) is another thing on safety valves, on vulcanizers. Undoubtedly that safety valve should be big enough to relieve the pressure going through the by-pass. That orifice (indicating on stereopticon view) around the disc of the safety valve, un-

doubtedly, ought to be equal to the discharge capacity of the globe valve on the by-pass line.

MR. ROBERT BOLLING (Aetna Life Insurance Company, Chicago, Ill.): With reference to the vulcanizer having a separate cut-off valve, I would like to ask if it has not been found convenient to use ordinary check valves in case the operator should forget to shut off these valves?

STICK TO CHECK VALVES TO SECURE GOOD PRACTICE

MR. COOK: Of course, if there is a chance of any material getting into the vulcanizers and getting down through the blow-off you should stick in the check valve. I think it is good practice. Four, five or six-inch check valves are not very often used; that is another thing you have to keep under consideration. If you had a check valve that was heavy enough it would not relieve the water when that pressure is relieved; it would not let the water out of the vulcanizers unless it was to stay down to around two or three feet below the floor.

MR. McNABB: I had an experience with a blow-off on a boiler. An engine happened to be shut down and we found that they stuck in the water from the blow-off; that made me think of the check valve. That was put in right afterward.

MR. COOK: It was placed in the same line?

MR. McNABB: Yes, they were connected altogether.

MR. E. A. HOENER (Firestone Tire and Rubber Co., Akron, Ohio): We had an accident very similar to the one mentioned by Mr. Cook. On one of our horizontal heaters the operator forgot to close the door; in other words, he neglected to look and the rings were only a quarter of an inch on the lock. One thing we have done to overcome that—we have painted our locking rings on the heaters a very bright vermillion, and when it is closed properly it forms a complete red circle. If the operator does not close it there is a gap in the red circle—anyone can notice it. I just offer that as a suggestion, possibly, to someone who has had similar trouble.

MR. COFFEY: I would like to have Mr. Cook explain a good seam.

MR. COOK: The ordinary vulcanizer is largely made so the thickness of the metal is far greater than necessary to maintain the pressure; therefore, the longitudinal joint does not have to be a highly efficient joint, 60 to 65 per cent is sufficient. For that reason a joint that has no greater efficiency than this (indicating stereopticon view) is all right. It is practical in some designs to merely put in a double ribbed bar joint with single butt, particularly in vulcanizers where you require all the room you can get, and for that reason put on single butt strap on the outside; double riveting butt joints—that gives you exactly the same efficiency as double riveting butt done without the lap. Where there is plenty of room a split-riveted joint with outside taking three and inside two; where there is plenty of room that, of course, is preferable.

CHAIRMAN MARTIN: There is a wide variance of opinion as to the value and merit of safety committees. Mr. Keating has recently had some new and very satisfactory experiences with plant committees and I will ask him to tell you of his experiences.

SAFETY COMMITTEES

H. F. KEATING, UNITED STATES RUBBER COMPANY, MORGAN & WRIGHT PLANT,
DETROIT, MICH.

I am pleased at the opportunity afforded me to relate my limited knowledge of safety committee experience in a rubber plant. I trust that whatever I state will be accepted, possibly not as the best, but probably as one of the few acceptable means of putting over a successful safety program in the rubber industry through safety committee work.

The subject, "Safety Committees," assigned me has been subdivided into four classes: (a) Value, (b) Types, (c) Functions and (d) Experiences Encountered in Organization. I will attempt to touch on each class in the order mentioned.

(a) *Value*—The organizing of safety committees among the workmen is obviously one of the most effective methods of safety education. It is generally conceded that safety committees are the most effective means so far devised for impressing the individual employee with his own responsibilities and teaching him the essential elements of accident prevention methods. Where such committees are organized and maintained they result, eventually, in the development throughout the working organization of a body of wide-awake employees who are genuinely interested in looking out for their own safety as well as that of their fellow workmen. The value of such an influence is readily apparent.

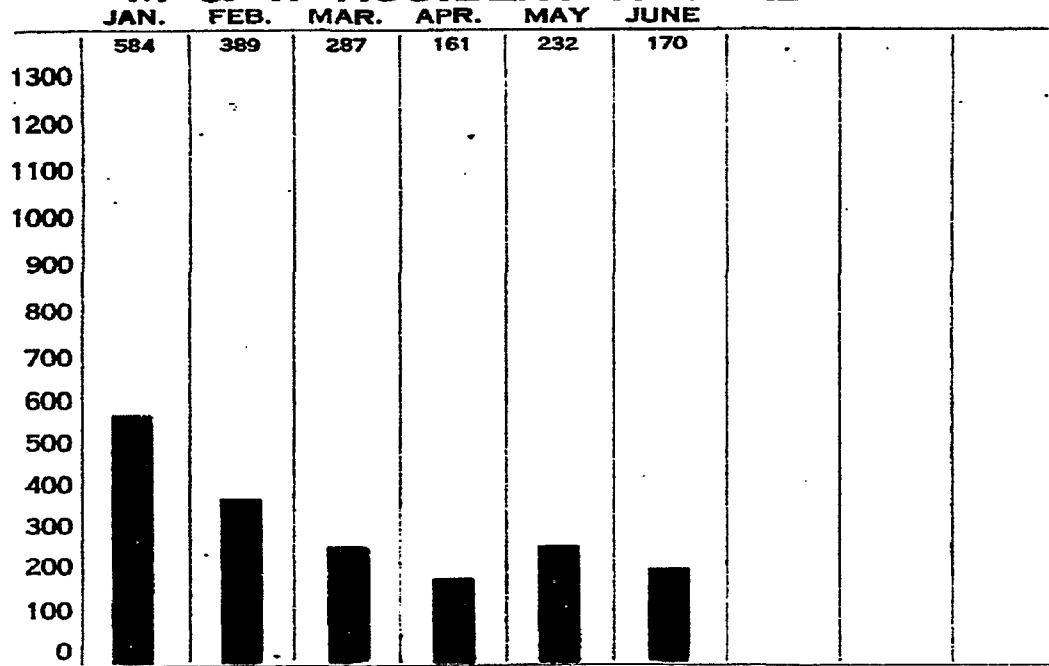
TO SECURE RESULTS YOU MUST ADOPT SPECIFIC PLAN

(b) *Types*—For carrying out safety work effectively and systematically in a rubber plant I suggest that definite plans be laid out and followed. In considering the type of committees essential to successfully carry out the program, we must first of all bear in mind that the educational feature of safety work is of prime importance. This is due to the fact that statistics have proven that 90 per cent of all accidents are preventable and attributed to the human element. Therefore, to reap the fruit of the harvest, after a given time, we must send missionaries forth to preach and practice the gospel of conservation of limb and life.

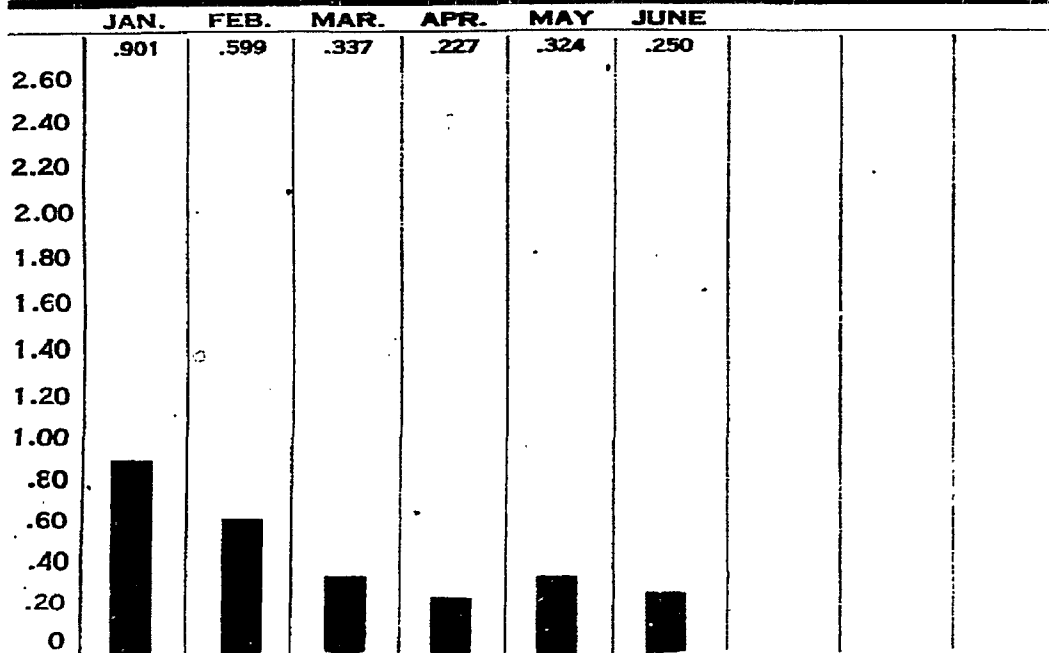
The director of safety is the high prelate of the church of humanity. He alone cannot convert, whether his congregation be large or small, the black sheep or the careless brethren of his flock to full-fledged devotees of his creed of safekeeping. Therefore he holds counsel with his board of directors, presided over by the plant manager, and informs them that not only to better the plant safety record, but also working conditions, he deems it advisable that he be given the authority to select missionaries from the flock of workers and organize among them an employees' safety committee. He also requests and is given authority to organize an advisory committee—this committee to be made up of men thoroughly competent to pass judgment on methods and mechanical devices. Thusly armed he sets forth to cover the field in an intelligent and efficient manner.

(c) *Functions*—The functioning of any committee depends, necessarily on the method used in selecting its members and the methods used

M & W ACCIDENT RECORD—1922



TOTAL DAYS LOST



PAYS LOST PER 1000 HOURS WORKED

(SEVERITY RATE) (TOTAL DAYS LOST ÷ NO. OF 1000 MAN HOURS WORKED)

in selling them the spirit of safety. Their duty, of course, is to do everything in their power to minimize accidents. Prior to the beginning of the present year we had at Morgan & Wright what we called a general safety committee, comprised of minor executives. This committee functioned about as well and efficiently as a one-armed man would in building or finishing a tire. It functioned and that was about all. Results were far from gratifying.

We started out in January of this year with the sole intention of bettering our 1921 safety record. We loaded up with two gatling guns—the employees' committee and the advisory committee. Since that time (I have charts to prove it) we shot holes all around the safety target's bull's-eye and by sunset Dec. 31, 1922, unless I miss my guess, Morgan & Wright's band will be leading a funeral procession for Old Man Chance.

THE SAFETY ENGINEER AND HIS RESPONSIBILITY

The safety engineer should be directly responsible to the factory manager. He should act as secretary to the employees' committee and the advisory committee. He should be held responsible for seeing that various recommendations that have been made and approved are carried out promptly and correctly. He should also be answerable to the advisory committee and should have authority in proportion to his responsibilities. He should keep records and statistics of the accidents that occur, he should be held responsible for proper and continued use of safeguards that have been installed, he should be responsible for having suitable articles published in the factory house organ. It should also be part of his duty to establish standards for guards of all kinds.

EMPLOYEES' COMMITTEE AND ADVISORY COMMITTEE

The duties of the employees' committee should be to make competent plant inspections at least once every two months. My suggestion for conducting plant inspections is to subdivide the committee into units of two members each and to have the safety engineer personally accompany one unit each week on inspection tours. By this arrangement it will be necessary to subdivide the plant into equal divisions of inspection. The divisions of inspections should be so arranged that committee members shall not inspect their own or adjoining departments. The reason for this arrangement is that employees inspecting their own or adjoining departments are liable to overlook hazardous conditions and horseplay because they have familiarized themselves with their local conditions.

The members of this committee should be required to make written reports, even though they submit oral reports that may be satisfactory—the idea being that a man making a written report is bound to give the subject considerable more thought than he would if he merely stated his recommendations verbally. The safety engineer should supply members of this committee with necessary report blanks.

ADVISORY COMMITTEE

The advisory committee should have authority to establish standards for protective devices and for methods to be applied in connection with processes which involve more or less hazard. It should also have charge

UNITED STATES RUBBER CO.,

FORM M1200

MORGAN & WRIGHT PLANT

EMPLOYEES' SAFETY COMMITTEE REPORT SHEET

THE FOLLOWING RECOMMENDATIONS ARE MADE FOR IMPROVING WORKING CONDITIONS
IN DEPARTMENT NO. _____

		DEPT. NO. _____
MEMBER		
		DEPT. NO. _____
DATE	MEMBER	

of the preparation of such safety rules, pamphlets or warning notices as it may deem advisable to issue for the benefit of the workmen, and it should also decide all controversies that may arise in connection with the safety work. This committee should pass judgment on recommendations made by the 'employees' committee. Recommendations considered worthy of adoption by this committee should be referred to the management for approval or rejection, through the committee secretary, the safety engineer. The committee secretary should inform, in writing, committee members of the final disposition of recommendations referred to the management by them. Minutes of the various meetings should be taken and kept on file by the safety engineer. The factory manager, the insurance department and each committee member should receive copies of the minutes.

CHEAPER TO PREVENT ACCIDENTS THAN PAY FOR THEM

(d) *Experiences Encountered in Organization*—In organizing the various committees the question of the best method of choosing the members, time and frequency of inspections, whether or not employees should be paid for the time they devote in making inspections, the furnishing of badges or buttons of authority and inspection blank pads should be thrashed out with the management. The formulated plans, even though tentative, should be given adequate space in the plant house organ. The foreman and division superintendents should be called together for a meeting and should be addressed by the plant manager.

At this meeting the safety engineer should outline the organization plans in detail and follow this up with a dollar and cents and humanitarian sales talk. He should point out to them that if any foreman or

superintendent present was responsible for the destruction of a quantity of tires that he would soon be burning a hole in the carpet, directly in front of the "big gun" because an actual production loss means increased overhead and a financial setback. Ask them what then should happen if a fatality should occur in a department where the foreman's safety temperature was lukewarm. Unquestionably, the paying of thousands of dollars in compensation would be a greater setback to the company than the loss of a few tires. Ask them pointblank if their wives or mothers expect them home for dinner. Then tell them not to forget that the men under them may also have wives and mothers and that it is their moral duty to protect them from bodily injuries if possible. The foremen are really the locks on the doors of any plant and the safety engineer and his committeemen are the keys. The locks must be kept well oiled and the keys used sufficiently enough to prevent rust. Get the foremen and you will get results.

The personnel of the employees' committee should be changed every two months, the idea being to have a complete departmental representation on the committee in the course of one year's time. It is true that under this arrangement some departments will have two and possibly three committeemen representing them in a year's time, but an increased representation for a large department does not decrease the educative value of the idea.

COMMITTEEMEN SELECTED BECAUSE OF QUALIFICATIONS

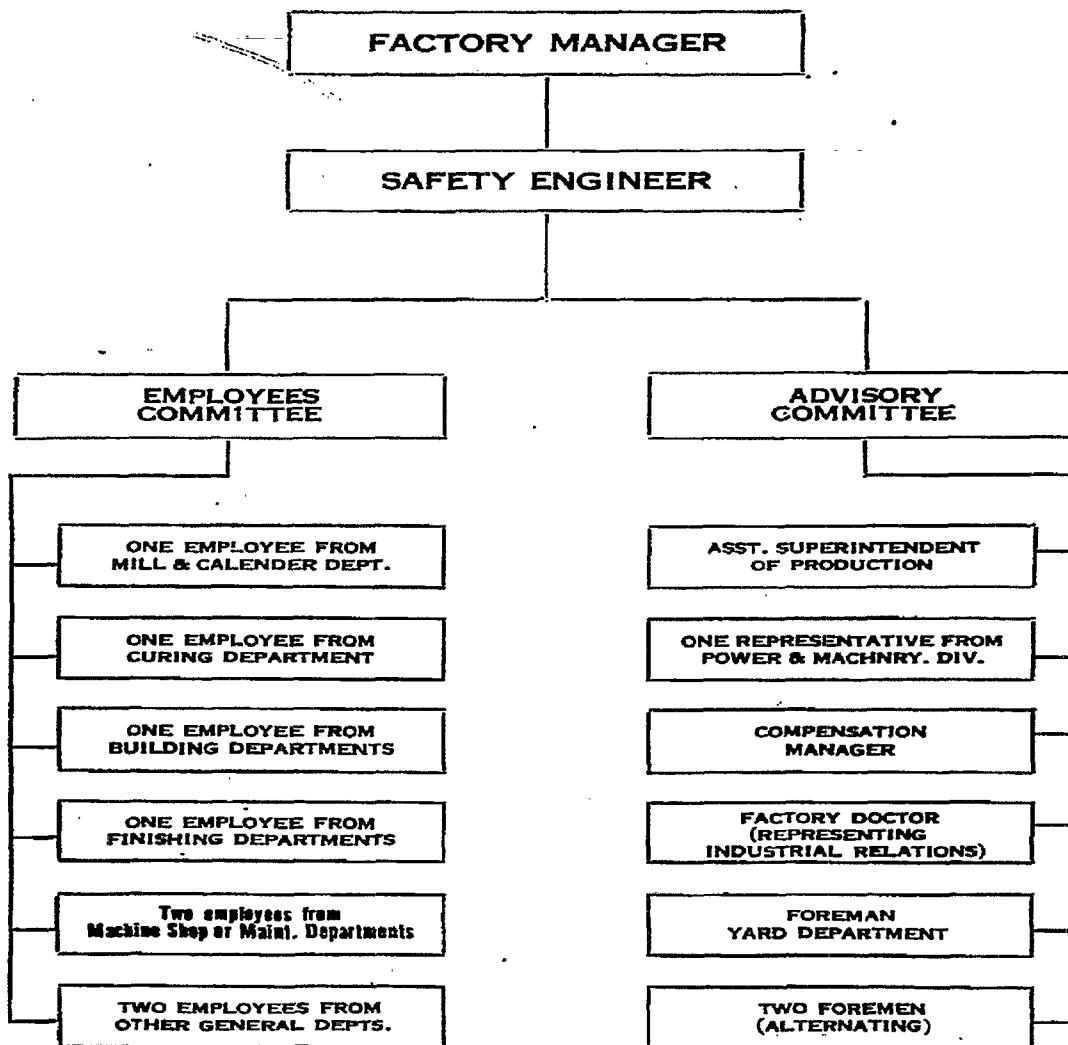
The organizing and composition of a safety committee necessarily depends largely on the size of the plant and it is certain that the number of employees that should comprise a committee is a matter of a question and one that will have to be thrashed out by time and experience. The selection of members for the employees' committee is left to the individual foremen who are cautioned by their division superintendents to use tact in selecting suitable employees.

Each foreman, after selecting his man, instructs him to go to the office of the safety department at a given time. There the safety engineer explains to him that he was chosen because of the confidence his foreman had in him and that he is being asked to serve, without compensation, possibly three or four hours of his time, after he has finished his day's work, for the general welfare of his fellow workmen, himself and the management. By educating the foremen to select the right type of men none of the chosen employees will be reluctant about serving a few hours of their own time, possibly once a year.

Badges or buttons should be provided members of both committees, partly to show their authority when they have occasion to question a man or to make suggestions as to his methods of doing work, and partly for their educational value, in keeping the existence of the safety organization always before the eyes of the workers.

I have copies of a suggested chart of authority for a rubber plant safety organization which may be of interest and I believe that as outlined it is feasible and not any too elaborate for opening the road to a permanent rubber plant safety organization.

PROPOSED CHART OF AUTHORITY FOR A RUBBER PLANT SAFETY ORGANIZATION



ADOPTED AND SUGGESTED BY MORGAN & WRIGHT
AT THE 11TH ANNUAL SAFETY CONGRESS
DETROIT, MICHIGAN - 1922

DISCUSSION

MR. W. L. SCHNEIDER: Mr. Keating suggests that committeemen should be paid for their time. In my opinion that is important, because if you have a group of committeemen in a large organization, such as ours, it would mean a considerable loss of money to them, because the men selected are usually high-priced men.

MR. HOENER: I would like to ask if the Morgan & Wright Company maintains a suggestion board system as a branch of their safety work organization? A great many of our safety suggestions come through means of such a board.

MR. KEATING: We have suggestion boxes distributed throughout the entire plant in the most conspicuous places and we average 25 suggestions a week.

Every time we have an accident I send each man a follow-up letter entitled, "Throw Out the Lifeline!" and ask for suggestions. It has brought good results.

MR. D. P. KENNEDY (Asst. Safety Engineer, Pittsburgh Plate Glass Co.): I do not understand the nature of the letter. Is the letter sent to the injured man or is it sent to all employees?

MR. KEATING: To the injured man.

MR. KENNEDY: The letter solicits a suggestion?

MR. KEATING: Yes, and calls attention to the fact that we know he had a little cut or something in his eye.

MR. J. A. BOWERMAN: What are the particular advantages of inspecting a plant after instead of during working hours?

MR. KEATING: Practically 95 per cent of the plant is on a piece-work basis and at the present time there is an objection to taking them off production.

MR. BOWERMAN: Your inspection is made while the plant is working? Without putting aside production?

MR. KEATING: Yes.

MR. E. W. BECK: Do you keep in constant touch with your safety committee?

LETTERS OF APPRECIATION ARE WELL RECEIVED

MR. KEATING: We keep constantly in touch with them. We have a list for safety news and everything we get of interest is taken up with them—clippings, a letter of appreciation once in a while of things they suggest. After they have served on a committee a period of two months we send them a letter of appreciation.

MR. BECK: Do you continue to take advantage of the work?

MR. KEATING: Absolutely.

MR. SCHNEIDER: Are these men doing this on their own time?

MR. KEATING: On their own time.

MR. SCHNEIDER: Are they appointed by the management or by a representative committee of employees?

MR. KEATING: The men are picked by the foremen.

MR. SCHNEIDER: Has there been any objection to them spending their own time on safety inspections?

MR. KEATING: No.

MR. SCHNEIDER: How long does it take?

MR. KEATING: The plant is divided; it takes two and a half hours at the most. The average rubber man is keenly interested in what is going on in other departments and a man on the safety committee has the privilege of visiting any part of the plant at any time—he gets an

opportunity to watch all the operations. If he informs me within twenty-four hours of his wish I will take him the next day and introduce him to the foreman of the department who will take care of him and see that he is shown anything he wants to see. It keeps their interest up and I have not yet run across a man on the safety committee who has not wanted to see the other parts of the plant.

MR. SCHNEIDER: I would like to ask if the appointing of committeemen in that way does not take away a certain amount of responsibility from the foremen?

MR. KEATING: We put the responsibility squarely on the shoulders of the foreman as he selects his own men.

MR. SCHNEIDER: I mean the responsibility he should assume over the men in his department.

MR. KEATING: We have an advisory committee. It is our idea to have every foreman serve, in the course of time, on the committee. I cannot agree that it takes responsibility away from the foreman.

MR. SCHNEIDER: Can you get good results by permitting a man on a committee and working in another department to inspect a department that is absolutely foreign to him?

MR. KEATING: Absolutely.

INSPECTION OF ALL DEPARTMENTS BY WORKMEN

MR. SCHNEIDER: I do not see how a man in the tire department can go through a steam or electric plant and find trouble—he might hit a point, by luck, once in a while, but could hardly be expected to make a thorough inspection.

MR. KEATING: I think, if you will do a little experimenting along that line, you will find that you are wrong. As a matter of fact, a man going out into a department other than his own is keenly interested in finding some defect or unsafe operation. Any questions that are asked with which he is unfamiliar I thresh them out with him then and there; in this way we avoid unnecessary reports being made.

MR. SCHNEIDER: That method is, not only an inspection, but an education. You are educating him on safety.

MR. KEATING: We are.

MR. BECK: I have been much interested in learning that Mr. Keating does not lose sight of his safety committeemen. In fact, he has got them all slated for the banquet this week along with the safety organization. The men appreciate a little courtesy and it shows you are not measuring safety work entirely in dollars and cents. They will come to a banquet and get the educational features, the spirit and enthusiasm that always prevails and does not come by any other means, and the foreman's responsibility is not eliminated. From the chart you will see there is a foreman of production, a factory manager and a safety engineer, one employee from the mill and calender department, one from the curing department, one from the building department, one from the finishing department, two from the machine shop or maintenance department, and two from other general departments. There is also an advisory committee, consisting of the assistant superintendent of production, one rep-

representative from the power and machinery division, the compensation manager, the factory doctor (representing industrial relations), the foreman of the yard department and two other foremen, alternating. In my opinion it is a very good scheme. There is a great deal in placing safety on a really scientific or what might be called a business basis. I am very much pleased with the spirit that exists in that plant and I think it is responsible for the good work you have done.

MEN TAKE GREAT INTEREST IN WORK

CHAIRMAN MARTIN: Do you find the committee at all active outside of the time they use for inspection purposes?

MR. KEATING: Very frequently I get a call from the foreman of a department that a representative member of the committee is coming over, and in interviewing him I make a point of getting over there at the lunch period and talking things over. As a consequence I am getting the good will of the men and in that way have obtained suggestions that I did not solicit.

CHAIRMAN MARTIN: What I had in mind was the condition at which we are all trying to arrive—the state of mind of our employees whereby they will use care and prevention work for their own safety while in the plant. We all agree that the recommendations that come in, as a rule, are of a mechanical nature and oftentimes of minor importance. I cannot quite understand just what effect a small group of safety committeemen have on other workmen. By the time you get through with your educational work a lot of men have left and new men have come in. What do they do? Do they talk to the new men?

MR. KEATING: Our foremen or assistant foremen instruct every man that comes into the plant as to our manner of operation. The foreman picks out the men in the department really known as "old timers" and who have leadership; when one of these men is given a button the other men really look up to him, and if he talks safety to them he will get results. As a matter of fact, the men volunteer to go on committees.

MR. SCHNEIDER: How long does it take to put some of these recommendations into execution through the various committees?

PROMPTNESS IN EXECUTING RECOMMENDATIONS IMPORTANT

MR. KEATING: That is a question of vital interest and importance. As soon as a recommendation is put through it is in my hands before the night is over; before the men leave the plant the committeeman writes up his report in my office. I take it to the superintendent, discuss the recommendation, and send copies of the discussion to our plant manager, superintendent and the committee that accompanies me on the tour of inspection. Our superintendent of machinery, or one of his assistants, gives me a detail answer on the recommendation submitted to him, and anything that needs immediate attention is taken up with the plant manager the next day.

MR. BOWERMAN: What method is used to spread the gospel of safety to the workers? In our plant I hold a safety meeting once a month; my assistant production superintendent, in turn, holds meetings with representative of the health and safety department and their foreman and

inspectors, and then, each month, the inspectors have a few minutes' talk with every man in their division on safety. An inspector has from ten to twelve men under him.

Mr. Cook (Worcester): I had an opportunity of witnessing the work of the safety organization of the Federal Rubber Company. Mr. Fitzgerald has in operation a system of workmen's committees very similar to that described by Mr. Keating, but with certain marked variations. I think we ought to hear from Mr. Fitzgerald.

Mr. FITZGERALD: In 1915 we organized our safety service and sanitation department. This committee was composed of the superintendent of production, the mechanical superintendent, two foremen and myself. We called together the foremen of the plant and told them that four times a year thereafter we would call them together in safety session. We outlined our safety work as we were going to put it across—we segregated the factory into six sections and in each we appointed a safety committee of one foreman and two workmen, sent each man a letter saying we were appointing him on a committee and outlining his duties.

We never allow a committee to function without a foreman—the Wisconsin law asks us to have a foreman on each sectional committee. We take the men at random from any department, we do not ask the foremen to pick them. Each man, whether alien or American citizen, is appointed for three months. You would be surprised at the results we obtain.

INSPECTION MADE WEEKLY

Our safety committees have been very successful and our safety work is very active. We inspect every Wednesday at 1 o'clock, the committee going through their departments; we are getting some very good suggestions. When the committee finds anything wrong they report it to the foreman and nine times out of ten, before the suggestions of the committees have been laid upon my desk, the foreman has taken care of the suggestion.

A committeeman is appointed for three months and with his appointment he gets a letter explaining his duties; he gets another letter the second month commending him for his reports, and after he completes his service we send him a third letter thanking him for his services. For the last two or three years we have been awarding watch fobs with "S. S. S." on them. Last year, instead of fobs, we sent pencils. Men who have been on the committee want to serve a second time, as they like the work.

We pay the men when they make inspections; if a committeeman is on piece work he gets his pro rata working time; the department he is working in stands the expense.

APPOINTMENT OF NOMINATING COMMITTEE

CHAIRMAN MARTIN: I will appoint as a Nominating Committee Messrs. E. H. Fitzgerald, John F. Lichtenberg and W. L. Schneider.

The Section then adjourned.

WEDNESDAY MORNING SESSION

C HAIRMAN MARTIN: The first business on our program is a report of the Standardization and Statistic Committee.

STANDARDIZATION AND STATISTICS COMMITTEE

On March 30, 1922, the Chairman of the Standardization and Statistics Committee wrote to the twenty-one members of the Rubber Section and asked that the accident experience for the second six months of 1921 be submitted on the standard accident summary and causes of accidents forms accompanying the letter.

It was the intention of this committee to tabulate the results and furnish each member reporting with a key number and in this way make it an easy matter, by referring to the previous six months' summary, to ascertain just how much better or worse their accident experience had been for the last six months of 1921.

Only nine members were able to furnish sufficient data for the accident summary which I have distributed. These nine members, however, control over forty rubber plants. It might be stated, therefore, that the figures are fairly representative of the industry. The companies which failed to report either lacked sufficient facilities for furnishing the information or were just coming out from under the recent depression and were feeling their way until such time as they might be able to resurrect their safety organizations.

The accident experience for the last half of 1921 was not as good as for the first half of that year, *i. e.*, the severity rate (days lost per thousand hours worked) jumped from 0.655 to 1.15, or practically double; the total days lost showing an increase from 23,258 to 54,764. Likewise, the frequency rate was increased by practically three more lost-time accidents for every million hours worked.

Let us for a moment consider the big increase in the severity rate. You will note that two of the rubber companies reporting were extremely unfortunate in the last half of 1921, in that they experienced three fatalities, against a record of one for the first half of that year. On this basis, if we were to disregard the two extra fatalities which occurred, and which account for 12,000 days lost, we find that the severity rate for the industry would have been nearer 0.90, which is almost 50 per cent greater than that of the previous six months. To the layman it would appear that the rubber industry did not fare as well during the last half of 1921 as it did during the first half. The fact that the figures for the last half were compiled only after a considerable amount of digging on the part of the companies reporting would indicate that the safety organizations were still in a disrupted state during this period and the fact that they were not functioning properly, it seems, helped to a great extent to cause this increase in the severity rate and is an excellent point in favor of 100 per cent safety activity.

CAUSES OF ACCIDENTS

While nine companies gave us sufficient data to compile the accident summary, less than half that number were able to furnish sufficient mate-

rial for the causes of accidents forms, for reasons already mentioned. I am, therefore, not in a position to give you a list of the causes of accidents from July 1 to Dec. 31, 1921, in as complete a manner as did your previous Chairman, inasmuch as the grand total would not agree with the totals of columns 3 and 4 of the summary.

From the lost-time and no-lost-time cases reported I can give you the percentage of the total. They are as follows, and are compared with the first half of 1921:

	First 6 Months, 1921 Per cent	Second 6 Months, 1921 Per cent
Handling tires and material.....	31.0	21.4
Hand tools and accessories.....	30.0	27.0
Machine accidents.....	10.0	9.0
Eye accidents.....	7.2	16.1
Wire cuts, scratches, nails.....	7.0	11.4
Burns.....	4.7	4.3
Falls.....	2.0	2.2
Miscellaneous.....	8.1	8.4

Handling tools and accessories, tires and other materials still continue to account for nearly 50 per cent of all accidents—you will note that both periods coincide in this particular. Probably the greatest offenders, under the tools and accessories classification, are knives and shears. It is in the perpetual pounding of the safety idea and the educating of the employees in the safe way of handling small tools that we can expect a reduction of this type of accident.

One outstanding point that this tabulation brings forward is the increase in eye accidents. You will note that this cause has been increased by over 100 per cent. It might be well for the new committee to circularize the industry and ascertain the cause for this extraordinary increase. I know that all of you will be interested in receiving a report of such an investigation.

CONCLUSIONS

Not too much importance should be placed on "cause" figures, however, inasmuch as they do not indicate where the *serious accidents* are occurring. I do not believe that we can urge too strongly the need for more exact figures, particularly as regards lost-time cases.

Another suggestion I would like to offer is that the Chairman of this committee should have with him, at the annual Congress, figures covering the previous year and not just a six-months period. In other words, we should have with us now the figures covering not only the last six months of 1921 but also the first half of 1922. If everyone of the rubber members had co-operated in getting their reports in promptly this could have been accomplished. As a matter of fact, only two companies have given us figures covering the first half of this year.

I would recommend that a *greater number of members* be urged to compile figures and submit them to the Chairman of this committee. There is no reason why our reports should not cover at least twenty or thirty members. We want to be able to say that the rubber industry is *not* a

hazardous one, as many have been inclined to believe, and we cannot make this statement unless we are able to show statistics covering the experience of a greater number of manufacturers. Incidentally, in our correspondence with various members, they have manifested a considerable amount of interest, and a little more sales argument will, I am sure, bring in more of the desired information.

I wish to thank the members for the co-operation they have given the committee in this work and as time goes on, and improvements are made in the method of collecting and distributing our accident statistics, I am confident we will be able to say, without hesitation, that rubber goods manufacturing is one of the safest, if not the safest, of all industries. Respectfully submitted,

ERNEST W. BECK, Secretary.
Chairman, Central Safety Committee, United
States Rubber Company, New York.

DISCUSSION

CHAIRMAN MARTIN: Two years ago a great deal of time and effort was expended by your first Statistical Committee and out of their work came the forms presented by Mr. Beck. They are slightly complicated, but in complying with these forms we are keeping our statistics on the same basis.

It is of value for Goodyear to compare with Goodrich, and for Goodrich to compare with United States Rubber. Local conditions should be taken into consideration, but we are all dealing in the same thing and getting somewhere. It is too bad some of our members have not taken the work seriously. We have thirty members in this Section and only nine have gotten their figures together. The standardization of statistics for our industry is very important and should be given immediate attention.

Our next speaker will be Dr. W. S. Ash.

AIMS AND IDEALS OF THE PLANT PHYSICIAN

DR. W. S. ASH, UNITED STATES RUBBER COMPANY, MORGAN & WRIGHT PLANT,
DETROIT, MICH.

Right near our meeting place, according to the *Free Press*, this morning an accident took place and a man was killed. If you read the details you will see that it was preventable. It is not enough that we boost safety in public—we must take it home with us.

The work of the doctor is inseparably connected with safety. I do not mean the mere mechanical act of opening up a finger—it reaches much further than that. Safety goes into the community, into the home. You do not complete your work by bandaging a finger; that is of minor importance to what we can do; prescribing a few pills for some trifling ailment is of little importance. When it comes to teaching safety the doctor furnishes one of the few personal contact points between the management and the worker.

Workmen too often view the factory doctor as a personal representative of that indeterminable something he knows only as "the company," and the doctor, if he is tactful, diplomatic and patient can do a lot toward ironing out the difficulties which arise between employer and employee from time to time.

SAFETY A CONDITION, NOT A THEORY

In the matter of ideals I do not know that we mean very much. An ideal is "a mental conception regarded as the standard of perfection"; our ideals can only be mere ideals. A man once declared that "he was confronted by a condition, not a theory." The factory doctor is not confronted by theories but by actual conditions, so we can picture the factory physician and the work he does. We will have to set our objectives a little ahead of what we hope to attain and then strive to attain them.

Dealing with the human equation, as the doctor does, there can be only one standard of work—the test, "to make this industrial world a better place in which to work and live."

How shall we group the aims of the factory doctor? I believe, broadly speaking, we can do it in three classifications: First of all, a partial physical examination of applicants for work. These examinations will weed out the misfits who apply for positions for which they are not fitted, yet at the same time give them a chance if they have remedial defects. I do not think we should say, flatly, to such a man that we have no place for him merely because of that defect; if he can remedy it we can find him a job.

After a man is in the organization some think we should provide the treatment to be accorded him, but I think the next thing to do is to co-operate with the management or the safety engineer in the prevention or elimination of hazards. By that I do not mean merely the placing of mechanical safeguards, but anything for mutual benefit—anything that goes to lessen the hazards of injury or sickness. We are dealing with the human equation and all are prone to fall from grace. The third proposition is to provide proper surgical and medical attention for our men.

DOCTOR CAN HELP SECURE CO-OPERATION OF MEN

This opens a wide field for discussion; how far do you want to go with physical examinations, what is to be the nature of that examination, why you should reject men and what kind of safety measures you wish to effect. If I had to answer how we should accomplish all these things I would say "by co-operation." From the watchman at the gate to the president of your establishment and the rank and file in the shops, all must work together; beyond that, you have to reach the agencies of the different clubs and lodges, your health and police departments and other outside factors.

You also have to work with the outside physician—in some instances he has been a most insistent and persistent knocker, but he is getting over it; he is beginning to realize that factory doctors are pretty decent, sometimes. We are getting along better than formerly.

The doctor demands the respect of the people with whom he works; if this is given him it soon leads to confidence, and soon you open up another big field because it furnishes the foundation upon which rests that intimate relationship which exists between doctor and patient. A doctor will never secure the confidence of his men by riding rough shod over them—he must treat them like human beings and show them every reasonable consideration. If he is a decent fellow the factory doctor almost becomes a father confessor to his men and they look to him for advice.

HANDLING MEN FOR PHYSICAL EXAMINATION

A word about physical examinations. We believe in them and are particularly fortunate in our arrangements to carry them out expeditiously. Our employment office works in harmony with the doctor and the doctor with the employment office. The carrying out of examinations depends, to a great extent, upon the subject. The entrance to the employment office is from the street and the applicant for work avoids running the gauntlet of a lot of watchmen and employees. If the applicant is hired he goes to the doctor's office, where, in one of a series of booths, he prepares for a physical examination. Some men object to disrobing because they have been to other shops where half a dozen men are herded into a room for examination. I do not blame them. We save time by having them entirely disrobe and the man is examined and is back in his booth before he fully realizes it. How far you should go with the examination entirely depends upon the subject. It is on the same order as to fit the man to the job and I think we do that within reasonable limits.

There is a wide variation in physical examinations, but we feel there is a marked value in having them. If done properly, and with proper co-operation between the doctor and the employment office, there is a maximum value to the shop and minimum friction among the men.

If you can get him to understand that you are taking an interest in him and explain why you are doing it you have him set, his mental attitude is right, and it is just as easy to do this as to make a sorehead out of him. If you get him sore before he starts to work there will be the devil to pay when he gets in and you cannot get away from it.

CLEANLINESS OF OFFICE IMPRESSES WORKMEN

You are all familiar with the location and equipment of the doctor's office. The office should be accessible—it does not make any difference whether it is in the middle or corner of the plant—and the equipment should be such as is necessary. Nothing is gained by having a lot of ornamental cases and bottles around. I do not believe the average employee is interested in a beautiful looking doctor's office as much as he is in one that is clean and manned by an efficient personnel—if you have too many cases and bottles around he thinks it is a good place to stay away from.

As to personnel, that opens up another field. Some establishments put in doctors and others first-aid men. It does not make much difference as long as you put in people that are satisfactory. Their model should be cleanliness—in their quarters, their person and in equipment. Do that

and you will have no trouble in getting the men to come to the factory doctor. One way to judge cleanliness is by the number of infections; do not have a man on the job that does not know what infections are. I have known beautiful places that had a lot of infections and mere shacks to come through with zero.

Our quarters were originally intended for temporary use only, but business conditions were such that we did not get new ones; we have been there three years, but our infection rate is very low. In fact, injuries that are treated within an hour of happening show zero. Infections have occurred in cases where injuries were neglected by the individual, but these we do not feel we should be blamed for.

The old-time industrial doctor was, presumably, a good company man, and as long as he did what he could in keeping his company out of law-suits he was considered as being all right. He was supposed to do as little as possible for as much as he could get; probably that was what handicapped industrial medicine in the past, but it has gone through an evolutionary movement like every other industrial activity. A number of men now engaged in industrial medicine are regarded as top notchers—they are men whose word is accepted by the country at large. They are called into consultations with accident boards and bodies of that kind, which they were fighting five years ago, but with whom they now work in harmony.

WHOLE-TIME WORKERS SECURE BEST RESULTS

In the practice of medicine I am in favor of the man giving his entire time to the work. I do not believe a man can practice private and industrial medicine at the same time. In some of the larger establishments one man will devote his time to a certain thing and one to another, and smaller establishments are grasping the same idea. Half a dozen establishments will employ a group of physicians to take their work and in the end the shop is benefited by it and the workers also. I think hospital service will soon be on the same basis.

In Detroit we are particularly fortunate in having a hospital that does nothing but industrial work. The staff consists of men who are acknowledged to be leaders in their lines and the work they do is excellent. They are acquainted with the work done in the various factories and they are in a position to intelligently advise the man when to get back to work. It is unfortunate that outside physicians tell the man not to go back, that he is getting mutual benefits and to stay off for a while. The factory doctor and the doctors in the hospital are experts at individual work and can advise him when to go back. They do not tell him to go back before it is safe.

They accomplish a three-fold object; they get the man back earning money for himself, they relieve the company of paying needless compensation and they assist in maintaining production, because they get the experienced man on the job instead of having a man there from the utility department.

You all know the lukewarm safety advocates in the shop. It is not only the men, there is the foreman who says: "If I send every man that

gets a scratch to the doctor they would have a path worn to his door." They also object to the man going on account of sickness. They say: "I know when this bird is sick and when that bird is sick." In a lot of instances I think they do know their men a lot better than we do, but we do not believe in any hard and fast rule in determining when a man should go home. Some plants say that when a man's temperature is 100 he should go home. With ninety-nine and four-fifths the man would have to stay. Some people with a temperature of 102 would be all right to stay on the job, but there are others who, at 98, would be better off at home. Again, confidence and co-operation are factors, and we are trying, at our plant, to make them feel that they have our confidence and respect. It is easy enough to find the four-flushers—there is where your card index is of service. You can soon find out from it that this man or that man comes to the doctor frequently, and those are the ones who need a heart-to-heart talk.

You all know the employee who is always ready with the chew of tobacco to slap onto the cut or has a toothpick to take something out of an eye and the chap with the pocket knife who says: "Sure. I can take the splinter out of your hand."

THE AVERAGE WORKER IS A GROWN-UP CHILD

It is up to you, and up to me as a factory doctor, to get after these fellows and show them the error of their ways. Lots of times, unfortunately, there has to be a severe result before you can bring their acts home to them—you cannot get away from the fact that average workers are merely grown-up children. We can put a lot of posters on the wall, but it is an impersonal appeal. Let a friend get hurt, you can bring that right home to the man in the plant.

Sometimes you do not give the doctor credit for being the discriminator on safety matters he actually is. He is there right when an accident happens and can point out to the workers the lessons taught by happenings of that kind—they must witness an accident to bring the hazards home to them. I do not believe in bawling a man out at that time; even the simplest cut or bruise is attended with a certain amount of shock and stirs the mental equilibrium, but, possibly, in a few hours, or next day, you can bring it home to that fellow.

The safety man should not be too much in evidence right at the time an accident happens, but after you have got the man back to thinking, and on a normal basis mentally, you can drive these things home to him. Personal example accomplishes a lot more than posters, but I would not abolish posters. The more you stick under the noses of your workers the better it is, but you cannot get away from personal contact.

The doctor, in addition, has an opportunity to consult with the management and the safety engineer, and no matter how good a safety man you are you cannot be in two places at once—and cannot have eyes that see everything. "There is no use locking the door after the horse is stolen," but I believe someone said "There are a lot more horses in the stable" and it is your duty to protect them. It is not a violation of ethics for the doctor to bring the cause of an accident to the attention of

the safety engineer, neither is it to bring his services to the attention of the safety committee. Let him attend the foremen's meetings, the men's meetings, the meetings of the mutual benefit society—anything to keep him before the men, to let them know who he is. It is not the desire of the factory doctor to be in on anything, but it is necessary to the carrying out of his business, because it is his duty to work with the safety engineer.

DISCUSSION

CHAIRMAN MARTIN: We are indebted to Dr. Ash for a very interesting talk.

We are fortunate, as in previous years, and generally through the courtesy of the United States Rubber Company, in having with us another busy man, whose chief duties are not those pertaining to safety. We are always glad to see an executive who is able and willing to appear before a gathering such as this and give us his slant on subjects with which we may not be thoroughly familiar. We know how we would like to have factory managers feel and we know how we think they feel. We will now hear from Mr. Myron H. Clark.

MANAGEMENT AND SAFETY

MYRON H. CLARK, GENERAL MANAGER, FOOTWEAR AND MISCELLANEOUS FACTORIES, UNITED STATES RUBBER COMPANY.

The mere fact of your presence at this meeting is a convincing indication that there is no doubt in your minds regarding the merits of safety work. It may not, however, be amiss for me to mention a few of the chief reasons why I personally am so thoroughly convinced of its value.

To begin with, the work, if properly followed out, reacts favorably on the employee, the employer and the community. This matter of safety is one of the big points of contact where employee and employer can meet on common ground with benefits accruing to both from their co-operation.

A safety program, adequately followed through, will unquestionably create greater contentment and efficiency in a working force as a result (1) of the greater confidence which it enables them to repose in the physical conditions surrounding them and (2) the more careful training given in the correct methods to be used and incorrect practices to be guarded against in the handling of machinery and equipment and in personal conduct. Good safety work results in fewer and less severe accidents and, consequently, there will be less lost time per employee and fewer losses in individual earnings.

Over and above the humanitarian or ethical necessity of the work, from a managerial point of view, it absolutely pays in dollars and cents through decreased insurance and compensation costs, decreased turnover and absenteeism, decreased instruction expenses and increased production from a working force maintained at a higher level of efficiency.

DISBURSEMENTS TO EMPLOYEES DECREASED

I have a chart here illustrating the accident experience of a group of employees, with which I am familiar, during the period from Decem-

ber, 1915, to December, 1920. You will note that while there was a sharp increase in the number of employees during this time—from a little over 11,000 in 1915 to over 21,000 in December, 1920—the number of accidents also increased during the period—the sharpest increase coming after November or December, 1918. At the same time, in spite of the increase in the number of accidents, the dollars disbursed per 1,000 employees decreased. This is the more remarkable because this decrease came at a time when compensation rates were increased in every state represented by the factories in this group. This showing is remarkable also in view of the fact that the increase in the working force meant taking on new and untrained workers, a circumstance which would be expected to effect a decided increase in the number of lost-time accidents.

The increase in the number of accidents, beginning at the end of 1918, dates from the time a full-time safety supervisor was employed, and without a doubt represents an increase in the number of minor accidents reported and not at all an increase in the actual frequency and severity rates of lost-time accidents. A particular drive was made at this time to have all accidents, no matter how slight, reported, with the idea that prompt attention to minor accidents would prevent the loss of time and compensation payments in the long run. These figures indicate an actual and material reduction of lost-time accidents as a result of safety work.

Industrial accidents are poor business, both socially and financially. Waste of time, material and life—suffering and inefficiency—follow in their wake. They cause disorganization and delay. To both management and employee they are a danger and a source of irritation. Management can ill afford not to do everything within its power to discourage accidents and take every means to prevent them.

HOW TO ACCOMPLISH OUR ENDS IN SAFETY WORK

There is no getting around the fact that safety is not a "one-man" job. It is everyone's business, with the responsibility shared by employee and employer. By the nature of things, however, it is necessary for the management to assume the initiative in planning and execution.

With a definite realization on the part of the management of the value of safety work, and its place in the organization, comes also the realization that in order to carry on the work the foremen and rank and file of employees must also be "sold" on safety. The responsibility for the actual carrying out of the safety program may be roughly divided into three sections:

- (1) That falling to management lies in the making of conditions, mechanical and structural, safe. This involves a program of technical study and mechanical installation, safety education of those representing the management (notably foremen) and of workers and, in a plant of any size, the creation of a definite safety department to follow through the work. This would mean willingness on the part of the management to spend an amount consistent with the return that is expected, in order to keep the plant in proper condition physically, and to maintain a proper safety organization.

(2) The attitude of the foreman is of paramount importance. He is the man who is directly in touch with the workers and the one who can probably do the most to sell safety to them, whether they are new employees or old-timers. It is often his duty to instruct new or transferred workers and in doing so he can, and should not neglect to, give warnings regarding hazards of the job and surroundings, and the clearest possible instructions as to the approved and safe methods of work and conduct.

(3) The worker's responsibility as an individual lies in an appreciation of the significance of accidents to himself and to his fellows. As a member of a safety committee, it may also become his duty to assist the management in detecting and eliminating unsafe methods and equipment. His interest may, perhaps, be stimulated by inviting suggestions or by personal contact with the management.

ORGANIZATION

Good intentions are all very well, but it is difficult, and in a large plant practically impossible, to carry them out without the organization or "machinery" specifically designated to do so. The problem, having become one of method rather than intention, so far as management is concerned, is progressive in its difficulties and requires unremittent and concentrated effort in its solution.

It has been said by Messrs. Tead and Metcalf that "Accidents may be due to mechanical, physiological or psychological causes. The mechanical deficiencies are obviously, to a large extent, remediable. Unguarded machinery, dangerous elevators, slippery floors, obstructed passageways, overspeeded fly wheels and all the other familiar causes for which the worker is not in any way to blame, have their cure readily at hand for the plant which will apply it.

"The physiological causes underlying accidents are due to long hours of work, an unhealthy working environment, inadequate lighting or ventilation and tasks that are monotonous or arduous. The manner in which a worker handles himself or performs his duties is profoundly influenced by his bodily condition. A man who suffers from overstrain and worry, or from excessive fatigue, is not a safe person in the neighborhood of any accident hazard.

"The psychological causes of accidents are ignorance, inexperience, carelessness, recklessness, lack of plant discipline and supervision."

That there are so many distinct and really diverse phases of safety work argues the desirability in large factories—of, say, over a thousand employees—of the creation of a special department in the plant to carry on the work. For this reason the executive head of the plant should be in very close contact with the head of the safety department by having such man either report to him direct or to some responsible executive who will see that the work is "put over" instead of, as sometimes is the case, having the work attached to some other department, such as the industrial relations manager or the works engineer. The functions and viewpoints of both these departments, as well as the functions and viewpoints of the planning and production departments, definitely overlap.

as regards safety work. For this reason and because the factory manager who is responsible for operations and production is also ultimately responsible for the safety of the workmen, the safety superintendent or supervisor should have an organization that would assure that due emphasis and consideration would be given to all phases of the work.

EDUCATIONAL AS WELL AS TECHNICAL WORK MUST BE PUSHED

If, for example, the safety man is made responsible to the industrial relations manager, there is a possibility that while the educational and humanitarian phases of the work will be pushed to the utmost, those bordering on the technical and cost end of the work, where engineering training is positively essential, may not work out to equal advantage to either employee or employer. On the other hand, the engineering viewpoint—if reputation serves it correctly—is apt to be rather cold-blooded and while placing safety work under the jurisdiction of the engineering department may mean the mechanical aspects of the job will be efficiently handled, it may also mean that the psychological and physiological aspects, which equal the mechanical in importance, will be overlooked or neglected. The “answer” in large factories seems to lie in the creation of a safety department with a head, reporting to the executive in charge of the plant, who is capable of tying together and properly weighing the work of these other departments insofar as their work bears on safety or accident-preventive lines of activity. In smaller factories the factory manager or one of the semi-executives should be “sold” on the idea and positively be directly responsible.

With adequate safety devices, and safety engineering backed up by management, the question remaining is largely one of safety education—the personal element. And, without minimizing the work which it can do on inspection and the making of safety suggestions of a more technical aspect, it is in this “personal” or educational phase that a safety committee of workers can do the most, and an invaluable, work. Many plants now have factory councils or works committees, which include safety committee of workers, with duties of inspection, suggestion and investigation to fix the blame for accidents and the promulgation of all safety work within the plant. Committees of this kind can do much to help the foremen and safety workers along the line of instruction and enforcement of safety rules and regulations.

RECORDS

One of the first things necessary in safety work is the standardization of statistics, if the statistics are to be worth anything. Unless we have standard “records” we cannot draw comparisons within the factory or in “competition” with other factories. The only reliable basis of comparison so far discovered is a severity and frequency rating. It is advisable to draw up a standard procedure. A manual showing the standard forms and formulas should be very explicit, so that all points are definitely understood by all those who use it. The standardization of formulas by the United States Department of Labor (statistics) and the National Safety Council is much to be commended; making possible comparisons between different periods for the same plant, between the same

period for different plants and between outside companies. This provides a good basis for carrying out the competitive idea. It tells us where and how our accidents are occurring and gives a basis for preventive work.

RATING AND COSTS

The figures made available by the above records should be used to develop ratings for departments and plants. This rating should show the frequency and severity of accidents and, if possible, should be definitely tied up with cost to the department or plant, and these figures should be submitted to foremen and the proper works committee. This cost should be included on the departmental and plant cost sheets as a definite part of overhead. This will place safety as a permanent fixture on the sole basis of dollars and cents.

VITAL POINTS IN ANY COMPLETE SAFETY PROGRAM

1. *Inspection of Mechanical Hazards:* It is a responsibility of the safety engineer that equipment shall be in safe condition, and herein most particularly lies the necessity for co-operation on mechanical matters between the safety and engineering departments. It is only fair to say that much of the work done to make conditions and machinery safe could be done to greater advantage if considered sooner * * * when study and planning is given to the conditions that are to surround the operations * * * than after the work is done and lack of protection discovered as a result of inspection or an accident.

2. *Educational:* As mentioned before, it is particularly the educational phase which brings out the necessity for co-operation with the industrial relations or personnel department on general material. A large amount of publicity can be given to safety work through the use of bulletins, factory papers, etc. In addition, periodic accident drives, timed when records show the peaks occur, will help decrease the accident totals.

The safety engineer should keep the foremen of the several departments in his plant advised periodically of the accident experience of their respective departments, showing days lost; also letting them know the frequency and severity rate. He should keep them advised as to the nature and causes of injuries, so that instruction may be given or physical improvements made.

It is desirable to get away—in educational work—from generalities such as "Safety First," "Make Our Plant the Safest in the City," etc., and get down to specific cases. Appeal must be made to the individual and the individual can only be aroused by making him realize, specifically, what *might* happen to *him* and what *he* can do.

Just because a safety man has good ideas on safety and realizes the importance of safety education, he does not necessarily know how to put education across. We call in the engineer on safety devices and the educational or publicity expert's co-operation should be enlisted on educational work.

There is a great danger of safety work—bulletins, factory paper articles, etc.—becoming stereotyped. We should never be content with

all the paraphernalia we have, but we should be continually testing the old methods and originating new ones. How many safety men really know if their bulletins are read? Novelty and continuous change is the life of all safety education.

FIRE DRILLS, SANITATION AND PHYSICAL EXAMINATIONS

3. *Fire Protection:* All employees should regularly be put through fire-exit drills. Employees must be educated in the use of the proper fire protective equipment in the plant. Employee fire brigades function in almost every plant * * * in fact they are one of the oldest phases of safety work as it exists today.

4. *Sanitation:* It scarcely seems that it can be necessary to emphasize the importance of regular inspection and proper care of toilet facilities, drinking fountains, shower baths, etc., but there are still many plants where the sanitary facilities are, to say the least, *not* sanitary. Carelessness in this respect leads to many evils—the spread of contagious diseases and infections and to weakened organization and morale.

5. *Importance of Physical Examination in Relation to Safety:* There is a big opportunity for preventive accident work in placing the employee on the right job. Physical examinations of prospective (or old) employees will indicate tendencies to hernia, poor eyesight, poor hearing or other weaknesses which may lead directly to accidents, through no fault other than disability, if the individual afflicted is allowed to undertake the wrong kind of work. In rarer cases, physical examination will indicate that such-and-such an individual may be an actual menace to the health of the working force.

6. *Compensation:* Matters of compensation and cost figures as safety work should be handled by the safety engineer inasmuch as they are an accurate index to the results which are being obtained from the program which is being carried out. The handling of compensation cases again illustrates the need of the co-operation of the industrial relations department.

7. *Safety Committee:* The need for organizing this committee has already been touched upon. We would emphasize the importance of feeding to this committee instructive and constructive material (in order to keep alive their full interest and keep them well-informed), in addition to the following matters which should be in regular routine:

1. General check on all conditions affecting safety and sanitation.
2. Regular inspection of plant by at least a portion of the committee.
3. Use of committee as an investigating committee in the case of serious accidents.

This should:

1. Bring out all details of accident.
2. Place responsibility for accident.
3. Take steps possible for a recurrence (preventive).
4. Generally educate the employees on committee.

MODERN INDUSTRY IS SOLD ON SAFETY

Such a committee constitutes a "court of inquiry" without the distastefulness which has, not without reason, attached itself to that name.

Safety work should not be at all "highbrow." The more practical and less intricate its workings are the more effective it can operate. The more definite and emphatic the instructions are made the more readily will they be understood, respected and followed. From our own experience I can recommend emphasizing and backing up safety work to the extent that in the written discharge and layoff policy, under which we operate, we specifically state that after due warning and investigation employees may be suspended for any one of some twelve or fifteen offences, all of which have direct bearing on safety.

I wish to repeat what I have said before * * * that safety work pays dividends not only in dollars and cents but in many intangible ways, in addition to the purely humanitarian reasons for its existence which alone would justify it. Industry today is manifesting its belief in safety by adopting safety programs and maintaining safety organizations. These are being justified by the benefits which industry is receiving in return.

With the increasing complications of modern life, and especially of modern automatic industry, safety work or accident prevention becomes of progressively greater importance. We look hopefully to the future that we may be able to call the rubber industry the safest industry in the country. In conclusion: It is definitely up to those of us in the Rubber Section, as safety engineers and as managers, to make ours the safest industry and the only way we can do this is by eternal vigilance on the part of all.

DISCUSSION

MR. MORSE (Goodyear): Yesterday a paper was read by Mr. Keating of the Morgan & Wright plant. There was some disagreement with Mr. Keating at the time and I found, after the meeting, there was even more disagreement. I have no bias on the matter of safety committees. The Goodyear Company have not installed them and the Morgan & Wright system seems to be rather elaborate. From the point of the management, I would like to get your opinion as to the practical working value of that system.

MR. CLARK: I am not personally familiar, in detail, with the Morgan & Wright plan you are speaking of. In the plan we follow we agree on fundamentals, in the details considerable discretion is left to the local plant.

MR. KEATING: The footwear division, undoubtedly, operates on a different basis. I would like to ask Mr. Morse just what the disagreement was.

MR. MORSE: My impression was that the chief value of the committees was an educational one; that it was not, possibly, suggestions or improvements in technical devices, the elimination of hazards; but educational purposes, along the line of prevention of accidents from carelessness. If that is the chief value of your committee how far can you go with committees in educating large factories, say, ten or fifteen thousand employees? The committees change, as I understand, every three months, and it seems to me a long drawn-out proposition to try to edu-

cate all the individuals in the factory by any such committee system. I am interested in a discussion to see whether or not it is a practical proposition.

DEPARTMENTS PROFIT BY MIXED INSPECTIONS

MR. KEATING: I believe that was brought out yesterday by another member. The foreman is asked by his divisional superintendent to select the employees to represent the department on the workmen's committees, and I think I said yesterday that the foreman selects the leaders of the various departments—the men what we call the "old-timers," the men really looked up to by their fellow workmen. These workmen have a badge of authority. Our experience is that the men in the departments have made it a point to go to their representatives and offer suggestions and they, in turn, confer with the safety department. It is surprising to see the support and co-operation among the members of the various departments given their representatives. I think experience will teach you so by testing it—putting the system in vogue—that you will, to a large extent, gain what you are after—educational work every day.

MR. MYRON H. CLARK: I was not here yesterday and I did not know what Mr. Morse was driving at. I would like to say that at our plant, so far as employees are concerned, the representative committee form of work is considerably different from that at Morgan & Wright's. We have gone even further than they have; instead of appointing a committee we have simply made one of the committees a working committee or factory council, under which we operate, and, consequently, what you might call a safety committee is actually elected by the employees.

We feel that a shop committee or factory council election should be by secret ballot; that organization can be used very nicely and is the ideal one for safety work.

Whether you have a large or a small committee, how long it serves and all that, I think a good deal depends on the nature of the industry and particular plant, the type of its people, the type of foremen and a good many other things, but the most important thing in a large plant is the need of committees. If I have not made it clear, possibly Mr. Hewitt, who is familiar with the details of our work and who has been at other association meetings, will be able to answer more explicitly.

MR. HEWITT: Mr. Clark has pointed out in his paper the definite points we have outlined as being the essential ones which our committee functions under. We believe that educating our employees is one of the important functions of the work. In addition, we carry on regular monthly inspection by a part of the safety committee. Our safety committees are composed of both employees and representatives of the management—industrial relations manager. The investigation we have made of our worst accident cases indicates that our plan is working out very well. As Mr. Clark suggested, it has all the benefits of a court of inquiry and the placing the blame for the accident, getting down to the bottom of things so we can take preventive measures.

SYSTEM NOT A COMPLICATED ONE

MR. SCHOTT (Morgan & Wright): I feel from what I have observed at our plant that the system is not nearly as elaborate and difficult to undertake as a person would be led to believe. It is simply a question affecting the psychology of the workman, by appointing a few men from the different departments as safety representatives and getting their advice on the work. It is like a snow ball rolling down hill, it accumulates energy as it goes along and the men, seeing workers of their own class and type delegated to act as their representatives, all seem to take an interest. The effect on the men is remarkable. The plan is very simple, because there is really nothing to it but the appointment of the men and the delegation of authority to come down at any time they see fit and talk with Mr. Keating; also Mr. Keating's authority to hold meetings with them. There is nothing to be afraid of in the system. Our management hesitated for a time, but they have absolutely no fear now and are convinced from results that it is an entirely safe and workable proposition. There is very little effort expended in comparison with the results obtained.

MR. BECK: By referring to the blueprint which Mr. Keating distributed yesterday you will see that the committee is composed of employees and executives. The makeup of the safety committee is very much in harmony with this; in fact, it may be this very same lay-out. You have an advisory committee and executives and the employees' committee. The men are appointed in many plants, so you see the general trend is very much the same.

MR. HEWITT: There is one essential point: By the nature of our industry we only work one shift and, realizing the desirability of making inspections while the plant is in operation, we pay our employees for time spent on inspection work. That differs, I believe, from other plans.

MR. E. A. HOENER (Firestone Tire and Rubber Co., Akron, O.): One of the big points under discussion is the advisability of having men from one department make inspections in other departments, where they are not familiar in any way with the work. It is the same as a tire finisher going into the calender room and offering safety methods. It seems to me that suggestions made along that line would not carry much weight with the calender-room organization. Mr. Keating mentioned that he accompanied the committee through the factory and straightened out suggestions, but that is the feature I wish to call attention to and which, I think, is objectionable from a partial viewpoint.

WORKERS USUALLY WANT PAY FOR INSPECTION WORK

It seems to be human for the modern workman not to want to do very much for the company unless he is getting paid for it; in other words, the men are usually filled with the idea that we are making them stay and not giving them anything for it; that we have even found it necessary in our various recreation activities and in the training of our orchestra, to allow the workmen time off during their regular working period. That may be an extreme condition, but I really feel it is necessary to pay the workman while making inspection tours.

MR. KEATING: I disagree with that view. I do not think it is a good thing to put a premium on a man's services for a few hours devoted to humanitarianism. We have a baseball team and a basketball team and have gained laurels by winning championships in the State of Michigan for the last three years, but none of our men have been paid for the time they devoted to practice or playing on the field. I disagree that a premium should be paid for devoting a few hours' time, possibly once a year. I think my paper brought out the fact that the time lost would not exceed five hours.

MR. MYRON H. CLARK: I would like to say a word on making inspections of departments with which the men are not familiar. I am on the other side from the previous speaker on that, because I think that is one of the strong reasons why you should have a committee made up in that way. It is essential that on a committee there should be at least one or two who are not familiar with the department they are inspecting. In going along our regular paths we get so accustomed to things that we do not see them and we get a new point of view if someone from another department goes to see things. I know it took a man from another department to fix a guard on a calender that had not been seen for a good many years. It is essential, if you want to get the most out of a committee, to have representatives on it from other departments. For example, here in Detroit—in a factory I am not familiar with—I saw a number of things I would call "bad hazards," simply because I was not accustomed to the work.

A number of years ago when I had an opportunity of taking visitors through our plant I received a good many ideas from people who knew nothing about the industry. I remember one case where I got some excellent suggestions from a group of women school teachers.

IDEAS COME FROM OUTSIDE INSPECTIONS

MISS SMITH (Wisconsin): Sometimes a person who is entirely unfamiliar with conditions sees things that people who are constantly working on machinery have overlooked. I work with the safety engineer and go into a great number of factories—I think into every factory in the State of Wisconsin—supervising the work of women and minors. I have to look at their jobs and machines and, sometimes, I see things the men have not noticed. I do not claim I can always remedy the condition, but I call it to their attention. A good many of our women inspectors have the same problem and we find that we can help. When working in the safety department—in a textile mill and also in a paper box factory—I found that by going into other factories I would receive good ideas for my own work. Safety committeemen are very helpful in offering suggestions on things they are not familiar with in their ordinary work.

CHAIRMAN MARTIN: The whole subject is one that is very difficult for all to agree upon. There are good arguments for and against. Workmen's committees in accident prevention work are all right if properly used, but a great many of their suggestions and reports have no real value. My point is that if they are educational they are good and we should have them.

Our programs have been laid out with the idea of getting three or four angles; we have heard from the physician and the factory manager, we will now have a paper dealing with production by Mr. J. A. Bowerman.

PRODUCTION WITH SAFETY

J. A. BOWERMAN, ASSISTANT GENERAL PRODUCTION SUPERINTENDENT, FISK RUBBER COMPANY, CHICOPEE FALLS, MASS.

Production without due regard for the safety of those who are producing is a criminal waste and should be punishable by law. The injured employee and the employer always lose whenever an accident occurs. The only winners are the undertakers, doctors and insurance companies, and the few dollars gained by them because of someone's misfortune come from the dear public, who pay for accidents through higher retail prices. The conservation of human life through the prevention of accidents is just as important as production, sales or dividends and has a decided effect on each. Recognition of this fact will have a marked bearing on production costs.

The factory manager in one of the large rubber companies recently caused the following message to be distributed to all employees: "As factory manager I feel a personal responsibility for the safety of every plant employee and would not knowingly ask anyone to undertake any work involving the danger of personal injury or loss of life. Whenever production is increasing and new employees are being added to the force even greater than normal effort must be made in connection with safety work. Our aim is safe production—that is Safety First—combined with quality and quantity; within many plants production means get out the goods and possibly give little attention to safety."

This sentiment proves that the factory manager in question was well fortified with human sympathy and appreciative of the terrible losses resulting from accidents to employer and employee; in addition, he is a good manager from a business viewpoint.

The factory manager, responsible as he is for the conduct of business in the factory, must overcome all obstacles and run his plant economically and efficiently—he must be able to deliver the goods. His attitude toward safety of employees is reflected throughout the entire organization, providing his organization is efficient. As we well know, his production department is his largest unit. There are many other departments which aid production, none of which would be needed for any other purpose.

SUCCESSFUL PRODUCTION MANAGER MUST PRACTICE SAFETY

The production superintendent primarily is engaged in supervising production. He is expected to produce to capacity, as a general rule, quality goods at minimum cost. Too frequently production supervisors have been lukewarm on the subject of accident prevention, only because they had become so absorbed in producing that they had failed to appreciate the true meaning of accident prevention work. Such men are shuffling around on their jobs and have no place in modern industry. A popular impression exists that the production man is "hard boiled,"

thinks only of production and has very little use for the safety movement. This is probably true in some plants and certainly has been true in many in the past.

The production superintendent must appreciate that he cannot produce at minimum cost unless accidents are reduced. There never was a time in the rubber industry when it was more necessary to keep costs down than at present; realizing this fact, he will not allow accidents to occur if he can possibly avoid them. Workmen's Compensation Laws in effect in practically every State in the Union have done much to awaken the employer to a full appreciation of his responsibilities.

Can you imagine a plant in our industry, a few years ago, not conversant with the merits of accident-prevention work? Men were hired with no effort to place them at work for which they were fitted. The foreman usually selected his own help and the only test of fitness was appearance. Men with hernias and bad hearts were placed at work requiring exertion which they could not stand with safety and men with poor vision were frequently asked to work where the best vision was necessary. In the entire plant, probably, not a belt, gear or other mechanical hazard was guarded; poor ventilation existing in many spots and little or no attention was paid to proper lighting facilities or conveniences for cleanliness. The employee was merely a thing to be worked to the limit of his capacity and, if he died on the job—get another and try to kill him! This is not an exaggeration but a statement of facts. Accidents were common in those days. The awakening came in some sources from the more humanitarian employer through love for his fellow man; in other cases, when he learned the effect on his production costs, and the compensation laws had much to do with his education.

Once the management appreciates the needless expenditure because of high insurance rates caused by bad experience, even though there is no human sympathy apparent, something will be done to change conditions. The usual procedure is to safeguard the plant mechanically, give more careful attention to the placement of men, and make an attempt to educate all within the organization, from the factory manager down, to avoid accidents because of the terrible waste.

EMPLOYER IS NOT HARD-HEARTED INDIVIDUAL

Today we find physical examinations at the time of employment, conducted for the purpose of placing men at work for which they are physically fit. We find the employer providing suitable washrooms, adequate toilets, clothes lockers, good light, proper ventilation, careful regulation of temperature; in fact, doing everything possible to maintain a healthy and contented working force. In the event sickness or accident does occur he has supplied hospital facilities where the sick or injured employee may receive immediate treatment by competent doctors and nurses, thus preventing many serious infections and much loss of time. As a general rule, the employer furnishes better medical attention, either through machinery established at the plant or specialists suggested, than the employee would be likely to obtain if left to his own resources. There is a further disposition to assist the man by making it possible for him

to return to some light work several weeks before he is able to return to his old job after a severe illness or accident and, further, to see that he gets the compensation to which he is entitled promptly and in full. All of this is being done by the employer because he recognizes that it is good business.

I believe we have come to appreciate that our human machinery is the most valuable asset we have. Without it we do not need machines and we have no need for a sales department. In fact, there are no white-collar jobs unless the men with the overalls are producing.

There is, perhaps, no ground where there is greater mutual interest between employer and employee than is offered by the work of accident prevention. To the employee, accidents mean loss of wages, possible crippling for life, reduction of earning power, maybe death; to the employer, loss of production, expense of breaking in new men, spoiled goods and higher insurance rates. Even though accidents are not of a serious nature they are expensive because they must be treated and a great deal of time is lost in having small cuts and scratches properly cared for.

Industry was the first to recognize that many accidents were preventable and approximately twelve years ago the first steps were taken by industry to prevent accidents. Much has been accomplished. Almost unbelievable reductions have been made by many concerns who have engaged in accident prevention work. Early in the war against accidents it was discovered that mechanical safeguarding, although desirable and necessary, was wholly inadequate to alone handle the job of reducing accidents. It is true that the accidents prevented were probably of a serious nature.

MAJORITY OF ACCIDENTS CAUSED BY HUMAN ERRORS

It was learned that the majority of accidents were caused by human errors, thoughtlessness, carelessness, and that the only way in which these accidents might be eliminated was by bringing about a condition in the minds of the workmen which would cause them to be more careful. Some people refer to it as "education," others as "selling safety." We will all agree that it is a difficult task to either educate or sell the safety habit to the average employee. Perhaps he is past the educating point. He is in the plant for one purpose; that is, to earn money to support his family, and the more money he is able to earn the better he likes his job. It is a difficult thing to get this individual to take the subject of accident prevention seriously.

It has become, during the past few months, more clearly recognized that industry is not responsible for all of the accidents. With the increasing number of automobiles on the highways there is a terrible toll of lives annually and the list of fatalities because of accidents outside of industry is appalling. Thousands of children are killed every year. More strict legislation is being brought about in an attempt to reduce accidents on the highways. The mind of the child in the public school is being so developed, without additional courses, that when he grows to manhood

he has a more thorough conception of how to avoid injury than the average workman of today.

A great deal of stress is being placed upon the education of the public to avoid accidents. Accident prevention in the factory today is only a part of the general campaign against accidents. The school child of today is the worker of tomorrow and much will have been accomplished when the applicant for work has already received some safety education and it is not left for industry to do it all. It being an accepted fact that accidents must be kept at a minimum, it becomes the proper function of supervisors in the production department to accept accident prevention work as a part of the job.

The attitude of the factory manager tells the story—if he has the proper conception of the value of a safe factory his spirit will permeate the entire organization. The production superintendent, aided by his influence, creates a safe atmosphere through his subordinates to the men on the job. To gain the best results, the work of preventing accidents must be carried out in a systematic way. The assistant superintendents, general foremen, foremen and inspectors must accept the moral responsibility for the safety of employees. If there are any members of the production supervisory force who do not team in they should be shown the way in or the way out. We must have no half-hearted efforts. The bulk of the work will fall upon the foremen and inspectors. It is up to each supervisor to so mould the minds of his men that they will practice safety because they want to and not because they have to.

STUDY CAUSES AND PROVIDE REMEDIES

The production supervisors should be called together at least monthly, oftener if necessary, by the superintendent for the purpose of discussing accident records, study of causes and to take whatever steps seem necessary to cut down accidents. These conferences have the effect of keeping up interest and the thorough knowledge of conditions brought out permits the men to deal more intelligently with the conditions or people who are causing the accidents.

The safety department can be of considerable assistance to the production men by furnishing statistics which will further increase their understanding of the causes of accidents. Through the bulletin boards the safety department reaches the employee, also through the plant publication with information relative to general conditions, also specific instances peculiar to the industry. Further good may be accomplished by other forms of publicity, all of which is intended to awaken the workmen to avoid injury. The safety man and hospital attendants can further assist by talking to the individual who has been injured, and as a rule he becomes a booster after he has learned his lesson.

The foreman must see that the new employee is thoroughly instructed relative to the dangers connected with his job and advised of what to do and how to do it. The foreman's knowledge of accidents which have occurred in the past within his department places him in a position to do this intelligently. The new man should be cautioned about his clothing, cautioned against wearing loose sleeves, flowing ties and finger rings

about machinery. His work may require goggles or gloves, perhaps some special kind of clothing. In this case the foreman should see that he is supplied. He should be cautioned against the practice of neglecting minor injuries. The foreman must study his men and win them over as best he can. Sometimes it requires tact, sometimes it requires an accident. Whatever it requires, he must overcome the obstacles and make safety boosters out of his working force.

There is probably no subject that supervisor and employee can discuss which is less interesting to the employee, providing he has never had a severe accident, than the subject of safety. All of us seem to feel that we are immune—we are too wise to get hurt—it is always the other fellow who is going to be severely injured. It is unfortunate that more people don't take the subject seriously. It is true that under the workmen's compensation laws the man receives some money after a waiting period of several days, but in no case does he receive as much as he would had he remained on the job. It is not necessary to dwell on the other disagreeable features connected with accidents—they are many indeed.

FOREMAN HAS TASK OF EDUCATING MEN

The foreman should converse freely with his men relative to the accident hazards of the department, accepting any meritorious suggestions advanced which will tend to reduce accidents and make the necessary corrections. He must have the backing of the management and corrections must be made at once or the workman will feel that the company is unwilling to do its share. He will find that, no matter how thoroughly his machines are guarded, he will continue to have accidents. He must keep safe production constantly on his mind and remove every known accident hazard.

In the rubber industry there are several well-known accident hazards—the mill and calender rolls offer perhaps the greatest opportunity for crushed hands. These machines should be equipped with modern safety devices and the men made to understand the danger and possible result of being caught in the rolls.

Knives and shears are used extensively in many departments. Employees must learn to use them properly and, further, to care for them properly when not in use. Many cuts may be avoided by the exercise of a little care. Heavy equipment such as molds and cores are common accident hazards through improper handling—too much haste and “butter-fingers” resulting in fractured bones.

Bad strains and sprains often occur from handling heavy objects. Many times this could be avoided by use of chain falls. Burns are not uncommon in some departments—due to methods used in manufacture. Silvers and scratches and foreign bodies in the eye are more or less common, but not serious if promptly cared for by a competent person. There are many other causes, such as slipping on stairs, on the level, falling from ladders, striking against objects or between objects and so on.

The foreman must insist on careful handling of equipment. It is the outstanding cause of injuries in our industry. He must insist on immediate treatment for all injuries and the necessary redressings until all

possible chance for serious consequences have disappeared. Whenever an accident occurs it should be carefully investigated at once by the foreman and reported to the proper parties. The injured person should be given the best possible treatment by competent doctors and nurses. No stone should be left unturned to guard against a repetition of any accident.

ACCIDENT RECORD SHOWS ABILITY OF FOREMAN

The accident record of any foreman indicates whether or not he is filling his position satisfactorily. If his accident record is poor the chances are his other work is all below par. The production superintendent should scan the records carefully and bring pressure wherever needed and not fail to compliment where it is deserved.

If the work of preventing accidents is carried on by the production supervisors as seriously as they aim to produce, because they believe in it, not because they have to in order to hold their jobs, the results are always worth while. If only a half-hearted, hit-or-miss plan is in vogue, accidents will continue with frequency and severity to cripple the working force, destroy the morale and increase costs both to the employee and employer. This unnecessary waste must cease and I believe it is up to each one of us to redouble our efforts to make the rubber industry safe.

REPORT OF COMMITTEE ON HAZARDS

CHAIRMAN MARTIN: Mr. Horan will report for the Committee on Hazards.

MR. HORAN: At last year's meeting a request was made of the Committee on Hazards in the Rubber Industry to formulate a report for the use of safety men and plant physicians in determining the chemistry of the material that is used.

Quite a number of safety men are not familiar, we will say, with the chemistry of aniline or of carbon disulphide, of carbon tetrachloride, hexamethylene tetramine or what not, but there should be some man or some place where the safety engineer and the plant physician could learn as much of the chemistry of the substance as he would need to know. Something of the dangers and just where the dangers were—whether it was danger from vapor, from dust, or otherwise. Then the symptoms, the measures of relief and the methods of prevention. We have taken up quite a lot of the compounds—anilines, antimony, benzene, benzol, etc.

We took up carbon disulphide and we have quoted from Dr. E. R. Hayhurst—the differential between carbon bisulphide and other poisonous substances known to the rubber trade. I think that is the best part of the report; first, because I did not write it; secondly, it describes the confusion with the multiplicity of poisons used in the rubber industry. We have taken up carbon tetrachloride and hexamethylene tetramine, that is your ordinary "hexa," and also known as hexamethylenamine, aminoform, urotropin, cystamin and cystogen, "lead," para-nitrosodimethylaniline, para-phenylene-diamine; sulphur chloride and thiocarbonyl chloride.

We have taken up each one of these—a little bit on the chemistry, something on the dangers, something on the symptoms, methods of relief and prevention.

If you have any question to ask on any of the particular materials I will be glad to answer them.

DISCUSSION

MR. COFFEY: In looking over your report I notice you give different grades of benzol and it seems they were based on different elements of impurity. Is it possible to get pure benzol?

MR. HORAN: That was the old theory, if you could get the pure benzol and get rid of toluene, xylene and its homologues and other unknown hydrocarbons, which were present in the substances, you might be able to get a material that would not be poisonous. Then we got pure benzol and we think we killed more people with it than we did with the other material, because of the fact it is a light substance and evaporates quite rapidly.

If you can get a cement made of pure benzol you can begin putting the fabric on before you are half through—that is, one man can put the benzol cement on and another man can be putting on the fabric, but because of the fact that it evaporates so quickly it is more dangerous than, say, 50 per cent benzol. Fifty per cent benzol would weigh more, per gallon, than pure benzol, and for that reason would not volatilize so rapidly and you would not get so much of it in the air.

I think on benzol one of the tests is your boiling point. The boiling point of pure benzol is about $80\frac{1}{2}$ degrees, centigrade; if you have a benzol that boils at 100 you have something that is not as dangerous as that which boils at 80 degrees, centigrade. Pure benzol is 80 degree, but in the other compounds the temperature is much higher. I do not say it is an absolute fact, but from experiences in the rubber industry by using impure benzol you lessen the danger, because of the fact that you get less of it into the air.

In relative order, as to desirability, your solvent naphtha would come first; you would have 50 per cent benzol next; then 90 per cent benzol, then pure benzol, but pure benzol apparently is more dangerous than any of the other compounds. Does that answer your question?

MR. COFFEY: Yes, thank you.

MR. CHING (United States Rubber Company): I was wondering to what extent the Rubber Section had considered the advisability of having some of the representatives of the larger rubber machinery manufacturing companies attend our meeting. My idea is that it might be advantageous to the Rubber Section to have some of the representatives of the large rubber machinery manufacturing companies present when Mr. Bowerman of the Fisk Rubber Company speaks of calender and other accidents which are attributable to machinery. It would be advisable to have, by invitation, some of the representatives present to hear the discussion.

CHAIRMAN MARTIN: The point is well taken and the officers for the ensuing year will undoubtedly consider it.

We are now ready for the report of the Nominating Committee.

REPORT OF NOMINATING COMMITTEE

CHAIRMAN OF NOMINATING COMMITTEE: The Nominating Committee suggests the following officers:

Chairman, E. W. Beck, United States Rubber Company.

Vice-President, A. L. Wilson, Kelly-Springfield Tire Company.

Secretary, A. M. Patridge, Fisk Rubber Company.

(On motion the recommendations of the committee were concurred in.)

CHAIRMAN MARTIN: It gives me great pleasure to introduce to you one of the finest fellows I ever met. I have had a very happy year with Mr. Beck. He has been of great assistance, is an untiring worker, and his heart and soul are tied up in this work. I am sure you will have an active year and when you again gather together you will be delighted with having chosen him as Chairman of the Section.

MR. BECK (assuming the chair): I take pleasure in appointing the Chairmen of the following committees: Mr. Graff of the Goodyear Company, Chairman of the Bulletin Committee; A. L. Viles of the Rubber Association, Chairman of the Program Committee; Mr. Hewitt of the United States Rubber Company, Chairman of the Membership Committee; Mr. Mitchell of the Goodrich Company, Chairman of the Engineering Committee; Mr. Underhill of the United States Rubber Company, Chairman of the Publicity Committee; Mr. Horan of the Hood Rubber Company, Chairman of the Health Hazard Committee; Mr. Lane of the United States Rubber Company, Chairman of the Standardization and Statistics Committee, and Mr. Schneider of the Goodrich Company, Chairman of the Safe Practices Committee.

The Section then adjourned.

Steam Railroad Section

August 29 and 30, 1922

ISAIAH HALE, Chairman

Safety Superintendent, Atchison, Topeka & Santa Fe Railroad, Topeka,
Kansas.

ARTHUR RIDGWAY, Vice Chairman

Safety Officer, Denver & Rio Grande Western Railroad Co., Denver, Colo.

A. V. ROHWEDER, Secretary

Supervisor of Safety, Duluth, Missabe & Northern Railroad, Duluth,
Minn.

TUESDAY MORNING SESSION

CHAIRMAN RIDGWAY: Our Chairman, Mr. Hale, cannot be present, but he has prepared a short address. It will be my privilege to read it for him.

REPORT OF CHAIRMAN

"It has never been my privilege to make history and it has never been my privilege to study much of that which has been made, but I recall that somewhere it is recorded that the Spartans of old—calling them Spartans for lack of a more definite and accurate designation—never buried a soldier whose body was found on the battlefield with his death wound in his back. It is only in hopes of being accorded a decent burial, officially, that I trespass on your time to the extent of offering a word of explanation as to why my back is offered as the only target in what may appear as an effort to make my get-away. A full year ago I made plans for the last part of August and first part of September, and inasmuch as such plans were dovetailed with plans laid down by several others I have been unable to bring myself to believe that the presence of the Chairman of the Section is of an importance which would justify the inconvenience thereby caused to others. It looks, however, at this writing as though all my plans will go into the discard and that it shall be impracticable for me to leave our property.

"It is most unfortunate that this Congress should be called at a time when all railroad safety men feel the urge of their presence on their own property and that conditions forced upon us may have contributed towards a smaller attendance than would have obtained under

normal conditions, yet the afterglow that has followed the storms of yesterday give promise of a brighter tomorrow. I do not often dally with the Muses but this jingle comes into my mind at the moment:

The inner side of every cloud
Is ever bright and shining,
I'll therefore turn my clouds about
And always wear them inside out.
To show the silver lining.

"The personal injury record of train and road service, reflected by the Interstate Commerce Commission reports on train and train service casualties on Class 1 railroads during the six years 1916-1921 inclusive, is such that our task of enlisting the interest and co-operation of men in all road and yard service will be made the easier and the degree of success enhanced beyond our fondest hopes of a few months ago.

"On the other hand, the new men who have come into our mechanical department in the receptive state of mind characteristic of new men and, under the guidance of the loyal, intelligent men who remained in service, will be found eager for knowledge as to how the better and more quickly to fit into their new surroundings and acceptably fill whatever niche in which they find themselves. Safety work today is of such a quasi-public character that I feel it would be short-sightedness were we to sit idly by and watch, much less permit, the disintegration of this Section, because there have been and will continue to be safety campaigns directed almost entirely at the general public, as for instance, the 'Careful Crossing' campaign now nearing the close of its triumphant four-months' march across the continent, the success or failure of which can with reasonable accuracy be forecast by the help we have a right to expect—and having the right to expect, get—from the National Safety Council. Paraphrasing Elbert Hubbard's 'I am today what I am because I was yesterday what I was,' I might say that safety in American industry is today what it is because the National Safety Council was what it was yesterday.

"Some railroad managements found in the formation of the Safety Section, American Railway Association, too strong an argument why they no longer saw or felt the need of the Steam Railroad Section of the National Safety Council and either summarily withdrew or allowed their memberships to lapse. I am advised by Mr. Cameron, under date of the 9th inst., that the present membership in the Steam Railroad Section is eighty-three, a loss of nineteen since the last Annual Congress at Boston, in spite of every thinkable effort to hold the membership at its top figure, even if we might not increase it. I feel that every railroad safety officer is entitled to regard the loss of every membership in this Section as a personal loss and, therefore, be willing to use his influence to not only renew the membership of his own road but that he be as willing to use his influence to hold other lines true to the course which we have been following for a number of years.

"I shall be with you in spirit and hope much may be accomplished by you for the good of us all."

TRAIN AND TRAIN SERVICE ACCIDENTS

Switchmen or Helpers

Year	Average Number in Service	Number		No. Per 1,000 Men Employed	
		Killed	Injured	Killed	Injured
1921	44,642	169	6,711	3.79	150.33
1920	54,383	363	11,606	6.67	214.52
1919	49,303	235	8,296	4.77	168.27
1918	53,790	397	10,472	7.38	194.68
1917	48,451	401	12,004	8.28	247.76
1916	40,175	341	12,209	8.49	303.90

Freight Brakemen and Flagmen

Year	Average Number in Service	Number		No. Per 1,000 Men Employed	
		Killed	Injured	Killed	Injured
1921	56,625	186	7,012	3.28	123.83
1920	68,140	396	11,439	5.81	167.87
1919	61,989	310	8,829	5.00	142.43
1918	69,048	527	11,938	7.63	172.89
1917	67,818	478	13,094	7.05	193.08
1916	63,285	432	13,115	6.83	207.24

Engine Foremen

Year	Average Number in Service	Number		No. Per 1,000 Men Employed	
		Killed	Injured	Killed	Injured
1921	17,675	39	1,094	2.21	61.90
1920	21,940	67	1,607	3.05	73.25
1919	19,325	50	1,249	2.59	64.63
1918	20,823	73	1,440	3.51	69.15
1917	18,703	78	1,815	4.17	97.04
1916	15,362	71	1,993	4.62	129.74

Freight Conductors

Year	Average Number in Service	Number		No. Per 1,000 Men Employed	
		Killed	Injured	Killed	Injured
1921	22,600	48	1,921	2.12	85.00
1920	27,590	62	2,093	2.25	97.61
1919	25,181	63	2,253	2.50	89.47
1918	27,679	104	2,832	3.76	102.32
1917	27,152	88	3,090	3.24	114.14
1916	25,130	72	3,051	2.83	119.98

SECRETARY'S REPORT

SECRETARY ROHWEDER: The Secretary has nothing but a regular formal report in the form of the news letter which has gone out periodically. (On motion the report of the Secretary was accepted.)

APPOINTMENT OF NOMINATING COMMITTEE

CHAIRMAN RIDGWAY: I don't know of any better precedent or custom in this Section in the matter of a Nominating Committee than to appoint thereto the last four or five next preceding past Chairmen. Mr. Carrow, Mr. Scott, Mr. Dow and Mr. Richards. I regret to say that Mr. Bell has left the Section. I will ask Mr. Carrow to act as Chairman.

CHAIRMAN RIDGWAY: Without further announcement I want to present Mr. Fred Meyers.

SAFETY FROM AN OPERATING STANDPOINT

FRED MEYERS, SUPERINTENDENT OF TERMINALS, DETROIT, MICH.

Accident prevention, from the standpoint of the operating department, is a very broad subject and the superintendent and his organization wield a most important influence in the education of employees in safe methods and practices and correction of unsafe conditions. We are actively and sincerely following the plan put out by the United States Railroad Administration in circular No. 3 in organizing and conducting safety work. We endeavor to impress upon the minds of all of our employees, through every known agency, that we are deeply and sincerely interested in this safety, that we want them to work with that idea in mind, to give us their co-operation.

THE FOREMAN IS A MARKED MAN

We hold the foreman the most important factor in accident prevention. He is the controlling element for the efficiency of his men and correct performance of their duties. Safe methods and safe practices must be given preferred consideration and the foreman must be brought to a realization of his responsibilities, that the safety of his men is more important than the work they perform. He must understand that the human equation is the controlling factor, that the mental attitude of the workmen has most to do in the prevention of accidents, that their training and consistent education is the foundation of our success. The foreman is held as much responsible for correct instructions of safety practices as he is for operating methods. We tell him that we are going to hold him responsible for the safety record in his department and we are getting results.

We have had considerable success in selling the safety idea to our employees, and I say this advisedly because my first year's record at Detroit showed a very remarkable reduction in personal injuries; we came within one of being at the top. I had the pleasure of notifying the superintendent who headed the list that he would have to go some to maintain the pennant for 1922 and if the record had been closed last

night I feel that he would have been as generous in his praise as he was in his good wishes when at the beginning of the year he gave me credit for the success of his organization in helping to organize and educate his employees while acting as safety superintendent.

It is remarkable to what extent an officer can develop, on the part of the employees, a genuine feeling of esteem and loyalty if he will but take just a little time to make the effort; in other words, get close to his men. You experienced safety men know the value of this feeling, it puts heart in safety work, which means fewer injuries and better workmanship. Naturally, on account of the large number of different classes of employees on railroad divisions or terminals, we sometimes find a lack of understanding or indifference of one group of men toward another, due to various conditions and circumstances, and the executive in charge, as well as his subordinates, should be quick to see and correct a condition of this kind; in fact we should at all times be quick to see the value of promoting and maintaining harmonious relations.

We are receiving the heartiest co-operation from all classes of our employees; this is evidenced by results. We seem to be having the largest measure of success with our train and enginemen, and in accounting for that I wish to give credit to the brotherhood chiefs who, at the Eighth Annual Safety Congress in Cleveland in 1919, endorsed the safety movement vigorously, and at their annual conventions adopted resolutions making safety a part of the minutes of their regular meetings. They have also given considerable publicity through their journals and other known agencies. Many other organizations have done as much and perhaps equally as well. The result has proven mutually beneficial in the promotion of the work and in the reduction of accidents.

A number of our shopmen are now out on vacation and as soon as the present conditions are adjusted I feel there will be a splendid opportunity for safety officers to better the safety record in and about the shops, because of the fact that there will possibly be a large number of changes. Our experience has proven that the new man, whether he is new in experience or whether new to the railroad, is more apt to observe and practice a larger degree of safety than most of the old-timers, possibly because he is anxious to make good and he knows that the foreman is watching him from all angles and that any carelessness or indifference is going to result adversely.

I think it profitable to discuss all the facts in connection with any accident at each meeting of the safety committee and to as many employees individually as the safety committee members can reach. I sometimes think we should have a memorial day to discuss every case of serious personal injury occurring to every employee in that particular department. It is obvious to any one who thinks what it would mean to abolish systematic, constructive, educational safety on the railroads and to dispense with safety officers who are charged with the responsibility of promoting this work. Just think of eliminating all of our safety and other special meetings, all forms of bulletins, pamphlets, including picture displays, word-of-mouth, in other words, just let matters drift along. Can you picture the result?

I had the pleasure a few days ago of looking over a ten-year safety record of one of the large trunk lines. It was a splendid record of accident reduction and a very convincing proof of the necessity for consistent and systematic educational work. I think it is of considerable advantage to have a statement of this kind and it should be prepared annually. Why? Because it brings into bold relief, through sheer necessity, the latent power in the stimulated safety effort to create conditions and practices as we would like to have them. It is a splendid tribute to your efforts and a convincing proof of what organized constructive educational effort will produce.

Organization is needed, but in many instances we carry it just a little bit too far; what we need is a revival, a personal sense of obligation; in other words, individual responsibility and a keener conception of "Thou art the man." My philosophy is safety activity on the part of every employee; we demand it, first, last and always. It has been said that "A friend doubles our joys and halves our sorrows." Safety is a real friend, it is intensely human, its study and practice creates an interest and a desire, it gives courage and faith and becomes a living part of every day and every night; it makes the world better and our family and friends happier, it makes us stronger because of our confidence in the belief that what should be done can be done. It reminds me of what our beloved fellow-citizen Edward Guest wrote:

There are thousands to tell you it cannot be done,
There are thousands to prophesy failure,
But just buckle in with a bit of a grin,
Just take off your coat and go to it—
Just start in to sing as you tackle the thing,
That cannot be done, and you'll do it."

DISCUSSION

MR. CARROW: It is all right to sit in an office and preach safety, but it is another matter out on the division or at the terminal and I would like to ask a question: "How can the safety agent be most effective in developing and maintaining the interest of the superintendent?" Recently, on one of our divisions, a little leaflet that they print and give to employees was placed in my hands—a dozen copies or so. I selected a list of people whom I thought would be interested and sent the leaflets with a penciled notation: "To Jones. Please note. T. H. C." Presently, a letter came back from the chief clerk of a division, saying: "I have been puzzled recently as to how I could put safety over without expense. Your little bulletin gave me the answer." I followed this with another little leaflet entitled "The Life Preserver." It contained a number of brief, terse, effective statements, largely taken from analyses made in the general offices.

MR. MEYERS: I shall never forget and I shall always be gratefully appreciative of my opportunity to serve as a safety man. It gave me the opportunity of seeing things I might otherwise have missed. The safety man must be a teacher as well as a salesman and must serve in both capacities when he deals with his superintendent.

AN ACCIDENT THAT WOKE UP THE MEN

Perhaps a brief outline of an accident may be of interest: Our up-track at one point is located on a slight curve and in setting out cars the engineer works on signals given by the switch crew—the cars are spaced a little distance apart. One evening I went down there and met the boys—the man in charge was a splendid fellow, the father of eight children. Within half an hour after he said “Good eve” to me he was caught between the cars—the lever did not work on his side of the car and he tried to cross through and operate it from the opposite side—but the engineer had received his signal to go ahead and the man was caught. He died a few hours later.

The boys were terribly upset and helped me to plan for avoidance of such accidents in the future. Our rule book contained some good rules but we amended and strengthened it to cover just such cases, as far as we could, but the greatest help was the promptness of the lesson we taught within the next day or so.

A certain percentage of safety committeemen will develop into chair warmers unless you put a kick into their work. The executive in charge of a division has all the power necessary to make safety work effective, but he must have whole-hearted co-operation from the men. We are getting this to a surprising extent—why, I have had engineers stop their work for a moment to discuss a safety point which they think should be given immediate attention. Discipline is all right, but an active interest in safety work is what counts.

MR. BENTLEY: Some of our operating officials are always on the job; they are active and full of initiative stunts to compel the safety department and the men to come across for safety—they keep everyone up on his toes and they get splendid results. On the contrary, we have ranking officers in a territory who never initiate anything and their inactivity is reflected in the accident records. The problem of the safety man is to get these men to work, as they will do nothing unless they are told exactly what to do and how to do it. Safety work, to be successful, must be spontaneous and human and not a cut-and-dried affair. It is a big question, this one of reaching officials who lack initiative.

(A motion was made and carried to give a vote of thanks to Mr. Myers for his excellent paper.)

CHAIRMAN RIDGWAY: Our next speaker will be Mr. Charles T. Schermerhorn.

SAFETY AND PUBLICITY

CHARLES T. SCHERMERHORN, THE DETROIT TIMES, DETROIT, MICH.

I want you to know that my presence here is an accident. My profession is that questionable following known as that of a humorist, the conductor of a column of the *Detroit News*, called the “Spotlight.” When one is accused of being a humorist there is only one thing for him to do and that is to come out frankly and admit it. I always do so because I know I am funny—I have been told that I am. It was only a day or two ago that a young lady came in from the reception hall and

said: "A great admirer, who enjoys your column in the paper, would like to meet you." So I went out and shook hands with the man and said to him: "Now, that you have been an admirer in the past, having met me, I suppose you will be an even greater admirer." "Well," he said, "I don't know. Maybe I will, but something tells me I wish I hadn't seen you." I said: "You will admit that I am funny, won't you?" He said: "Yes, you are the funniest thing I ever looked at."

This is the era of stop, look and listen, and perhaps a humorist should be mindful that there are other saving graces. You who have noted the newspaper columns have noticed that we generally hide behind our initials. My own are C. T. S. That is the A B C of column making. Before I congratulate you gentlemen upon your achievements I wish to compliment you upon the excellent taste you displayed in the selection of those who are to talk to you, as exemplified in your original preference for my brother. As an example of safety first that is splendid.

I will not talk about my family, but some of you may have heard my brother; he is one of the best public speakers in the country. That may be a rather broad statement and I will qualify it—he is probably the best speaker in the country with one exception. I am not talking about myself so I will not discuss it any further.

I was called to a meeting the other evening which was held in a church. Many steps led up to the entrance and an old lady stood there. She said: "Pardon me; would you do me a favor?" I said: "Certainly, madam." "Would you kindly help me up these steps?" "Why, certainly," and I assisted her up the steps. When we got to the top she said: "I understand there is to be a speech here tonight." I answered: "Yes, madam." "Have you ever heard the speaker?" "Yes, madam, I am the speaker." She said: "Would you do me one more favor?" "Why, certainly, madam." "Will you kindly help me down the steps?" I was about half way through my address when a man got up and said: "I haven't heard one word you said." Just then a fellow in the front row got up and said: "You haven't missed anything."

SAFETY LIES IN PROPER PUBLICITY

My brother asked me to express his regrets on account of his inability to be with you. I know he would have liked to be here today to discuss safety and publicity. Going to Europe, he has left me to talk to you. He is given more to sailing into a subject than he is to sailing away from it, but I have been wondering whether he is sailing away from it, and if he is not, in fact, sailing toward it. In the ruins of the stricken old countries, I am pretty sure he will find plenty to suggest the dangers that underlie the lack of publicity. The rock upon which civilization tottered, just recently, was that of secret covenants, instruments of ambition, greed and dictatorship for throttling power. Civilization was seeking a general wellbeing and good feeling, but had to grab in the dark for a remedy and got hold of the wrong bottle. The light that might have saved the world was a cannon ball that set it on fire. Some terrible casualty lists brought to us during those terrible four years demonstrate what publicity might have averted for us in time.

Filling my brother's shoes, I feel called upon to deal with the subject as I am pretty sure he would have dealt with it. I feel confident that he would have paraphrased the subject slightly to "safety in publicity." I think he would have pointed out to you the dangers that lurk otherwise than in the yard, at the crossing, or around the bend. He would have talked to you about casualties that take their toll, not only in the loss of legs and arms and broken bones, but of other dangers that incapacitate the individual in society and are just as destructive of efficiency. It has been my good fortune, in thirty years of metropolitan newspaper experience, to have been connected always with newspapers that have stood, like the flagman at the crossing, on guard for means and morals in the safety of the home.

A PAPER THAT FEATURES SAFETY FIRST

It is particularly gratifying, at the present time, to be connected with what I consider the world's greatest newspaper, which, day after day, is floating the banner of Safety First for the thousands of hearthstones that it visits. It is fine to have a part in that work of conservation. The helpful newspaper is the one that spells A B C for the fireside, in that which it continuously prints and admits to its columns, and which does not admit to its columns this growing danger to Safety First; it is hanging the danger signal down the track and trying to teach the young that wild oats are not a breakfast food.

In my own column we try to co-operate with you gentlemen and occasionally sound a word of warning to those who are given to monkeying with the brass works. For a number of years I have been trying to persuade deaf people to walk somewhere else except upon the right of way of railroads. For some time, day after day, continuously I have admonished particularly the reckless drivers of automobiles. Somehow or other a young lady in Detroit got the impression that I was an authority on automobiles. She came down to the office one morning and asked me if I could tell her what was the matter with her Ford. She said: "It has developed a strange sound." Being a Ford driver I was able to help her a little and I said: "Madam, so long as your Ford is developing a strange sound it is all right. Some day if you should happen to be driving along and you find your machine working perfectly and noiselessly, without a sound coming from anywhere, go to a garage as quickly as you can. There will be something wrong with it." Some want Henry Ford for President and some want a Ford. They are sure to give it a fair shake.

The speakers have resorted occasionally to poetry and I want you to forgive me if I recite to you a little of my own verse, some that I like very well—I like it because it is founded on brotherhood. There is no more definite esteem of brotherhood than that which finds you gentlemen co-operating with your heart and hand and talents and abilities in your great work of unselfishness—that of saving brothers and sisters and the little children spoken of here this morning. There were no two brothers fonder of each other than two who lived in my old home town that we used to call the Beach boys. Day by day I saw them going past

my house. After they had been in the Civil War—I don't know whether it was the way they walked down the Shenandoah Valley or may have followed Sherman to the sea—but Jim was always a step or two ahead of Bill. My failing for verse developed in me quite young. I was 16, I believe, when I wrote my first poem. I thought that chaos would follow unless a certain young lady in school read some of my lines. I dedicated to her a poem entitled "I Wonder If She Misses Me," and I read it to my father. He said: "If she does she never should be entrusted with firearms again."

MUST BE A NATION OF STRONG MEN

In my earlier experience in newspaper work I wrote a poem and I took it to my managing editor. I said: "Tell me very frankly what you think of it." He read it, looked up at me and said: "Charley, this poem will be recited after Burns, Tennyson, Longfellow, Lowell and Field. have been forgotten—but not until then."

They were brothers, Bill and Jim, mornin' and night and interim;
Folks said never was and never will, be a pair like Jim and Bill.
Brothers on their way to school, brothers to the swimmin' pool.
Jim a step ahead inclined, Bill a-comin' just behind.
Brothers on the sliding hill, Jim went over, so went Bill.
Brothers with the circus tent, Bill weren't there unless Jim went.
Women fair never got the two apart,
Bill wouldn't consent to Jim, and Jim wouldn't consent to him.
When they heard their country's call, both went in prepared to fall.
Jim put on a suit of blue, nothin' else for Bill would do.
Brothers in that bitter fight, column left or column right.
When at last the war was o'er, home they came as in days of yore.
Lived and died in brotherhood, just like all real brothers should.
Once, just once, was Jim alone.
The reason put on a tombstone on the hill. Later on he said, "Here's Bill;
Jim a step ahead inclined, Bill a-comin' just behind."

Letting Jim go ahead may have been Bill's idea of Safety First, but Jim was willing to lead for Bill. You gentlemen are leading for Bill and all Bills. And that is the responsibility of all of us and of all institutions, and of the newspapers in particular. We want a Nation of strong men. The great force for publicity must remain the newspaper. Safety and publicity, safety against unsafe publicity, safety through publicity and that will help the fourth estate, augment the noble efforts of you men that are certainly and in an inspiring way bearing such an abundance of fruit for humanity and prosperity.

"NO MORE ACCIDENTS—BARRING ACCIDENT"

Before I close I want to tell you that yesterday on my desk there came a newspaper with that well known headline that comes from Texas: "Freight Strikes Katy Flier." Last week I picked up a newspaper in Texas, "Freight Strikes Katy Flier." That will come next Wednesday again. I want to ask you gentlemen when you get home to please speak to the parents of Katy Flier and keep that woman off the track.

Let me hope that the fourth estate will never be found derelict in its responsibility to the cause you represent. Let us have as much optimism as Mr. Charles Close of the United States Steel Corporation who said, in a recent interview, that the day is coming when there will

be no more accidents. That is a rather sanguine view and yet the day may come when there will be no more accidents—barring accident.

CHAIRMAN RIDGWAY: Our next paper will be a very interesting one by Mr. R. M. Little.

EYE INJURIES AND THEIR PREVENTION

R. M. LITTLE, DIRECTOR OF REHABILITATION, NEW YORK STATE DEPARTMENT OF EDUCATION, ALBANY, N. Y.

It has been impressed upon me, again and again, that in the safety group, representing industries and profession, there is a spirit that responds to the idea, to the true, to the good and to the beautiful, and everyone has long since awakened to the importance of conserving the eyes of the workers and to a recognition of the fundamental need of preserving the eyes from danger.

During the World War the first draft revealed a great startling fact, that three times as many of our boys were rejected from military service on account of defective eyesight as for any other one reason. Dr. Deal, the examining oculist of New York City, reported last year that of 100,000 pupils who failed of promotion 50,000 failed because of defective vision—lack of examination and adjustment of proper glasses. A recent examination of 1,500 steel workers in a plant at Pittsburgh showed that there were 500 men with defective vision, and they didn't know it; twenty-five with one eye and they didn't know it—that is, with one eye 80 per cent or more gone as to its vision.

The prevalence of defective vision and the necessity of a more intelligent consideration of the eye, from the point of view of life generally, is apparent, and, of course, it is important from the point of view of safety in industry. Railroads for a long time have been testing the eyes of men in responsible positions and in the operation of trains, especially as to color blindness and so forth, but the medium for a better conservation of eyesight in the shops and in the general work of the railroad may be assumed to be very much as it is in other general and large industries of our country.

The facts are that we have only been making an initial attempt in the solution of the problem, although a tremendous amount of work has been done. The question of goggles has been discussed and dissected and analyzed in almost every way and considerable progress made in developing suitable eye protection, but, upon the whole, we are only at the beginning of solving the question. Does it not follow, as a natural corollary, if half the people have defective vision, that they cannot be as efficient as if they had properly adjusted glasses that would enable them to perform their work in a normal way?

It is undoubtedly true that there is a great deal of spoiled work because of defective vision and a great deal of illness, sickness and fatigue as a result of the same reason. Much of the nervousness and restlessness of our people results from the lack of a universal examination of the eyes and a proper adjustment of glasses. I do not mean to

over-emphasize it, but the eye is the most delicate, sensitive and necessary organ in the human body, from the point of view of economic enterprise and workmanship, just as it is for pleasure and an aesthetic appreciation of life.

A serious injury to the eye is irreparable. We may do something by securing an artificial leg when a man has lost a limb, or furnish him a hook if he has lost a hand, but you cannot furnish a new eye that will enable him to see. If he loses both eyes he is stone blind for the rest of his days, isn't he? Nothing can remedy that great fact. There are 52,000 blind people in America. Is there not a great need for the National Committee for the Prevention of Blindness? There is need for people to have their eyes examined, to consult oculists and have proper adjustment of glasses—it is a great work for organizations like the Eyesight Conservation Council: one that needs to be constantly brought home to the minds of all the people.

You safety men have stressed so much the practical problem of goggle selection and fitting them to the worker that I will not touch upon it, but we are happy that the Bureau of Standards at Washington has worked out an eye code of protection and safeguard and that it is being accepted by the best opticians of the country—they are endeavoring to conform their product to this high governmental standard. After the Bureau of Standards has done its work and after the manufacturer has done his, it comes down to a detail matter in every individual plant and shop and road or industry in the country.

The old method, which I observe at some places, of buying goggles by the box, laying in a supply of 100 or more and putting them on the counter for the workmen to come in and make their own selection, is all wrong, and if industry is to make progress it will come through more personal service in seeing that the worker is really suited in the goggles he must wear for his protection.

We cannot hope to make a great deal of progress until we have passed the commercial point of view and we cannot put goggles and glasses in the hands of laymen and deal with the workers to their satisfaction. We should go to a good oculist every few years to have our eyes thoroughly tested and to an optician to have them adjusted, that we may get normal use of our vision. The worker needs a similar service that he may receive the most benefit, see clearly and do his work effectively without eye strain. Many industries have taken such action.

In the State of Pennsylvania, after the compensation act became effective on Jan. 1, 1916, in the succeeding six years 3,489 eyes were compensated for, insofar as money could do so. Under the act \$4,400,000 was paid; in other words, more money was paid out for the loss of eyes than for all the losses of hands and arms and feet and legs. Let me give you another thought on this subject: In New York, Ohio, Wisconsin and California they have what they call a second-injury fund, created by order of the industrial commission or by an amendment to the compensation act. In substance it provides that if the handicapped person is re-employed in industry, after he has experienced the loss of a hand or foot, an eye or a leg, and he suffers another serious loss of a similar

nature, which under the scheduled law would classify him as a permanent, total liability for compensation purposes, that the element of permanent totality resulting from the second injury shall not be borne by the employer or the insurance carrier, but by the second-injury fund created by the State, which fund is created out of awards resulting from industrial deaths where there are no dependents. The act in New York, when it was first amended, provided that for every industrial death, where there were no dependents, \$100 should be placed in this second-injury fund. More recently the act was amended and the amount increased to \$1,000 for every industrial death when there were no dependents—\$100 for the second-injury fund and \$900 for a rehabilitation and maintenance fund. That has been changed again last year to divide the amount \$500 to one fund and \$500 to the other. In substance, it means to take from the employer the extreme hazard of re-employing one who has experienced a serious functional loss, if he suffers a second, that under the scheduled law he becomes a total liability for the rest of his life.

It is very interesting to watch the operation of the second-injury fund. There has been a great deal of discussion pro and con as to whether a person that has been seriously hurt is apt to be seriously injured a second time; whether the burnt child does stay away from the fire; whether one who has lost an eye, a foot or leg will probably have another serious injury. The amendment to the New York act became effective in 1919 and has been in operation about two and a half years, functioning under the second-injury fund, and sixteen workers have experienced second injuries that made them permanent total liabilities—fourteen out of the sixteen second injuries was the loss of a second eye!

I held an opposite view until I got those facts, because of my experience at Nitro, W. Va., during the development of the great smokeless powder plant there during the winter of 1917-18. At one time we had a body of 19,000 workers, gathered from all over the country, and we had everything that everybody else didn't want. We had men with Bright's disease and men suffering from hernia; at one time we had 289 one-eyed men, but we never had the loss of a second eye. I thought the matter of the loss of a second eye was not a serious thing, that the risk of employing one-eyed men was not very great. Well, it is. The New York figures demonstrate it.

The growth of exposure we do not know—we don't know how many one-eyed men are employed by the industries of New York—we cannot tell by the rate of exposure, but we do know that fourteen of them lost a second eye and are now totally blind. As men in charge of safety, concerned in the conservation of eyesight and the working ability and efficiency of the company, if you employ one-eyed men be sure to place them where they will not lose the other eye. You have no right to put a one-eyed man on an operation particularly hazardous to eyesight.

The Section then adjourned.

WEDNESDAY MORNING SESSION

VICE CHAIRMAN RIDGWAY: We have one with us who is experienced in railroad safety. He is just the kind of a person we like to hear from whom we gain the most benefit, one of our co-operators in railroad safety work, Mr. W. F. Braden.

RELATIVE IMPORTANCE OF SUPERVISION AND PROPAGANDA IN RAILROAD SAFETY WORK

W. F. BRADEN, SAFETY REPRESENTATIVE, BALTIMORE AND OHIO
RAILROAD

In the last decade we have seen frequently the value of propaganda. We all are familiar with the famous, though insidious, propaganda carried on by the German people to dominate the world. We are likewise familiar with the propaganda used by our own government that made the various war loans successful. We are fully cognizant of the results obtained by the propaganda fostered by the National Safety Council in spreading the gospel of safety among employees throughout the Nation. Most recently we have had a striking example of it in the "Careful Crossing" campaign which soon will terminate.

Most of us have witnessed the play "It Pays To Advertise." There the possibilities of propaganda were emphasized. Everywhere we look today, along the city streets, along the country roads, on farms, even in our own homes, we are confronted by some sort of propaganda for this or that product. The sole idea back of it all is so to impress our memory that automatically we will think of a specific brand of good rather than a generic article.

What is the psychology behind all this propaganda?

We know that knowledge is of little value unless it can be made use of. Before it can be utilized it must be so placed in our mind that it can be found quickly—of all the faculties of our mind, memory is the most widely used. There is absolutely no power in knowledge unless it can be applied through memory. Every man can have a good memory if he will train it until it becomes dependable. The average railroad employee will not take the trouble to do this; so safety directors must force it upon him by propaganda.

Nature aids in this forcing process, for of all the senses she has made sight the strongest. Through sight, impressions are recorded on the brain much more quickly than through any of the other senses. Scientists tell us, and we have every right to believe it, that the nerves conveying impressions from the eye to the brain are eighteen times larger than those of any of the other senses performing a similar function. The things that a man sees are remembered most easily.

WHAT YOU SAW WHEN A CHILD

Recall right now some of the events of your earliest youth. Let your memory go back over a span of years, say, to when you were 10 or 12 years old. What picture does your mind conjure up? What flashes to

your memory? Something you *saw* comes before you. You cannot recall a taste or a smell of your early youth. Get an elderly man in a reminiscent mood and listen attentively to the stories he will tell of the days long, long ago. He will invariably begin each reminiscence with "I remember way back when I *saw* so-and-so." Seldom will he tell you of the things he tasted or heard.

Next let us observe the child. The young ones at play will be most interested when they are visualizing something. They will dress themselves fantastically in their parents' old clothes and pretend they are princes or princesses. They can turn a playroom into a palace; they can make of a broken chair a king's throne; a few cakes on a broken dish will be to them an epicurean feast. In adolescent periods we gradually lose this power to visualize because of artificial substitutes. It is a pity our modern life compels this loss of visualization. More of us would be artists and savants.

Impressions on the mind to be remembered, then, must reach the mind through the quickest channel—and that is sight. But not all we see is remembered unless we strengthen the visual impression. This can be done by *exaggeration*, *motion* and *unusual association* of the picture. As to the first, *exaggeration*. If we exaggerate a thing out of normal proportion the mental impression or picture is just as strong and deep as the ration of exaggeration. * * * A mental picture of a horse as tall as this building we are in will remain with us longer than a picture of a horse of normal proportions. The second quality, *motion*, is likewise important. We know we often pass motionless things without their attracting our attention. Put these same things in motion and we will not fail to see them and take mental impressions of them. Advertisers take advantage of this fact and they draw a crowd in front of a show window by merely setting something in motion behind the glass. Halt your automobile at the curb on any street, allow the engine of your machine to run, raise the hood and in a few moments you will have a crowd around you peering down into the moving mechanism. The wide popularity of the cinematograph is due in great part to the love of motion by the public. The third quality, *unusual association*, is best exemplified by our conversation when we meet a friend on the street or when we reach home in the evening. We tell our friend the unusual things that have happened since we last met. We delight in hearing him tell of the unusual things that have happened to him. When we reach home in the evening you will find the children telling you of the odd things that have happened during the day. You, in turn, will be telling of the odd things that you saw and heard downtown.

MAKING LASTING IMPRESSIONS ON THE MIND

The most successful cartoonists, the best commercial advertising artists of today, are the ones who make best use of these three qualities in presenting pictures for use. Without *exaggeration*, *motion* and *unusual association*, Maggie and Jiggs, Mutt and Jeff, and the Skipper of the Toonerville Trolley would never get a laugh from us. These cartoons appeal primarily to our sense of sight and you will find that you can

recall, months after you have seen them, the ones which were most exaggerated, that had the most motion, and which were most unusually associated. The more ludicrous and unnatural the situation, the deeper they impress the mind.

Let us now turn to supervision. The American worker wants novelty; he despises monotony. The average foreman in any plant is the supervising officer who is in direct contact with the men. He is restricted in his ability to present new safety ideas. He does the best he can, but he has not had the training in visualization that is so essential. The management bases his efficiency, in the great majority of cases, upon the ability he and his men have to produce in quantity and quality. For him, then, is it any wonder that he subordinated safety to production? He may have an absorbing desire to produce without casualties and on this basis he talks to his men, but his urgings and warnings soon become monotonous. He can only appeal to the worker's mind through the sense of hearing. It will not be long, with his restricted vocabulary, when his words will fall on absolutely deaf ears.

Since I set out to show the relativity of propaganda and supervision in safety work as I, in my humble judgment view it, it is about time I was arriving at that point. I shall try to put it upon a more sane and understandable basis than did our contemporary, Professor Einstein. Not so many weeks ago this delver into the realms of relativity was threatened with death and was forced to flee from his native haunts when an enraged public sought him. I trust his fate will not be mine. I assure you, though, I shall be hard to catch if I start my flight, for I shall use the Baltimore and Ohio.

"A PICTURE IS WORTH A THOUSAND WORDS"

With some trepidation, then, but in the belief that I have proved my case, I hold that propaganda, relatively, bears to supervision as 1 to 18. Psychological tests have proved that in 100 tests the eye makes a mistake only eighteen times, whereas the ear is mistaken thirty-four times. Hearing is second in strength of all the senses in conveying impressions to the mind. In other words, seeing a thing once is equal to oral repetition eighteen times, so far as memory is concerned. An advertiser of a nationally known product has stated that in making the public remember his goods "a picture is worth a thousand words." I'll wager there's not a man in this room who cannot recall without any difficulty whatever the pictures that made Fisk tires famous, or the Victrola, or Cream of Wheat, or the funny little men of Wrigley's gum.

Before concluding, I will take two hypothetical cases: In the first place let us picture a magnificent new factory built on the latest approved lines. Perfect lighting and ventilating systems. All machinery guarded with the most approved guards. Material ideally placed. Tools in proper condition. No obstruction in any walkway. Place in that shop a group of men who never have had safety propaganda presented to them. Despite all the safeguards, there will be casualties in that shop before the whistle blows for the cessation of the first day's work.

On the other hand, let us take a second factory. There are few guards on the machinery. Material is piled in haphazard fashion and the tools are not all in good condition. Into that same shop send a group of men who for months have been warned of the dangers of carelessness, who have seen pictured the horrors of neglect of safe conduct. It is more than likely that no accident will occur. If the safety propaganda is effectively carried on day in and day out in that same shop no accident ever will occur.

Safety propaganda, to be really effective, must be constant. There must be a kaleidoscopic variety of warnings and pleadings so that the men will not become bored. To my mind this can be accomplished only by propaganda.

VICE CHAIRMAN RIDGWAY: We could not have a greater honor than to have Miss Beard, Supervisor of Safety in the Detroit Public Schools, address us this morning.

THE RAILROAD AND SCHOOL SAFETY WORK

MISS HARRIET E. BEARD, SUPERVISOR OF SAFETY, DETROIT PUBLIC SCHOOLS

I had been doing Red Cross work for the children of Europe and I felt, when I came back, that I wanted a real live subject to work on, so I took up the teaching of safety in our public schools. More than 20,000 American children are killed by accident every year, by one thing or another, and most of these accidents could be prevented.

In beginning my work I received some help from railroad statistics on accidents and a great deal of my inspiration came from railroad safety people. The co-operation found in the safety movement is one of the finest things in the world.

Our work in the Detroit public schools is planned in co-operation with other agencies. For instance, a committee composed of one member of the Automobile Club, one from the traffic squad and similar agencies get together and discuss these matters, then take them up with the committee on safety. The Automobile Club stands back of us, so does the Board of Education, and when we put on a campaign they all get together; our success is largely due to the co-operation we receive from the various groups in Detroit that are interested in safety work.

The most helpful information that we have received has come from a bureau that keeps a report of every accident that happens to a school child—we really know what is going on. Every department under our city administration is active and we receive impartial reports that are of great value—this is especially true of the work of the police department.

BOYS AS TRAFFIC GUIDES AT SCHOOLS

If the principal of a school writes me or calls on the phone saying that a very bad place is unguarded—perhaps a railway crossing or a dangerous street corner—we immediately discuss this with the police department and the Secretary, Mr. Walters, takes it up with other agencies that can assist in its correction and we get results.

For instance, a little girl was killed in front of our new library building. I got in touch with Mr. Walters and within two days we had the co-operation of the board of education, the police department and the department of parks and boulevards. They changed the traffic intersection to another place that we thought would be less dangerous and an officer was sent to direct the children in going back and forth. As a result we have had no further accidents at that particular place.

We have talks in the schools by a policeman trained for that particular duty—in selecting a speaker you must get a man that knows how to handle the teachers and the children. This policeman makes his talk very short and snappy and is doing a splendid service. We have a film entitled "The A, B, C of Safety" that illustrates our school work very well.

A part of our traffic work is done by school janitors who have been instructed by the police department. They are paid to care for a particular corner. Oftentimes, too, we have boys help at corners. We do not allow them to go out in the street and regulate traffic, that is too dangerous a job for a school boy, but they help by standing at the corners and at intersections and in emergencies they have acted as traffic officers. They do splendid work, especially the Boy Scouts. We also co-operate with the fire department and have had good results. We understand each other.

SINGING FOR A POLICE OFFICER

One of our policemen is a big, husky man, and after he finished one of his talks in a school the principal said: "Mr. Brown, the children want to do something for you. Would you like to have them sing?" They sang for the policeman and he told me afterward: "I have been in the business a long time and I have come in close contact with all sorts of people, but when those children sang for me I could hardly keep from crying." He understands children.

The fireman also has his work. He tells the children what the fire department is doing and how the children can help. He always asks if any of them would like to be junior firemen and, of course, they all do. It sounds well and so very important! Every child in the school wants to be an assistant fire marshal and they are really doing good work. They learn how to turn in a fire alarm. The policeman shows them how to do it and I believe every child in the public schools knows how to turn in an alarm. It is a profitable investment of a little money and we have had some wonderful returns.

In one year the fire loss in Detroit was four and a half millions and they paid our teachers five millions. You see, teachers are worth just about as much as is thrown on the ash pile. We saved about a million dollars last year, as we had a reduction of 508 in the number of fires—the first time in the history of the city.

I had some trouble at first. The fire marshal said to me: "Miss Beard, if you teach the children how to turn in a fire alarm they will all run and do it and we will have so many false alarms we won't know what to do." "Mr. Goldwater," I answered, "if you teach them properly

they won't do so." The records show that I was right, for we had a reduction of 120 false alarms last year. That shows our work to be really worth while.

We are getting better co-operation from the courts than formerly. The children visit the court; it is a good thing and the judge sits up and takes notice when the boys come into his courtroom. Don't you think so? The courts are giving fine co-operation in regard to reckless drivers. If a driver runs over a child he is prosecuted. We cannot do anything in safety work unless we have the co-operation of the courts.

We have the co-operation of the women's clubs, the Parent Teachers' Association, the Boy Scouts and many others. The Federation of Women's Clubs give us one day a month for the presentation of our safety problems.

The home should be made safe. Last year fifty-seven babies were scalded to death. We teach safety in the schools and the children help teach it to their mothers. It is up to the mother to make the homes safe and we are seeking to have them do so. We are getting good results but it will be necessary to get them absolutely wedded to safety work.

Another most important matter is to provide suitable safety material for the use of the teacher. Teachers are overburdened with their present assignments and they must be given something that is very simple and very definite; something that they will be able to carry out. Cleveland has provided a very fine course of study and other cities have gathered together a lot of material—presently we will have sufficient for an adequate teaching course.

AVOID MORBID SUBJECTS IN SCHOOL WORK

We should take great care to avoid the morbid in teaching accident prevention. It can be made very horrible if you go into all the details of accidents where people have their eyes gouged out and things like that, and should not be taught to children in that way. We want to give them courage, not teach them to be afraid.

There could not be a more fertile field for safety than we have right in this city. If we can cut down the number of our accidents you can do it anywhere. The children are all keen for it; they are enthusiastic, and we must give them material to work on. Clubs or traffic courts are interesting and safety buttons help wonderfully. The expense is very small and the return is large. They are something tangible for the children to have and the boys like to wear them on their coats; they need them in their work.

One thing I should mention is that bad boys love safety work. I have gone into two or three schools where they did not know how to handle their traffic and at one school they had a large class of ungraded boys. I suggested to the principal that she let them do traffic duty and she said: "You know, Miss Beard, the bad boys are lazy; we cannot have them as traffic officers." I said: "That is a pretty large boy." "He is one of the ungraded boys." "Make a traffic officer out of him." "Oh, my, we could not do that; we could not let them have that responsibility." "That is my recommendation. Try it out." I talked to the boys:

"We have decided to give you boys very responsible positions. Will you do it?" Now they have one of the finest traffic squads in town. The bad boys are so interested they have forgotten how to get into trouble. Some of your bad boys will make good as traffic officers. They love the work. They become important and don't impose on other children; they feel their responsibility and rise to the emergency—it is wonderful what they will develop.

In one school they have a Citizens Court and every child becomes a citizen of the republic. Not long ago the clerk of the court came to my office to talk things over. He was about 11 years old and brought two traffic officers with him. They told me what they were doing and wanted suggestions. I inquired how they were doing their safety work and they informed me that they had them on all the corners of the school. I asked: "How long are they on duty?" and the oldest boy said: "Twenty minutes before the bell rings." "How do you get them in on time?" "Oh, you see. I am the chief and I blow my whistle." He pulled out a whistle—I never saw such a huge one on a small boy. He had it tied to him. He said: "This is the whistle and when they hear it they come running in."

BOYS SCHOOL IN CITIZENSHIP

While he was telling me this the clerk of the traffic court, Austin, sat there, and then he thought he would have his say: "Miss Beard, we have citizens in our school. When they apply for citizenship my first question is 'What does co-operation mean?'" I said: "That is a good, practical question, what is your next one?" He said: "What does self-control mean?" I looked at the little 11-year-old in amazement. "I question them about our schools. I ask them who our public schools belong to, who gave the land for our school and who gave the land for the poor people of this neighborhood to plant potatoes on"—that particular school was the gift of Governor Pingree. He said: "I ask them who is the President of the United States, who is General Pershing, who is General Foch and where is he at present" (he happened to be in the United States at that time). I said: "Austin, that is splendid, you are doing a fine thing. When you hold your next court let me know and I will come out and visit you. He said that a little boy was coming from another school and "We are going to make him a citizen before long."

I went out to see him make citizens. Leo and his two witnesses sat on one side and someone sat on the other with his witnesses. Austin gave them some of the questions I have mentioned and a few others. He asked: "Do you shove when in line?" and the boy answered "No." They thought he would make a good citizen. Then he was asked: "How can you help Miss Beard in her safety work?" That is what this 11-year-old asked; it was an inspiration to me.

When he got through he said: "Hold up your hands. Do you renounce the old form of teacher government and promise to do your best to make this a government of the pupils, by the pupils and for the pupils of the Pingree school?" They all said "I do."

When these little boys and girls grow up we will have a better world and safety will inspire them to do better things. We are going to hand to our children a very queer and difficult world—we are doing it now. I don't think any generation ever had more serious problems than we have. The whole world is upset. The countries of Europe are distrustful of each other and their national conditions are terrible. The world is full of suspicion and we need now, as never before, to have our children given good training for citizenship, because the children of America are going to help very much to make this a better world.

VICE CHAIRMAN RIDGWAY: Mr. Bentley, our next speaker, needs no introduction.

"BILL DAY," THE BOY ATHLETE

A STORY FOR SCHOOLBOYS AND GIRLS AND OTHERS; RELATED BY L. G. BENTLEY,
GENERAL SAFETY AGENT, THE CHESAPEAKE AND OHIO RAILWAY
COMPANY, RICHMOND, VA.

We frequently refer to the newly employed, untrained railroad man as a "railroad baby." If we would insure his greatest usefulness, we must make of him a safe man and his safety education must begin when he receives his initial instructions; this must be continued as a systematic, perpetual, every-day, every-hour necessity, of the same importance as production, economy and co-operation.

We have found that in starting the railroad baby off with inspiration and with enthusiasm for safety, his mind is tuned to receive the practical every-day lessons he later receives from his foreman. We endeavor to inspire him and arouse his enthusiasm and sentimental welcome for safety in various ways, one of the most effective being the recital, either orally or on the screen, of stories based on actual occurrences, which portray the results of carelessness. These stories touch his heart and create impressions that will remain and which he will connect up with his work later on.

We know that the railroad baby in this respect is comparable with the kindergartner, whose safety education is being undertaken with such splendid success in the public schools of our large cities. We of the Steam Railroad Section have followed with pride the several articles in the *National Safety News* showing what Detroit has been doing for her school children in this respect.

The bad habit of trespassing on freight trains and on tracks (and in this the railroads have a very great interest) is much less prevalent in the large cities than in villages and small towns, where the graded or country school is the limit of educational advantage, and safety as an educational feature has not even been considered. It is in the village, the small town, or in the country, where the small boy and girl, following the example of their elders, is wont to use the railroad track as a thoroughfare; where the boys think it quite the smart and proper thing to "hop a freight" in going to and from school, work or play, more frequently "just for fun." It is here that great numbers of boys and girls are being killed or seriously injured annually, and unless national pressure is brought to bear it will probably be many years before any well-defined, systematic method of

teaching safety in the public school of the village or small town will be introduced and maintained successfully.

I believe we can prepare the school authorities, the patrons and pupils of the small towns and villages, for this undertaking by showing them the need for it every time we get a chance. We have gone into the schools along our line with the germ of safety education, and, as a result of one or two meetings, school committees have been formed and the authorities have gotten into communication with the National Safety Council, with the view to introducing safety as a regular feature in the school course.

HEART THRILLS EXPERIENCED IN SCHOOL SAFETY WORK

My personal part in this work has been a great inspiration to me and, because the Chairman of the Section suggested that our program here be inspirational, I decided, at the risk of seeming to advertise home industry, to try to pass on to the Steam Railroad Section some of the heart thrills I have experienced in the course of the three-score school meetings I have held.

Oh, Boy! to stand in the midst of seven hundred to a thousand children, seated on the floor and on window ledges, so quiet that the proverbial pin could be heard to drop; to gaze upon that sea of upturned childish faces, to catch the sparkle in their eyes, to watch the little hands shoot up, indicating eager replies to the several leading questions—that is the inspiration a man needs to convince him that the country school is fertile soil for safety work.

If this appears childish, simple and not in keeping with a dignified business program, if you can forget your years and with the enthusiasm and pep of childhood shoot your hands up too and give me the replies to those same questions, I shall know that I have not misjudged the occasion.

Backward, turn backward, O! Time in your flight,
Make me a boy again, just for tonight.

You fellows down there on the front seats, answer this one:

When school closes for recess or after the term is over, when you get together and want to run, jump and limber up, what do you play? (Answers in chorus) "Base ball," "Ride my bicycle," "Play leap frog."

That is right, you look like that type of boys.

Now, you older fellows, what particular athletic stunts appeal to you? (Answers) "Playing foot ball," "Basket ball," "Exercise in the gym."

Fine for you, you'll all be men, some day.

Little girls, you are in this too, what do you enjoy most, when you are not in the class room? (Answers) "Jumping rope," "Roller skating," "Puss-in-the-corner."

Correct, all little girls love some kind of sport.

Now, then, everybody. When the snow falls on the hillsides and the ponds freeze over, what about your sports then? (Answers) "Slide down hill on my sled," "Go skating," "Throw snowballs," "Make a snowman."

Everyone is right. Now listen carefully and when you answer these questions be certain that you have the right answer. It is important. How many legs does a little boy need to play baseball? Foot ball? To ride a bicycle? (Interruptions by many) "Two."

A boy could not play leap frog very well with just one leg and one arm, could he?

Well, could a little girl jump the rope and skate on her rollers with one leg? (Answers) "No, sir."

GOD INTENDED CHILDREN TO BE HAPPY

That's right and God thought the same when He gave two to each of you. He knew that you would need them to play your games, and in later years to work as you become useful in industry. It is very dishonest, to say the least, to allow them to be cut off or broken when we can prevent it.

You all know, for you have been taught from babyhood, that it is wrong to take that which does not belong to you. A pencil, an apple, a marble belonging to Harry, has no right in the pocket of Tom—this brings out the principle of property rights. We must not take that which does not belong to us.

Now can you tell me for what purpose we have sidewalks? (Answer) "To walk upon."

What are the streets for? (Answer) "For automobiles, street cars, fire engines and trucks."

To whom do the railroad tracks belong? (Answer) "To the railroads."

Correct, the sidewalks belong to the people who walk. The playgrounds to the boys and girls, the middle of the streets belongs to the drivers of vehicles, etc., and the railroad tracks and trains belong to the railroads.

Now, what would you think if, sometime when walking down the sidewalk, you should hear a fire engine coming down the sidewalk behind you? You would be frightened and indignant, because the fire engine would be trespassing on your property rights. Well, the fire engine has the same right to use your sidewalk as you have to play in its street.

Imagine, if you can, a railroad train coming over and running around on your playgrounds! Can't you see that the train would be trespassing on your property? Of course you can. Well, the train has exactly the same right to run around on your property that you have to run around on its tracks or to jump on its cars. They don't belong to you.

THE STORY OF BILL DAY

Now I'm done lecturing and because you have so nicely answered my questions I shall tell you the story of a little boy I met since I have been doing safety work. His name is Bill, and that is a regular boy's name. Well, Bill was a regular boy and his last name was Day, Bill Day. He was just the kind of a boy his name suggests. He could swim and skate more swiftly than any boy in school, he had the record for long and high jumping and he was the crack pitcher of his ball team and the homerun king of the school. But, with all these accomplishments to his credit, he had one serious fault. He was *careless*.

In going to the store for his mother he would hang on the back end of an automobile truck, if he could catch it, and one day while he and his chum were doing this his chum dropped off and was struck by a following car. That was two years ago and the chum is still in the hospital, sitting all day in a rolling chair. When Bill wants to see him he takes a

book and goes around to read to him, to talk over the great games of baseball they used to play before the chum was crippled for life.

If Bill had to cross the street he rarely did so at the corner, but would run between the automobiles, right in the middle of the square. He had many narrow escapes while doing this, for the drivers of cars did not expect to find little boys crossing in the middle of the square.

Bill would not steal, oh! no; he was an honorable little chap, but he did not seem to realize how dishonest it is to jump on freight trains and to play on the railroad tracks. One bright afternoon Bill came from school a little early and asked his mother if he might go down to the diamond, about half a mile away, and play ball; of course, his mother agreed, for she was always glad for him to enjoy himself and felt proud of his splendid physique. Snatching his mit and cap he ran out of the door and when part way to the diamond he saw a freight train coming. When it reached him, he ran over to the track, jumped on the side of a coal car and rode on down to the hill just above the ball ground.

The train was running faster than he thought and when he jumped off he fell, rolled along beside the track and down the bank. He was not much hurt, just bruised a bit, and minus a piece of skin from his left cheek, so he brushed his clothes and went on over to the diamond. When the boys saw him coming, they waved their welcome and shouted "Come on, Bill; get in the game!" Of course he "got in the game." The third ball that the pitcher put over the plate Bill knocked for a home-run, but the ball went away down in leftfield, where there was a patch of weeds, and the boys had a tough time finding it.

When Bill crossed the home plate he was somewhat breathless and a little excited from his fall in getting off the freight train, so he sat down in the "dugout" while the boys were searching for the ball. He dropped his head over in his hands and began to think what a narrow escape he had.

BILL LOOKED INTO THE VALLEY OF SHADOWS

Let's leave Bill there on the bench, waiting for the lost ball, and see what happened the next time he hopped a freight train. It happened in the same way except that when he got off he didn't roll down the bank, he fell with one leg under the train and as he threw up his arm to guard himself the wheels passed over both the leg and the arm, mangling them terribly.

The trainmen saw him when he fell, so they stopped the train and the conductor and brakeman brought the stretcher, while the fireman went to the telephone to notify his mother that her little boy had been seriously injured. He then called Bill's daddy at the shop (he worked for the railroad, too) and told him to meet the ambulance at the hospital.

Think, just a moment, of your own mother and daddy, and imagine how they would feel should someone telephone that their little boy or girl was being brought home in this condition.

Then the ambulance came, the little sufferer was placed inside and hurried to the hospital. The surgeons and nurses examined him carefully and the chief surgeon told Bill's daddy that he did not think he would die, but that they would have to amputate the leg near the hip and

the arm just above the elbow. So this was done, and after many tiresome days, filled with suffering and sorrow, *Bill went home.*

Just think, little people. That great, strong boy, Bill Day; that fine swimmer, deep diver, swift skater, the "home-run king" of the school, went home on crutches, with but one arm and one leg, and you told me a few moments ago that a boy *needs two.*

Where do you s'pose Bill wanted to go, the first thing after he got home? *Down to the ball grounds to see what the fellows were doing.* So he took his crutch and hobbled down there. The boys were just getting ready to start the game and did not see him until he had laid his crutch down and seated himself in the "dugout." When they did see him they forgot for a moment that he was crippled and everyone raised their arms, waved at him and shouted, "Come on, Bill; get in the game!"

Without a word, he reached for his crutch, stood on one leg and hung his head. All the boys hung their heads too, for they knew that Bill was done with the game. They might knock three-baggers and home-runs, steal bases, pitch in-shoots and groove 'em until the batter was rattled, but Bill could only sit on the bench and wish that he could "get in the game" again.

When the snow falls on the hills the little girls, who always depended upon Bill to drag their sleds up the hill for them will have to get some other boy to do it, and poor old Bill will have to get some of the other boys and girls, maybe, to drag him up the hill.

DID YOU EVER DREAM OF FALLING INTO SPACE?

When the ice forms on the ponds and the boys and girls, with great glee, are skating to their hearts' content, with great bonfires burning on the shores, Bill can but stand by the fire, wishing, *wishing*, *WISHING*, that he might "get in the game," while he casts a long, pitiful shadow on the snow—the shadow of a little boy with one leg, one arm and a crutch.

And then—just as his little heart was about to break with sorrow—the boys found the ball in the weeds, down in leftfield. The umpire raised his arm and shouted "Play Ball!" The fellows shouted "Come on Bill; get in the game!" And Bill Day jumped up from the bench, rubbed his eyes with both hands and found that he had been sitting asleep on the bench all the time and had dreamed every bit of that terrible experience, and that he had two arms and two legs, just the same as you have.

Did you ever dream that you were falling, *falling*, *FALLING*, from some high place for about an hour? Then do you remember how glad you were when you awakened before you hit! That is an experience no one will forget. Then, how do you suppose Bill Day felt? He jumped around on his two legs, slapped and pinched them, stretched both arms up in the air, turned a handspring or two and then began to cry, because he was so glad he had two arms and two legs and could "get in the game."

Bill Day has never hopped another freight train and has never played on the railroad tracks again. He has stopped hanging on the backs of trucks. Bill never steps off the sidewalk without looking to see if an automobile is coming.

Bill Day is a careful boy and his father and mother learned their lesson, too, when Bill told them of his dream, for they knew that they had not taught him to be careful and they knew that it was only because of the goodness of God that Bill's dream did not come true.

I do not know how permanent the lesson of this story may be. I gathered it from various sources and experiences, but I believe it contains the germ of inspiration which, if imparted to and absorbed by our school faculties and by parents—particularly in rural districts—it would be the means, to some extent at least, of awakening them to the necessity for a more extensive system of teaching safety to the young.

This I know. I have told the story to some fifty thousand school children and at its close fifty thousand boys and girls, with uplifted hands, have promised me that never, under any circumstances, would they hop a freight train and that they would not play on railroad tracks.

Fellows, some of those boys and girls are going to keep that promise and, if they do, young lives and limbs will be saved. If that saving is but one my work shall not have been in vain for I shall have done something for these little ones

Who are treasures of heart and of household,
They are angels of God in disguise.
His sunlight still sleeps in their tresses,
His glory still shines in their eyes.
Those rascals of home and of heaven,
Have made me more manly and mild,
And I know how Jesus could liken
The Kingdom of God—to a child.

(At this point a group of children presented the playlet entitled "In the Doctor's Office," which was received with much applause.)

MR. SCOTT: I move a rising vote of thanks to Miss Beard and the school children for this exhibition. (The members arose amidst applause.)

CHAIRMAN RIDGWAY: Our next paper will be given by Mr. H. A. Rowe.

THE CAREFUL-CROSSING CAMPAIGN

H. A. ROWE, CLAIMS ATTORNEY, DELAWARE, LACKAWANNA AND WESTERN
RAILROAD, NEW YORK CITY

For the benefit of those unfamiliar with the inception of the campaign, permit me to say that at a meeting of the Safety Section, American Railway Association, held at Boston, Mass., Sept. 26, 1921, there was established a Committee on Prevention of Highway Crossing Accidents, Mr. John T. Broderick of the Baltimore and Ohio, Chairman.

Careful study was given the subject and several thoughts became dominant in turn: 1. *Elimination of the Crossings*—This was abandoned as impractical with 251,939 crossings in use on class 1 railroads and an elimination rate of 400 a year; necessitating a period of 629 years and an expenditure of \$50,000 per crossing, involving over \$12,500,000,000, which amount would be impossible of acquirement and would be non-revenue producing.

2. *Drastic legislation to actually require the stopping of every pedestrian and vehicle before crossing a track*—Such laws would be absolutely

impossible of enforcement and would chiefly be recognized in their breach. Such legislation might be applied as a defense to lawsuits, but would no more prevent the occurrence of accidents than hanging or electrocution has prevented murder.

3. *The available remedy lies in education*—The constant calling of the attention of the traveling public to the necessity for care at highway crossings and the development of public opinion that just condemnation may be visited upon the careless, indifferent and reckless users of the highway at railway intersection.

ADOPTION OF UNIFORM POSTER

The last plan was adopted. To make it more effective, efforts were concentrated upon the development of a single, uniform poster depicting an impending disaster, yet leaving the consequences to the imagination. The title of the campaign and the slogan adopted formed a double alliterative, epitomized the purpose of the movement and gave tersely all the advice necessary for safe travel over railroad tracks. This poster and a miniature of it, referred to as the "sticker," were produced by the Sales Printing Corporation and distributed through the American Railway Association to practically every steam railroad in the United States and a part of Canada.

Upward of 1,300,000 posters were used and nearly 8,000,000 stickers. The posters were displayed on railroad property, postoffices, hotels, auto supply stations, stores, at industrial plants, etc., and the stickers were applied by the railroads to their outgoing United States mail. The poster was reproduced as a slide for use in moving-picture houses and nearly 9,000 slides were distributed gratuitously.

The campaign was opened by President Harding, who wrote a splendid letter of indorsement which was freely used by the press of the country. Most excellent editorials and special articles have appeared in the newspapers and magazines, speaking highly of the cause, though occasionally warped by some picayunish local necessity. Be it said to the credit of the press, they nearly all saw the opportunity to do public service and to aid in the unselfish, humane and personal cause. Radio stations gladly loaned their facilities for the broadcasting of campaign messages.

The efforts of the committee were augmented by individual work, by many of the roads, such as the publication of the poster design on menu cards, blotters, postal cards for free distribution, appeals, cards of advice to drivers, etc. The co-operation of national and local organizations, municipal authorities and schools was generously offered and undoubtedly a very liberal publicity was obtained.

Arrangement was made for the putting of the railroad house in order; for instance, upon the giving of statutory signals indicating the approach of trains, suitable maintenance of mechanical warning devices, and the keeping of crossing gatemen and flagmen alert.

Interesting observations were made upon fifty class 1 railroads throughout the country on July 15 and 16 at 300 crossings. On the com-

bined dates 306,306 automobiles passed over these crossings, and 356,697 drivers, or about 50 per cent, apparently neither looked to the right nor left while approaching or passing over the crossings. This fact, however, was also developed, that but 26,453 of the observed autos, about 9 per cent, passed over crossings at a higher rate of estimated speed than 30 miles per hour.

The available statistics for June, comparing deaths and injuries at crossings, do not yet reflect an improvement, but cognizance must be taken of the fact that during the first six months of this year 1,120,000 autos and trucks were produced and sold in this country, indicating about 2,000,000 additional cars this year over last. That you may get a better grasp of the situation, I mention that there has been a new car sold this year for every poster we have displayed and there were ten or eleven million cars in use before these additions.

Taking a few roads at random, let me call your attention to the Chicago and North Western. Mr. Richards reports for June and July four less deaths and seventeen less injured at crossings. Mr. Broderick of the Baltimore and Ohio reports twenty-six less persons killed and injured in crossing accidents over last year. Mr. Dow of the New York Central reports one less killed and twenty-eight less injured.

We must all recognize that to imbue more than 100,000,000 people with the necessity to cross crossings cautiously is not a thing which can be accomplished in a day or by the stroke of a pen. What has been done to call attention to the need of increased care at highway-railroad crossings must be regarded simply as the foundation for continued efforts to develop a broad, constructive, practical program for the further enlightenment of the driving and riding population, which includes almost all of us.

Organization and systematic attack upon railroad-employee deaths has resulted in a decrease from the high mark of 4,354 in 1907 to the low mark of 1,505 in 1921. If such deaths can be reduced 64 per cent in fourteen years no stronger argument can be presented in proof that deaths of employees are preventable and unnecessary and will ultimately be almost eliminated.

The problems of public mishaps at crossings presents different aspects, to be sure, but basically they are due to someone's negligence and the remedy is not beyond us. The railroads must do their full duty in maintaining the crossings in safe condition for travel, in keeping mechanical safeguards in a high state of efficiency, in demanding from employees the utmost compliance with the rules and the exercise of intelligent judgment and, further, the railroads must do their share in encouraging the public to its duty. With these acts performed by the railroads the burden for accidents is shifted squarely to the driver of the car and his companion travelers upon the highway. No traveler upon the highway should suspend his own care and rely upon manual or mechanical devices to assure his safety. He must be absolutely self-reliant, he must know it is always train time, he must approach crossings cautiously. The press can be of vast assistance in the training of auto drivers.

There is a common tendency, following crossing accidents, to first condemn the railroad, regardless of the facts. Justice suggests the placing of the blame where it most frequently belongs, upon the driver of the vehicle. If, instead of heroizing the driver following a serious accident, he were justly condemned for his initial fault in heedlessly approaching the crossing, the spirit of bravado and self-glorification would be curbed, for who can stand the contempt of his fellowmen when his conscience also finds him wrong?

Though it is premature to judge the numerical success or failure of the present campaign, and it may be that final analysis will show but a slight check upon the regrettable loss of life at highway crossings, yet undoubtedly a step has been taken in the right direction and success will be nearer tomorrow for the labor of today.

STATISTICS NOT FURNISHED PROMPTLY

We have 201 Class 1 railroads—railroads earning over a million dollars a year—and we have persistently mailed requests to the various safety representatives, asking that they supply us with figures every two weeks, but railroad safety men are not always good business men and good office men and out of the 201 requests, which we repeatedly sent out, we have received thirty-nine answers. Gentlemen, I arraign you who have not responded. I am not in a scolding mood, but I say this: You cannot ask your committee to give you figures of encouragement if you do not furnish them to us and you have not furnished them.

I had the liberty, last Thursday, of addressing another organization with which I am connected, the Claim Agents. I wrote to eighty-one railroads—and this shows that claim agents are live men, better business men than safety representatives. I got sixty-six responses in three days. They did not give us much encouragement, but they gave us facts, and we must look squarely at facts.

The list shows that in 1921, for the months of June and July combined, a total of 317 people were killed at highway crossings and 1,089 were injured. For the year 1922—now prepare yourselves for a shock because you are going to get it—with all our labors, we have had 352 killed and 1,119 injured; an increase this year, notwithstanding the effort we have made to reduce accidents, in the months of June and July, on sixty-six leading railroads of the United States, which shows thirty-five more people killed and also more injured.

Those are facts, those are the things we are up against, and those of you who thought that you were going to eliminate accidents this year are now learning that it cannot be done in a year and it cannot be done by a stroke of the pen. We must recognize that we have entered into a campaign which will require continual effort and which will require a progressive character of effort; we cannot lay down and say this campaign has failed because thirty-five more people were killed.

What did I tell you in my little written paper—1,120,000 more automobiles this year than you had last year; for every poster that we were able to put up throughout the whole length and breadth of the country,

the automobile makers manufactured more than one car, and you have that tremendous increase of traffic.

You may say that does not represent 1,120,000 new drivers, because lots of those fellows had cars before. True, but they sold the old car and some fellow that did not know a thing about driving has it now.

STANDARD OF ABILITY FOR AUTOMOBILE DRIVERS

The automobile situation is getting so that it is not the intelligent man that will drive our cars in the future, it will be any kind of Tom, Dick and Harry that has \$52.50 in his pocket. That is what it amounts to and you will reach a situation where, sooner or later, the public must recognize the necessity for a standard of ability upon the part of drivers of automobiles. We must have a standard of ability upon our railroads which you and I have the honor of representing. We can safely say that no man would be permitted to run a passenger train conveying precious lives over a mile of our tracks unless he had at least from five to fifteen years' experience. You give an instrument of death into the hands of anyone with \$52.50 in his pocket and say to him: "Go out on the highway, pick up passengers, if you can, take your loved ones, take your friends and your children to ride!" Too often he don't give a ——— what happens.

You have come to the stage, gentlemen, where we must demand from our officials issuing licenses a standard of ability, and that standard of ability should be put high above the ordinary standard, not that we can develop a class discrimination, but it will be discrimination, and until we get to preaching that thought we are going to continue to have automobile accidents.

We have a man's job before us; not a one-man's job but the job of a thousand and a million men before us. This organization, of course, did not start the campaign. The phraseology of reporting to you is hardly correct, but you are railroad men and interested in what we are doing. Most of you are members of the A. R. A., and if you are not, if you become members of the association, you will become interested in it. Those of you who are members of the association, I want you, when occasion presents, to lend your co-operation, heartily, carefully and fully to a continuation of this campaign and be not discouraged because you know for the first two months of this year sixty-six railroads have an increase in the number of deaths. We must not be discouraged for one single moment. We have a big job, we must realize that, and we must simply go at that task as though we were going to succeed if it takes us ten years—and if it takes us to the millennium.

I said before that I was not in a critical mood, and I do not speak critically, but I think the National Safety Council has missed a fine opportunity of presenting at their public meetings, with force and with sincerity, by good speakers—not myself, but by good speakers—they have missed an opportunity to present the "Cross Crossings Cautiously Campaign" to the public.

If there is any merit in safety organizations, or in the safety work that the railroads are doing, that is coupled up with the public, this is

the work, this is the opportunity. I hope the Steam Railroad Section will receive wider advertising—if necessary—and that you will take me in the right light when I speak of these things. This is a fine opportunity, and I sincerely hope the Steam Railroad Section will take energetic action in building up its public duties.

DISCUSSION

MR. WALSH: I want to ask Mr. Rowe if he kept a record of the number of accidents as well as the number of deaths and injuries.

MR. ROWE: We have such a record for thirty-nine railroads, but it is so unrepresentative that it is not of real value. In 1921 there were 295 accidents reported on thirty-nine railroads and 319 in 1922, an increase of twenty-four.

There are 752 railroads reporting to the A. R. A. and practically all of them are in this campaign. Of the 201 Class 1 railroads only one did not enter the campaign.

MR. MARCUS A. DOW: The real story of the results of the Cross Crossings Campaign cannot be told until the campaign is completely finished.

The increase in our crossing accidents were in the first two weeks of the campaign. We did not begin to show results until the first half of the second month, when we had a slight decrease on several lines. I do not have the figures for the first two weeks because they were not quite ready when I came away, but there was an indication of an increase.

You probably have had the same experience as some of the other lines. It seems to be a peculiar fact that nearly every crossing accident I have had during this campaign has been more than ordinarily serious. I mean by that, when we hit an automobile, instead of hitting one that had one or two people in the machine, it had a whole family in it. We have had a half dozen cases of that kind.

I agree with the chairman of the committee that we must not be discouraged, because, apparently, a better record has not been achieved so far in the campaign. We must remember that our efforts at safety work on railroads, thus far, have been centered principally upon the education of our employees; we really have done very little public safety work and we have got to come to it.

I hope that during the coming year there will be a greater co-operation between the National Safety Council and the Steam Railroad Section along the line of public safety. I believe the success that has been achieved in the reduction of the industrial accidents shows the way to the probable success of a greater co-operation along the lines of public safety; we are coming to the point where we will have to concentrate on public safety with greater insistence than we have been doing.

One of the most important things we have before us in connection with the crossing problem is to bring forcibly to the minds of the average automobile driver not only the hazard that exists but also what a tremendously serious thing it is to get mixed up with one of our modern railroad trains. Last night I had the privilege of talking over the radio

at the broadcasting station and I recited a little incident which occurred in my boyhood days.

A CROSSING ACCIDENT THAT COULD HAVE BEEN AVOIDED

I am a native of Detroit, and one day I went to the county fair at the old exposition grounds. There I saw a balloon ~~ascension~~ and we were horrified to see the balloonist lose his hold and ~~plunge headlong~~ to the earth a thousand feet below. He landed on a sidewalk and every bone in his body was broken.

Some years later I was on a passenger train in Pennsylvania. The train came to a sudden jarring, grinding stop and a number of us got out to see what had happened. A vehicle was scattered a hundred feet along the right of way and over in a field, where it had been tossed by the train, lay a shapeless, lifeless thing which a moment before had been a human being. It looked to me like the remains of that luckless balloonist that I saw laying on the sidewalk in Detroit twenty years before. Someone pointed to the familiar sign we all know so well. It read: "Railroad Crossing. Stop! Look! and Listen!" I gained a new respect for that familiar, unpretentious-looking crossing sign and the words, "Stop! Look! and Listen!"

You have to bring the crossing problem before the average motor car driver in a way that will impress it upon his mind, just as that catastrophe in Pennsylvania impressed itself on my mind. You have to educate the public in such a way that they will be deeply impressed, not only as to the hazards at railroad crossings, but with the tremendous destructive power of 130-ton locomotives with heavy steel trains behind them.

One of the drivers Mr. Rowe told us about, buying a car on the installment plan—if he was driving towards a railroad crossing and on that crossing was planted one of the big guns the Germans used during the World War, and he knew the gun was loaded with its deadly missile, do you suppose he would drive his car onward, unconcerned, in the face of that death-dealing gun? Hardly. It is more than likely that he would scramble from his car and take refuge in a nearby cornfield. We must teach drivers to remember that no big gun was ever more efficient in destruction than a locomotive, if they get in its way. That is what I mean by impressing this-crossing problem on the minds of the public—impress it in a way that will seep in and stick. Let's go to it and see the thing to a finish!

One of the things we did on the New York Central was to prepare a little speech that will take four or five minutes to read. We send it to everyone of our station agents with instructions to get out and personally appeal to the people, deliver the speech in a church, in a club-room or before any kind of an audience. From information we have received I feel confident that our little message was personally delivered to more than 2,000,000 people in the last two months.

That is the kind of educational work that we will have to continue; not finish it in September, but continue it throughout the year.

SAFETY CAMPAIGN REDUCED ACCIDENTS

MR. BRODERICK: I agree with what Mr. Dow and Mr. Rowe have said regarding the results of this campaign. It is too early to predict what the results will be and even though they may not be as pleasing as we expect at the end of the term you must remember this work will require a very long time to get results.

I have with me the results obtained on our road up to Aug. 11, and the number of crossing accidents, as compared with the same period last year, show a reduction of 20 per cent; in the number of persons killed and injured we show a reduction of 34 per cent. I am with the Baltimore & Ohio. The results may be due to the fact that we have been carrying on a safety campaign for the last three years and have done many things to try to make things safe and to bring these facts to the attention of the public. I don't know of any better way of doing that than through the workmen's homes—I think a man is prone to pay more attention to a thing if it is presented to him in his home. We have carried on our campaign through the homes and the schools.

As chairman of the Safety Section of the American Railway Association I think it is time to emphasize membership in the National Safety Council. The Council has done a good and a very valuable work and the Steam Railroad Section has been a very important part of it. I would like to impress upon those here who are not now members or who have withdrawn their memberships that they should get into the field again.

MR. CARROW: I told Mr. Ridgway that I had looked into the publicity feature of this campaign and I am very happy to say that I believe we have something a little more cheerful than the report of Mr. Rowe. Really, as has been pointed out, there is nothing in figures. "There are lies and lies and statistics," as was said a good many years ago, and unless you have some sort of basis for a comparison of statistics they don't mean anything. There is something infinitely more important, and that is the amount of publicity we have actually obtained through this campaign.

I had the opportunity of analyzing 115 newspaper articles. There were 969 inches of written matter, eighteen inches per column, on the average. There are 2,500 associated newspapers in the United States and 14,000 weekly, semi-weekly and others. They have a circulation of 33,000,000 for the dailies and 56,000,000 for the weeklies and others; that makes a total circulation of 89,000,000. If you estimate that one article appeared in each paper since the campaign started it would amount to a space equal to two miles in length, the width of a newspaper column. It is fair to assume that nearly every person in the United States who is capable of reading and writing has had this message.

PUBLIC INTERESTED IN SAFE CROSSING CAMPAIGN

There is another feature of this campaign that is very important—you can write all your advertisements and put them in the newspapers with a dozen headlines over them, but when it comes to headline the

"Cross Crossings Cautiously" proposition has anything beaten that ever was put out for publicity.

I have examined the headlines in the newspapers and I will quote a few to indicate how they line up: "Cross Crossings Cautiously Campaign Has Been Started," "Big National Poster Drive to Reduce Accidents," "Safety Drive Next Month in Cross Crossings Cautiously Campaign to Be Launched," "Railroad Campaign Against Grade Crossing Accidents, Posters to Be Developed and Drive Will Be Nation-Wide. Closes Sept. 30."

We cannot help but get results. I saw an editorial where they did not stop at headlines; at the beginning of each paragraph they had headlines also.

You can put it down as a safe proposition that when the public interest is aroused by cartoons it cannot help but attract attention. In other words, cartoonists like Bud Fisher and De More of the *Philadelphia Record* will not jeopardize their reputation by using a subject that has not worked deeply into the public mind.

In one cartoon that I saw there was a railroad with a locomotive coming in either direction. There was a parade on one side of the track with an elephant in it, and there was a sign reading: "He will have a job Crossing Crossings Cautiously." On the other side was an automobile and on one side of the automobile was written the bonus and the tariff and all the other questions and a sign reading: "The government at Washington will have trouble Crossing Crossings Cautiously." That is a fair indication that the cause has sunk in.

I estimate the cost of the campaign, for speakers and so forth, at something around \$50,000. I have some figures, but they are not accurate. The amount of money we spent is infinitesimal compared with the amount of money involved in this campaign—I trust that is perfectly proper phraseology.

Another point that I want to emphasize is the cumulative effect of this campaign. When you have planted deeply in the minds of the people a slogan of universal importance it sticks, and as long as the highways cross railroads at grade, "Cross Crossings Cautiously" will remain in the minds of the American people. For that reason you can depend upon it that those who are yet to come will be educated in safety. I have never known of a better conducted campaign than this one.

METROPOLITAN PAPERS FEATURE SAFETY WORK

Another thought Mr. Rowe brought out was in regard to making an appeal to the people that would have a lasting effect. When I was a youngster down in my country they were great Methodists, and after the preacher got through asking the people to come to the mourners' bench he would cast his eye on some old brother to offer a prayer and any man that did not respond was certainly hard hearted. I went two or three times myself.

The co-operation of the people and the support of the press in this campaign is most encouraging to me, and I think it is to the railroad fraternity as a whole. Without exception, every paper, particularly the

metropolitan papers, has gone into it with a whole-heartedness that is unprecedented. Not even during the war did we have a slogan that was taken up like this "Cross Crossings Cautiously." It proves conclusively, to my mind, that if the railroads have a proper cause and if we have the proper people behind it, it will go across and we will find a solution for our problems. With such men as Mr. Broderick, Mr. Rowe and their colleagues behind it I am sure it will be put across.

MR. MORRIS: When we first started safety work on the railroads we did not make much progress. You have got to be patient. Don't get discouraged.

We have had increases on our road in automobile accidents. Up to the 15th of this month we show a decrease of fourteen less killed than we did the first three months of the campaign of 1921. While we have had more accidents we have had less people killed.

Our claim agent related a little incident that prevented him from being with us yesterday—we hit an automobile. We expect to hit them. When an attorney will drive up on to a railroad and get hit what do you expect from somebody else? .

CAMPAIGN TO CONTINUE FOR LONG PERIOD

I hope every man connected with us will stick—they must remain constant to the National Safety Council as well as the American Railway Association. Keep your memberships in them, because you are going to be of as much help through the National Safety Council as the American Railway Association. Stay right with them. They are on the right road and are going to do better work. We are going to get results, not this year but in the coming years.

This campaign will last five or ten years, and you will see our posters in every place all that time. I know of one place—we have a negro watchman at Memphis, Tenn., who has both the inside and outside of his house papered with them and he is not going to take them down either.

SECRETARY ROHWEDER: I went over to the leading newspaper office in Duluth. The editor is a personal friend of mine and he said: "That slogan is good enough to use as a public safety slogan in addition to your railroad campaign. You can put it over. It would be a big thing if we could get them out generally; we could use them in the city."

We talked to the people that get out our magazine and they said: "We can make a zinc etching of that placard and print it on weather-proof stock. You can put them on telephone poles and street car poles and so forth; make them permanent fixtures." We had five thousand printed on weather-proof cloth. We put them on every street car pole and electric light pole and on all the automobile trucks of the large wholesale houses and other places in the northern part of Minnesota. We put them up in May and they are just as good today as they were the day they were printed. Not 5 per cent of them have been taken down.

Just to show you how that worked: The Duluth Street Railway has something like 2,700 poles in the city of Duluth, over about 160 miles of track. They put the posters around the pole and pulled them tight; they slipped a large pin through them and that held them in good shape.

That put the posters over in a wonderful way. Some of the wholesale houses and factories put them on the wind shields of their automobiles, some of them tacked them up on the tailgates of the cars. All this served a mighty good purpose.

EVERY STATE HAS DIFFERENT LAW FOR DRIVERS

MR. BRADEN: Everything on the poster is copyrighted and belongs absolutely to the inventor of that sign. If you will write to the printer and get his permission to use the poster that is all right; I think you can get his permission, but if you go ahead and use his wording without permission you are liable to have a lawsuit on your hands. If you go to the holder of the copyright he can give you permission to use it and it will keep you out of trouble.

MR. BRENNAN: This is a very broad question. This is not a campaign that is going to run from June 1 to Sept. 30, as we all know. Mr. Dow clearly brought out that fact, and I think we have this angle to consider among the others that have been discussing; maybe we can bring it out later.

We want some uniformity of method in providing careful drivers. How are you going to make a man a careful driver? You have forty-eight States with forty-eight varieties of legislation and governments trying to solve this problem. I think we should go on record as being particularly anxious to solve the question as to what a man must sum up to who drives a car, not simply the question of what he owes to his wife and children and to his friends who occupy the car with him; not simply that, but what legislation or what rules may be laid down of a uniform character that would compel that man to do something besides rush across crossings.

A man has to be sober before he can even say "Cross Crossings Cautiously." It is like that test of a man who came home drunk one night. He came upstairs and his wife asked: "Is that you, George?" "Yes." "Are you sober?" "Yes, ma'am." "Say chrysanthemum." "It can't be done, dear; it can't be done."

The time will come when we will get away from "Stop, Look and Listen!" "Look out for the cars!" and things of that sort. We have to make this thing a uniform national grade crossing caution. Eventually they will have to stop and read it and if they read it a great advantage will result.

What do you get when you arrest a man for violating the speed laws? If he goes before a judge he gets a fine, maybe \$30 or \$35. He does not get fifteen days in jail. Some say we will regulate the fine according to the speed you are going—forty miles an hour, \$40 fine.

We must have something that will compel the man who drives a car to realize that he must not and cannot go on doing this thing; that he owes it, not only to himself and to his family and to the fare he drives, if he is driving a public vehicle for hire, but he owes it to common sense and to the community to do something decent, and fair and square.

WARY DRIVERS TO BE CAREFUL AT CROSSINGS

He won't do that voluntarily—there are too many complex conditions of mind among men who drive cars. Some day we will have a record card system. That is, every man will have a card upon which a record will be kept of first, second and third offenses. The time has not arrived where we want to take a car away from a man who is making his living by driving it; that is a serious thing to take a man's livelihood away from him, but I think if he could be given a warning he would be a more careful man.

I do not drive a machine for hire, but I do drive a car, and I think we must all concede that we have the fault of not using sufficient care in going over crossings. We are very largely in the state of mind, when we get a car, as the Italian was down on Long Island. A friend told me that he sold this Italian a car for \$250. "I gave him fifteen minutes instruction," he said, "showing him how to shift the gears and he started down the road. He got excited and said: 'Oh, gee! Hot dog! We go fifty miles an hour.'" That is the spirit, gentlemen. We want to see how soon we can make fifty miles an hour and we don't care where the railroad crossings are.

"Stop, Look and Listen!" was all right when we drove old Dobbin fifteen miles an hour, but now we go like the very devil. When we are going thirty-five or forty miles an hour we cannot stop. Why should we?

The Railway Association, in discussing the matter, very clearly reached the conclusion that it is not proper to ask a man to stop before he comes to a crossing. Why should a man stop if there is nothing in sight? It simply resolves itself into a question of when should he stop. The association ridiculed the idea of "Stop, Look and Listen!" They say: "You have a slogan, 'Cross Crossings Cautiously.' That is the important thing; the next most important thing is to have a uniform system of registration or a law requiring the man who drives a car to keep a record, and if he is afraid of having that record spoiled, because it is liable to be the cause of his license being taken away from him, we are going to get somewhere."

It does not make so much difference to the average man if a judge fines him or even takes his car away, but it would be a serious thing for the man who makes his living driving a car.

What do we owe to our families? What are your wife and children worth to you? What is your own life worth? The point I want to make is that this campaign must go on indefinitely. It is not a thing to be taken up and forgotten. It has got to be carried on by you and by me.

NUMBER OF ACCIDENTS NOT DISCOURAGING

We have a lot of work cut out for us and it is a man-sized job, but you are all men. We have this campaign and we have got to go on with it. I know the results so far are not of much comfort to you, but you must remember that we have had a couple of million cars thrown on to us. We are to be congratulated, I think, that we have not had a great many more people killed than we have had. The world has not

recovered from the state of war that upset all of our nerves. We are not driving cars in the sensible, sane, quiet and intelligent way that we ought to, and between now and the time we meet next year we can give the matter a whole lot of thought. I want to impress upon the members present the importance of getting some form of legislation across which will be worth while and have a uniform regard for the driver.

SECRETARY ROHWEDER: My understanding of the law is that you can copyright a poster in its entirety, but you cannot prohibit the extraction of any one particular part of it.

(On motion a vote of thanks was extended to Mr. Bentley for his excellent paper.)

REPORT OF NOMINATING COMMITTEE

MR. CARROW: It affords me great pleasure to say that we have selected for nomination as Chairman of the Steam Railroad Section Mr. L. G. Bentley of the Chesapeake & Ohio Railway, Richmond, Va.; Mr. A. V. Rohweder, of the Duluth, Missabe & Northern and Duluth & Iron Range Railroads as Vice-Chairman, and Mr. L. P. Green of the Soo Line as Secretary.

SECRETARY ROHWEDER: Mr. Chairman. I appreciate very much the honor that your Nominating Committee has bestowed on me, but my duties will be such during the coming year that I cannot devote the necessary time to this important office.

MR. CARROW: As Mr. Rohweder is unable to serve, the committee presents the name of Mr. John Fitzhugh of the Colorado, Santa Fe & Galveston for the position. (The report of the committee was concurred in and the nominees elected by acclamation.)

MR. BENTLEY: I realize that the work of the Steam Railroad Section of the National Safety Council, during the coming year, is going to be one of tremendous importance and in accepting the chairmanship of your Section I do it with the definite and positive promise on the part of every member that they will not only strive to their uttermost to influence their officers to retain their membership in the National Safety Council, but those of you who have influence with other companies that have withdrawn or who have never come into the fold will call on those officers. will not rest until you have brought them into the fold. I promise you everything I have in my effort to make this Section a success during the coming year.

The Section then adjourned.

THURSDAY MORNING SESSION

VICE CHAIRMAN RIDGWAY: I would like to invite further discussion of Mr. Rowe's report of the Cross Crossings Campaign.

MR. BRENNAN: There is a new type of swinging sign. Most of you know of the blinking red light. The Pennsylvania Railroad sometime ago installed, in connection with this, a track operated gong which starts

to ring when a train is 2,400 feet back. If the light stays red it means "Stop!"

Mr. Braden brought out the fact that a moving object would attract attention quicker than a stationary one, and upon the strength of that belief the Long Island developed a red light that blinks, one above and one below. The Pennsylvania people rather laughed at us, they thought it was far-fetched and did not amount to very much, but they are using it now. I believe the Ohio Valley has adopted it and I hope others will do so. We have received the highest kind of compliments regarding it; people come to my office and ask where they can get it.

The light has a particularly fine disc and is devised so that when it is facing toward the sun you can see it 1,500 feet away; at night, on a straight away, you can see it four miles. It ought to be a splendid thing. We are using it not in lieu of but in connection with the crossing bell. We know, as railroad men, that the ringing bell as put up in the old days has become passe, because people riding on a noisy truck or in a closed car will have difficulty in hearing it. With that thought in mind we put a red light up in that fashion (indicating). It does not necessarily have to be track operated; if you have a man at the crossing you can put in a knife switch.

The cost of installing one of these, on an ordinary track, is about \$1,200. We have places (where we have four electrified tracks) where it costs as high as six or seven thousand dollars. We prefer, however, a traffic man on these crossings—this is something in the way of a development that might be carried home; our chief engineer will be glad to submit plans and blue prints and the cost and amount of material necessary to install these signals if you wish to have them.

POSITION OF SIGNAL VERY IMPORTANT

VICE CHAIRMAN RIDGWAY: I would like to ask the height above the ground and the position with respect to the center line of the roadway at which these signals are installed.

A motorist friend of mine says he believes one of the great difficulties about the railroad crossings is the fact that the driver's eyes are focussed on the road and that signs are usually at one side and at quite an elevation—that you don't see them. It is his belief that if we put a post right in the middle of the road with a red light burning continuously, about four or five feet above the surface of the road, it would be the most effective crossing signal we could install.

MR. BRENNAN: The Pennsylvania has something along that line—a steady light that stands in the middle of the road and serves as a guide for right and left traffic, but you cannot always have good lights in the country. If you were to have something of this sort a man might crash into that post at night.

This blinking light has two relays in operation, so if one relay goes out it would still be a moving light; it would be a rather far-fetched assumption to say that both lights would go out simultaneously.

The light is about six feet from the ground and the pole is a round one with a white and black effect to attract additional attention.

MR. ORR: An accident happened at Stevensville, Ont. There were eight people in the car, seven were killed and one very badly injured. Our fireman, I understand, says that the engineer did not see the automobile at all. The fireman says that when he saw it it was just approaching the track, going south. A young lady, 19 years of age, who was running the car continued south, and then all of a sudden she gave a sudden jerk, crossed the track, and was struck.

In talking it over with the trainmen and others the statement was made that possibly she put her foot on the accelerator instead of the brake. That has been discussed very freely among our men and in the last few days we got a bulletin from the A. R. A. speaking of similar happenings.

Is there any way this Section could make a recommendation to provide against that sort of thing. I have talked with automobile people and some say it cannot be done, that you cannot make a difference in the accelerator to protect the people in the car; that it is impossible to do it. Our safety committee has had the matter up as our men were involved in this terrible accident and we want to secure what information we can to see if something cannot be done.

POSITION OF AUTOMOBILE ACCELERATOR AND BRAKE

MR. CHAPIN (Pennsylvania Railroad): One of the first things that impressed me about the control of an automobile was the close location of the accelerator to the brake and the fact that unless one was watching particularly it was just as easy to step on one as the other.

There is to be a meeting tomorrow of the Automotive, Metal and Drop Forge Section in which they will start the question of co-operation between Sections as a means of promoting general safety. It would seem proper for us to present something to that meeting, looking toward, perhaps, a revolutionizing of the design of automobiles to get away from facts so closely associated as these two controls. They are within the width of a man's foot—right in the same place, to be operated by the same foot. If the accelerator control could be placed on the wheel, and not have the control as it is now, there would be little chance for your foot to slip off one and onto the other. It could very properly be done with the hand. They are far enough ahead in the construction of automobiles so that something could be done about it.

MR. MORRIS: We differ a little about automobiles. There are old style cars and some makes of cars where the accelerator is in close proximity to the brake, but you will find that the brake and the clutch ordinarily are together; you will have to set your heel opposite the brake in order to touch the accelerator. That is particularly so on the Moon car. I have got to stretch a little to get to the accelerator; the brake and the clutch pedals are at least the length of a man's foot from the accelerator.

MR. CHAPIN: The accelerator is placed a little beyond the brake; if a man's foot slips off the brake it goes onto the accelerator.

MR. CARROW: This is a technical subject and it seems to me that Mr. Scott, who started with a Ford and graduated with a Cadillac, could make a statement.

MR. SCOTT: I have been driving an automobile since 1906 and I have not used the foot accelerator in sixteen years. There are two accelerators on a car; one controlled by the hand and the other by the foot. My reason for not using the foot accelerator is because of the serious danger of giving your car gas when you intend to put on the brakes.

If I can go along for sixteen years and get by with the hand control I think the foot control is not necessary, but 90 per cent of the motor drivers will tell you they never touch the hand control and that they always use the foot accelerator.

HAND AND FOOT CONTROL OF ACCELERATOR

MR. BENTLEY: How about getting out of tight places in a hurry; that is, accelerating your speed and jumping out of the way. Do you find the hand control sufficient to enable you to get out as quick as if you put your foot on it?

MR. SCOTT: Yes.

MR. MITCHELL: It seems to me that the same thing is involved here as when an employee makes a mistake. When that happens, someone wants to change all the rules. I have stepped on the accelerator at times, but I don't imagine that that was the case with the young lady. It seems to me that we are out of order when we want to recommend that automobiles should be rebuilt. I am not in favor of the recommendation. I don't know why Mr. Scott never uses the foot accelerator; I always do. I would not want to make recommendations to people who have given extensive consideration and careful thought to the construction of automobiles and to the arrangement of controls. I believe we are on the wrong track when we ask for a radical change because one person made a mistake.

MR. ORR: Might I ask why the American Railway Association put out that bulletin?

MR. MITCHELL: What bulletin do you refer to?

MR. ORR: A picture of an automobile all smashed up and a line below saying: "He put his foot on the accelerator."

MR. MITCHELL: I would say the man didn't put his foot in the right place.

MR. HOBBLE: I do not believe the real solution of the question lies in changing the cars but in changing, if possible, the minds and brains of those who drive them.

Some gentleman spoke about a new style of signals. That is all right, but when a man will deliberately, at a rate of seventy miles an hour, drive his car into the side of a train that is a half a mile long, what is the chance for him to see a signal, particularly when right on the crossing he was approaching was a pole with a bell on it in plain sight?

That happened on the Santa Fe the second day of June of this year. The driver slid his car seventy feet after he saw the train, as the skid marks on the road showed.

I think it was in Massachusetts that they adopted a certain standard that must be attained by the individual before he would be given a license to drive a car. During the first year 14 per cent of applicants were rejected and automobile accidents decreased something like 50 per cent. Whether or not that report is correct I do not know, but we do know that in practically all States of the Union all that is necessary to get a license to drive a car is to have enough money to make a payment on the car and a dollar to pay for the license. All sorts of irresponsible people are turned loose in these cars. They do not provide that the drivers should be possessed of some engineering ability, such as the engineer you put on locomotives. Although these drivers do not run all over the country by any means they become just as dangerous a proposition as a locomotive.

NO ADEQUATE PROTECTION FOR CROSSING MEN

You can stand on the boulevards of Oklahoma City and hour after hour see them drive up to the boulevard and stop before they cross, and yet I have seen scores of pedestrians knocked down on the railroads in Oklahoma City because the legislators, in passing the regulation requiring automobiles to stop, said nothing about railroad crossings. I think I am safe in saying there is not a week passes but what someone is hurt by railroad cars in Oklahoma City.

I do not mean to say that every car approaching a crossing in the country and everywhere else ought to stop, but if certain regulations were in force, carrying a jail sentence for their violation, there would be a very material reduction, and it would be well worth the efforts of the railroads, from a financial standpoint, to make an effort in the legislative departments of the various states to secure some regulation of this kind.

VICE CHAIRMAN RIMWAY: We have gotten off the point we were discussing and onto another.

I want to ask you gentlemen, unless you have something else to suggest, whether or not your trainmen and enginemen have been assisting in this Cross Crossing Campaign by reporting automobile license numbers and the kind of car and the time of day at which they had narrow escapes caused by automobiles passing in front of their trains.

MR. PRATT (Philadelphia & Reading Railroad): Our road has a system whereby, at places where the crews slack up their trains to let machines go ahead, they get the numbers and give them to us.

VICE CHAIRMAN RIMWAY: That is fine business; it makes the trainmen feel they are part of the safety organization and it does a lot of good.

MR. HEAVEY (Erie Railroad): I can verify the statement just made as far as our men are concerned. This has to do with careless drivers: We had a case where a driver was going along the public road and got in front of one of our limited trains coming into a city. If it had not

been for the vigilance of the engineer, who immediately applied the emergency, there would have been a casualty.

ACCIDENT LOSSES HAMPER RAILROAD WORK

We have no law in the State of Indiana that will reach such a driver, and I appealed to the American Railway Association, as an auxiliary of the National Safety Council, to use its influence with the Automobile Association of the State of Indiana. Possibly our next Legislature will try to enact into the statutes a section whereby we could deprive a man like that of his license. The secretary of the association told me he could not do any such thing, or he would not do any such thing, and that I would have to handle it locally. I have done that.

That is one of our big issues. I am a field man and on the firing line. I am supervisor, inspector, engineer and general utility man in the safety field and I won't take my hat off to any man, because I have been connected with this work almost continuously since 1906.

An appeal through this association, along those lines, would be very beneficial to our future activities. The railroad managements are adverse to any more losses—there is a great money loss now that hampers railroad operation—and something has to be done in the automobile and grade crossing campaign.

In the region I represent as a safety supervisor, during the months of June and July we did not have a single automobile accident, but unfortunately, we had some in August. I am going to illustrate one case—it is a community crime to permit such a man to handle a power machine on the public highways. He was blind in one eye and 63 years of age. He drove his machine at an angle of 45 degrees right into a train coming towards him.

With all due respect to what we have on our statute books, and if the American Railway Association is to function as an auxiliary of the National Safety Council, we should use our best efforts to have enacted into the statutes of the different States some law that will put the burden of responsibility upon the driver.

The standard sign that has been and is now being erected in the State of Indiana has a set light. It has a disc with a white background and the letters are set in concrete. That sign was adopted by the representatives of the steam railroads, the electric railroads and the Public Utilities Commission of the State of Indiana. I am not exaggerating when I say that I have asked 500 automobile drivers how this sign showed in the rays of their lights at night and I have never had one that did not tell me that it is the best thing that has ever been erected on the public highways.

THANKING MEN FOR THOUGHTFUL WORK

The sign is erected 300 feet from the crossing and there is no excuse for an automobile driver, if he has a clear road ahead of him, to pass that sign and run onto an obscure crossing in the dark.

The light with the mirror that Mr. Brennan spoke about, of course, is a better light but is more expensive. A simple but effective advance

sign, calling attention to railroad crossings, if adopted in every state in the Union would do away with a great many automobile accidents.

VICE CHAIRMAN RIDGWAY: Mr. Pratt, what did you do for the engineers or trainmen that reported those narrow escapes? Did you take the trouble to have the division superintendent or their superior officer thank them for their thoughtfulness in calling your attention to it?

MR. PRATT: Yes, sir; the superintendent took it up with the train masters and they thanked the boys.

VICE CHAIRMAN RIDGWAY: That is fine.

MR. PRATT: We need safety legislation in Pennsylvania. We had a crossing watchman who endeavored to stop an automobile from running into a train. The machine had gone over that section of the crossing a number of times the previous three weeks, but this time it hit the watchman and knocked him under an engine; he was killed. The automobile driver was arrested and jailed; then he was pardoned.

VICE CHAIRMAN RIDGWAY: In many States the public utilities commissions have issued orders that all vehicles carrying passengers or freight for profit on the highways must come to a stop before crossing a railroad track. That is as far as the power of the State goes. The utilities commissions only have authority over the regulation of the vehicles used for profit.

MR. MITCHELL: It has been the practice of the New Haven road for the last four years to report every automobile driver who crosses a crossing at a rate of speed which would not enable him to stop before getting to the track that the train was coming on. We have a blank card—a form all printed—so we can fill in the information, giving the direction, location of the crossing, time and the estimated rate of speed at which the driver was traveling. That comes direct to me and we report that to the commission, or the man in charge of motor vehicles in the State where the car is registered.

In our part of the country we have very heavy traffic in the summer time and on Mondays we get as high as fifty or sixty cards from different sections. That covers Saturday and Sunday.

TAKE RECKLESS AUTOMOBILISTS INTO COURT

Before we established that practice I interviewed the motor vehicle commissioners of the various States in which we operate and asked their co-operation, which they pledged. It is better in some States than others, I am sorry to say. Massachusetts and Connecticut are particularly good. In every case we report to them they warned the owner of the machine. It is a mild warning the first time, but the second time it is a little stronger. In some cases they suspended the licenses and took the offenders to court. We have furnished witnesses whenever they wanted to call a hearing. That is the only policy we work on. If you cross grade crossings at a rate of speed which will not enable you to stop if a train is coming sooner or later you won't get across.

In regard to legislation which has been referred to here in connection with public service orders, our general manager is chairman of the American Railway Association's Committee on Grade Crossing Protection

and Restriction of Trespassers. There are various public service orders in the various States regarding public-carrying vehicles and the other day our general manager decided to make an appeal to the commissions in all the States to issue a uniform order to apply to all motor vehicle operators. I am not going to tell where the suggestion came from, but it will affect you all, whether you are public carriers or private joy riders.

Our practice in reporting these careless drivers consists of classifying them all under one head and it has worked out very successfully. We are following it up. All our men who have to do with grade crossings are supplied with a form, particularly crossing tenders, section foremen, station agents, train crews and so forth. True, they don't all keep themselves provided with them, and I don't suppose they report them all, but we get reports from all kinds of employees on the New Haven road and invariably the report is forwarded to the commissioner of motor vehicles in the State where the car is licensed.

MR. HEAVEY: We have followed that out something on the line of the Pennsylvania. They established it by writing to the owner. I am sorry to say that our returns were not very good.

MR. MITCHELL: Don't you get co-operation from the State authorities?

MR. HEAVEY: We have been writing to the individual, the driver of the machine. We get the owner's license number and his name from the Secretary of State.

MR. MITCHELL: We don't do that, we let the commission write to them.

MR. HEAVEY: Our effort was wasted, as far as getting any benefits from writing to the driver.

I would like an opinion, before this meeting closes, if I can get it from the representatives here, as to the crossing watchman's duty. The standard rules of the maintenance of way department do not specify whether the watchman shall give a signal or not at a crossing which is protected by a crossing watchman. We use, on our railroad, the hand paddle, "Stop!" Some of you use the one with a long staff. I think our manager has under advisement the substitution of the long staff for the hand paddle. The man with the hand paddle, if he gives a signal and there is an automobile approaching—if the driver thinks he can do so he goes across—and there is another fellow behind him who sees him do it and he can do the same thing. What is the consequence? The watchman is liable to get hit.

CROSSING WATCHMEN SHOULD GIVE NO SIGNALS

A crossing watchman should, in my opinion, give no signals unless it is a signal to stop—the watchman should give no signals for automobiles to come-ahead or anything like that.

MR. HAMMOND: We use the six-foot staff on the New York Central, because a man with the short-handled staff is liable to put it in front of him and you cannot see it. We have issued explicit orders never to give hand signals. We have some very busy crossings, and, perhaps, the crossing watchman has been incapacitated, maybe he is a one-legged man, perhaps he only has one arm, and the crossing is so congested that it is almost impossible to get away from the hand signal.

In that case, we give him written instructions never to use the hand signal, but go out and place his staff and come away. When the way is clear he goes back and takes it away.

MR. MITCHELL: I say give no hand signals. If you beckon them they are liable to run over you.

VICE CHAIRMAN RIDGWAY: Yes.

MR. BENTLEY: The matter has been brought up, Mr. Rowe, as to legislation, and the fact that the Careful Crossing Campaign Committee did not favor legislation at this time throughout the various States in an effort to restrict accidents or to reduce accidents. As you are here, and as you are the chairman of that committee, I would be very glad if you can state why the committee on grade crossing accident prevention was not favorable, at this time, to the introduction of bills in the various States for laws governing automobile traffic.

— MR. ROWE: *First:* There is no uniformity of laws throughout the United States and there cannot be because every State decides upon its own laws. *Second:* Anything that the railroads ask for in the line of protection at railroad crossings they will not receive at this time, because public opinion is not sufficiently strong to give us what we want. *Third:* We are endeavoring to cultivate a public opinion, so that the public will go after the legislation and give us what we want and what we could not get for ourselves.

We are not in favor of the "Stop, Look and Listen!" law because, in a vast number of crossings throughout our whole country, there is an absolutely unobstructed view and it is not necessary to stop. It is useless to put a law upon your statute books that we do not actually need and would have no effect in any way at all if enforced. There is no way that you can get them to do it.

SAFETY MEN SHOULD NOT SUGGEST LEGAL ENACTMENTS

What you want, if you can get it, is to induce them to move with reasonable caution. That is about as far as you can expect to go. We are also restricted in this way? The American Railway Association has a legal section or department and it is not fitting for us as safety men to make recommendations as to legislation when those things are handled by the general counsel of the railroads. We would simply be told that we were getting into matters that did not belong to us.

There was some talk yesterday about the copyright on our poster. The reason that the poster was copyrighted was, at my suggestion, because the American Railway Association had no money whatever to put into a scheme of that kind. They advanced not a single dollar. We had about twenty interviews with different railroads and they refused to advance anything; then there were changes and rechanges and about eight months' time was put into it before it turned back a dollar.

After the first copies were sent out it was thought that the different roads might be able to get even a lower price from the publishers in their particular towns than we had received, but the publisher would not give them the benefit of the money that he had expended. It was for that reason that that poster was copyrighted.

There is no copyright as far as the words are concerned; Mr. Rohweder is in error on that; you cannot copyright words. You can copyright words in connection with a particular type of picture, but if you take away the picture you cannot copyright the words. Anybody can use the words and if there is any difficulty about the use of the poster, or the print from the poster, in any way at all, if you call my attention to it I think I can straighten it out with the publisher.

VICE CHAIRMAN RIDGWAY: Let us turn to Mr. Braden's paper on the relative importance of supervision and propaganda in railroad safety work. I will ask Mr. Carrow to please lead the discussion.

MR. CARROW: "Supervision" means the work of the official in charge in getting men to do things when they have to be done. The definition of "propaganda", is an open subject—it may mean anything from starting a campaign to blow up a city to advertising a Billy Sunday revival. For all practical purposes, propaganda is a method employed to induce people to do the thing you want them to do. It may be done orally or in writing, by cartoons or by example. Arthur Brisbane says "repetition is reputation"—that is a very large chapter in safety work. No matter what you want to put across you have to do it by propaganda.

EMPLOYEES' MAGAZINES AND THEIR MISSION

The propaganda Mr. Braden had in mind was to illustrate your point in such a manner as to make it effective. I must be specific in order to make my point. Take my friend Bentley's magazine for example. He tries to keep to an even keel, he does not go too far on the ludicrous or the serious; to sum up, he has a magazine suited to his particular product. The idea Mr. Braden gave you is very important, but bear in mind that you have to use some sort of a vehicle to make the thing interesting and make it possible to repeat it in a manner that will cause the person for whom it is intended to reach to read it or to hear it.

Here is the meat in the cocoanut: Education properly directed and habits properly cultivated will minimize the effort you would ordinarily employ in performing a job. Through education and habit we acquire a facility in doing certain things which, for want of a better expression, may be spoken of as a sixth sense; that is to say, a faculty of mind which impels a man to do a thing safely in the midst of danger. The only way to acquire this is to have the thing so imprinted on one's mind so that the sixth sense does it.

Consequently this sixth sense is the thing that railroad men, through the medium of propaganda, through the medium of supervision, through the medium of campaigns, through the medium of cartoons and magazines and everything else within reason and experience must be stressed, whether you start with a magazine article or anything else. If we only attempt to do this from Jan. 1 to Dec. 31 the reaction may be worse than if you have done nothing. In other words, you had better let a body of intelligent men work out their own solution than to undertake to carry out a plan that conditions and circumstances will not permit carrying on from day to day.

If you have in mind our propaganda and our supervision, with the definite idea that you are going to inculcate into the minds of all of us, not only the men in the shop who do the work but every one else, to do a thing automatically and safely without minimizing the effort, then you have got the thing in a nutshell.

CULTIVATING THE SIXTH SENSE FOR SAFETY

MR. BRADEN: There is only one way to arouse that sixth sense and that is through propaganda. Mr. Carrow tried to persuade your minds in regards to the value of the ludicrous, exaggeration and unusual association. This idea is often carried out in the bulletins issued by the National Safety Council. [Mr. Braden exhibited a number of bulletins and analyzed their contents and probable effect on their readers.]

It is not the policy of the Baltimore & Ohio road to play up the ludicrous—we stick to the even road. Some day we may change and inject a little exaggeration—a little fun—into our bulletin work, but for the present we avoid featuring anything of a ludicrous nature.

I cannot get this idea over on the Baltimore & Ohio, because if there is anything Mr. Broderick despises it is the ludicrous.

MR. BENTLEY: Mr. Braden has advanced an idea that, possibly, we are overlooking. Speaking of the large horse and the normal-sized horse, as I got Mr. Braden's suggestion yesterday, it was to the effect that some means should be adopted to get us to retain an impressive recollection of that particular sin or that particular accident, sometimes by exaggeration and sometimes by other means—if that suggestion could be adopted the recollection would be retained.

In the bulletins just displayed I see nothing of that kind. Personally, I want to see those bulletins displayed on our boards—piles of material carelessly placed and the cartoons. I am frank to admit that the one showing carelessly piled material will be with me years after the other had faded into oblivion.

After all, what we want to plant in the mind of the careless man is a picture of the hazard, be it a condition or a practice, that will remain with him in a natural manner. Then, when we confront him with the right condition or practice, we will be in position to act and to act decisively and that hazard will be removed. I believe in an actual statement of facts.

Whether our safety work takes the form of bulletins, lectures, posters, or what not, in their relative importance to safety instructions and safety supervision, the question that appeals to you is this: Does instituting and carrying on successfully a system of supervision beget propaganda? I do not believe it does. It begets purely a matter of supervision; whereas, if our propaganda is based on facts, on actual conditions and practices that are being indulged in day by day—if the man in Jericho is advised of an unsafe practice that is in vogue in Kalamazoo—it does beget supervision and the right character of propaganda. When you couple up supervision with propaganda you will get results.

AVOID THE LUDICROUS IN POSTERS

MR. BRENNAN: An eminent speaker once said: "If I had two shillings I would spend one to buy hyacinths." I like hyacinths, but there are other men who do not like them. Mr. Braden's text was not in regard to hyacinths; nevertheless, there are lots of men who have an entirely different conception of what safety will do and how to reach the men from what my conception may be, and I think they want something of a ludicrous nature occasionally. I think that reaches them, but the more sober types of men do not care for it. To the majority of us, and to me personally, it is revolting, but I know there are men in our own employ, and I suppose in the employ of every industrial plant and railroad in the country, whose mentality is about the average and that stuff reaches them. It is a happy medium, but you have got to feed it to the men according to their respective appetites.

MR. BRADEN: Yesterday, to shorten my paper I struck out a point. I think now it would have been well to have included it. A child will go into a playroom where there are other children and they will take a number of little chairs and call them a palace, they will call themselves princes or princesses; they will take a few little cakes and call it a feast. It is a pity some of us are not like that, but through education and contact with the world we have lost the power of visualization.

I find, through a study of the men in the shop, that they have not lost the power of visualization. They do not read as extensively as we do and they have not our education. It is a pity some of us have not retained this power because I think we would be better off in this world if we could do so. It is this faculty of visualization that makes our pictures and printed matter valuable and helps to put the safety idea across. I do not want to disregard supervision but I believe in supporting it with propaganda.

MR. SCOTT: So far as the word "propaganda" is concerned, it is a word not permitted to be used on our line; we know it is a word that is liable to be misinterpreted.

EXAGGERATION TO BE AVOIDED IN POINTING MORAL

With reference to ludicrous and exaggerated bulletins, we have not reached the point where we feel safe in putting them out. Our first idea, to put the safety movement over on our road, was to convince the men that we were thoroughly in earnest, there was no joke about it; what we had in mind was to save men from death or injury and that no levity must be taken in dealing with the subject. For this reason, except in a few cases, we felt that we could not use the calendars issued by the Council—because of the use of cartoons as illustrations. The new calendars are much better, in my opinion.

VICE CHAIRMAN RIDGWAY: We have a very unusual occurrence at this session, there are one or two ladies present who are conducting safety work on railroads and I have asked Mrs. Green to speak to us.

MRS. GREEN (Pere Marquette Railroad): I think your worthy Chairman has in mind the story of the Irishman in New York City who wanted

a job on the police force at the time Roosevelt was commissioner. By way of testing him Mr. Roosevelt asked what he would do to disperse them if an angry mob were collected. The Irishman answered, "Begorra, I would pass the hat."

STUDY HUMAN NATURE TO ACHIEVE SUCCESS

On our road we have had quite a considerable measure of success. We have reduced our fatal injuries very materially during the last two years, and the serious injuries in proportion. In 1918, when the roads first went under government control and the safety department organization was instituted, we had something like thirty fatal injuries; up to the 1st of September this year we have only had four. We are justly proud of our record.

In times gone by, we put out a good deal of literature and much of it was of a sensational, striking character. A good deal of money was spent on this work—more than at present—but I think we are securing as good results and possibly better, because in studying human nature you will find that if you appeal to the extremely emotional, and if you put out things that are highly ridiculous and highly unusual, it will, possibly, have a good effect, but unless each time you can follow it up and be continually doing so you will lose the effect. The more sober things and those that appeal to a man's logic seem, to a certain extent, to have fallen flat, because the man is expecting something sensational. If you evoke extreme emotions by your appeals you must continue to do so if it is to have effect. If you appeal to the fair-mindedness, and the right sentiments in the man—the spirit of fellowship and doing as he would like to be done by and doing the fair thing by the company—that does as much good as anything.

Another thing that has assisted us materially is publicity of carelessness, accidents and unsafe conditions. Every month we get out a little statement of avoidable injuries and that, to a certain extent makes for publicity. We do not give the names of the careless men; I don't think we ought to. The men are reading and discussing the statements, and enough curiosity is aroused to stimulate their interest; the men look forward to them because they are interested. Rarely do we overlook a case of extreme carelessness and the men have found out that where they are extremely careless it goes out to their fellows as an example.

On thing that people dislike more than anything else is publicity of some defect in their character; some little thing they should not have done. Appealing to them, I find, has a tendency to make a man take pains to keep from doing a thing he should not do. If he thinks people are going to know about it, and it is going to be discussed, it has a big influence. Possibly, it is vanity; it is natural to shrink from publicity; whatever it is, human nature has a lot to do with it.

Habit is three-quarters of safety. It is like eating. You do not always think, when you have a morsel of food on your fork that you are going to put it into your mouth. Eating is a habit, it is second nature, and if you get men to do things by second nature you will have gone a long ways in safety work. You must make them do it automatically.

REPETITION AND HABIT MUST BE CULTIVATED

Men and women are like children. When you start to teach a child the A B C's, you do not use reason, you have to say "A B C" over and over to the child until it knows A from B from force of habit. It is the same with us. We form habits and if we want to make men safe we have to teach them the safe way to do things and start them to doing the things right. Teach them to move carefully, to do a thing a certain way and eventually you will get the maximum of protection.

We have a practice that is carried on by one of our superintendents that is getting exceptionally good results; in fact, he has less accidents than any other division. He has what he calls a "sub-safety committee." Of course, he has his regular divisional committees, and it is only remotely connected with them. When he finds a man has committed a careless act that has resulted in an injury he writes that man a letter and puts him on what he calls his sub-safety committee. The man is required to show that letter to ten other employees. It explains what he has done and he has to get the signature of ten employees to that letter; then he returns it to his superintendent. That has had excellent results. Few of us have attempted anything of that kind, but this foreman has installed that one peculiar system and it is giving results.

VICE CHAIRMAN RIDGWAY: It has been moved and seconded that we extend to Mr. Braden a rising vote of thanks for his admirable and exceptional paper. All in favor please rise. (The members arose amidst applause.)

MR. BRADEN: Thanks, very much.

VICE CHAIRMAN RIDGWAY: Let us turn to Mr. Meyer's address. The question arose as to how he interested superintendents in safety work.

MR. SCOTT: I do not know of any better way to accomplish this than for the head of the safety department of the railroad to pay a personal visit to the superintendent and convince him that he means business and to let the superintendent know that he has the management behind him.

It is all very well for an executive officer to issue a circular and say that they are going to have organized safety on the line, but unless the man who is directly in charge of the work goes to the superintendent and master mechanic and says to these men that it is not going to be a paper organization but "We are going to do some real work and put our hearts and souls into it," we will not get results.

I recognize that on the larger systems it is not possible for the head of the safety department to visit every divisional headquarters or every shop or plant, but just as often as he can get around to shake hands with these men, look them squarely in the eye and show them that he is behind them in the work and that he is expecting results, that should be done.

MR. CHAPIN: The average man who is not interested in safety is interested in his accounts and if you get him through his pocketbook you will not only interest him but he will react to the economic side of rail-

road operation. We recently put out a statement of the accidents during the year, with the costs by divisions, and we found those figures—whether they were good or bad in a given case—were interesting to the superintendent; in some cases men who had been lukewarm in safety work became very much interested.

ANTAGONISTIC OFFICER IS NOT EFFICIENT

MR. MORRIS: It all depends upon the superintendent, his ability and inclinations and his duty towards his men. If a superintendent is antagonistic toward his men he cannot be an efficient safety officer and he cannot secure efficiency among his men. There is no man but what is dependent upon one or more other men for his success. The great successes that our most forward railroad men have made have been dependent upon men that were under them. If a superintendent will not purchase safety for his men he is losing efficiency. The organizations of railroads differ considerably. On our railroad we have seventeen superintendents and each of them is the supreme boss of his division, even to the master mechanic. Everything is in his hand.

In one case we had difficulty in getting a superintendent to hold his meetings promptly and properly. We have a thorough program setting forth just how this should be done and the general manager exacts a report of all meetings. I take the minutes of a meeting and summarize it, picking out the points that need attention, and my recommendations are handed up to the general manager. He takes it out on the road with him and if a superintendent has been a little lax about his duties he talks to the superintendent. I suppose he jacks him up about it—I don't know—but I notice things come in a little differently than they did before. No one's feelings are hurt and the men are gradually coming to the thing more and more.

Superintendents, sometimes, do not feel responsible for the conservation of the lives of their employees. As a rule they are a little indifferent toward the rights of others and that class of men have to be sold pretty strongly.

I visit the master mechanic and if he has a foreman who is a little lax and is having men hurt I talk to the man. I do the same thing with the roadmaster if he fails to keep his employees from getting hurt. Of course, he cannot keep some fellow from sticking his head or his hand in the way of a spike maul or lining bar, but he can teach the men a little. That works out pretty well—they appreciate the personal influence.

We hold what is called an "expense meeting" on the twenty-eighth of every month. Each superintendent is there and gets his allotment of funds. He is allowed so much for supervision and so much for maintenance of way; he spends that money just as he pleases, but he has to confine it to the purpose for which it is issued. I go to those meetings. Each of the superintendents has brought in his list of accidents and laid it before the general manager and also what it has cost the division. They discuss cost and the seventeen men sit there and draw

lines from each other trying to see which division is the best. That keeps them on the alert.

TAKE SAFETY OFFENSES TO HIGH OFFICIALS

Of the seventeen, seven which have been master mechanics and one a shop superintendent—they are the best fellows I ever saw to look after the welfare of their men. Our president has a deep interest in this work and so has our vice president and our general manager. It goes right on down the line. We have accidents, we cannot help it, but, at the same time we think we have made progress and we feel that we are taking care of our men in good shape.

Our hospital is one of the big features of the railroad. It takes care of our men that are hurt, if they want to go there. We have got a bone specialist and if a man has a leg broken or a foot crushed he knows he will get the best treatment in the country.

I do not suppose all safety officers take their cases to upper officials, as they should. I know a few safety men that are a little afraid to approach their superior officers on certain things or make any special recommendations. That is wrong. All men are born equal and you have as much right to have a good talk with one man as you have with another. If a man cannot reach his superior officer and let him hear his recommendations, if he has a complaint about something, you are in a bad way. Where you have the entire support of the railroad you feel independent and you can walk in and talk things over with your superior officers. Our president will go down through the yard—I have walked down there with him many times—and he will stop and talk, possibly, to a colored track laborer and ask him about different things. Two or three days afterward they ask: "Who was that gentleman with you?" "That was the president of the railroad." That is what we have on the Illinois Central.

MR. BENTLEY: During the coming year it is going to assume greater importance, because superintendents will be overwhelmed with duties that are trying and time taking, and if a safety officer ever needed the support of his superintendent it will be during the coming months. I cannot offer very much of a suggestion, so far as my experience in this respect on the Chesapeake & Ohio is concerned, but I want to offer one that has come to me in recent months. I speak of the chairman. Undoubtedly the chairman of the committee sets the pace, he hangs up the bull's-eye to be shot at, but don't let's lose sight of another important person on the committee—the secretary—the man who molds the mind of the chairman, sometimes. I strongly suspect that before Mrs. Green assumed her present duties on the Pere Marquette that she handled the duties of the secretary.

Mr. Scott believes in meeting and comparing ideas and every year he calls his secretaries together and they discuss the business connected with the operation of a safety committee. The secretary who actually handles the records and writes the letters for the superintendent to sign can do a great deal in my opinion, to win or divorce the chairman of

the committee from the cause to which we are espoused. The secretary is often the most important member of the committee.

GENERAL MEETING OF ALL SAFETY WORKERS

I want to tell you of something that I was successful in putting over on the Chesapeake & Ohio and which I consider one of the best stunts I ever pulled. Mr. Morris has done almost the same thing, except that his safety matters were discussed in connection with a meeting held in regard to expenses. The safety meeting I have reference to was called by the president of the railroad and all the chairmen of the safety committees were assembled at White Sulphur Springs. We spent an entire day going over safety matters and I think it was, without doubt, the most important meeting in the interest of safety ever held on the Chesapeake & Ohio Railway. We have been promised another one just as soon as conditions permit it to be held.

MR. CARROW: We nearly always talk about something indefinite. If we are to prevent accidents we have to get down to specific individuals. Make an analysis of the hazards in specific occupations, do it intelligently and well, and give it to your division superintendent. He will take the information and put it into process. The analysis I have before me is entitled "Safety First—Passenger Train Men and Passengers" and it includes passenger conductors, brakemen and all the men on our railroad. Our road has a fine record. We have not had a man killed in considerably over a year and only 181 injured.

I start the analysis with getting on and off trains, I go into that fully; then I go into coupling and uncoupling cars, working on and around cars or trains, trespassing, and eye injuries. Then I reach a conclusion as to what should be done.

The next thing I have to say is in regard to saving passengers from accidents—this will appeal to Mr. Rowe, I know, because it costs a lot of money if you don't save passengers from injury. Then I go into details as to the causes of accidents to passengers; I give fifteen to twenty illustrations of accidents. Then I come to getting on and off passenger coaches, boarding wrong train; I deal with coach windows and doors, passengers losing their balance, baggage in aisles, baggage in racks, and so forth. Then I draw my conclusions.

PAMPHLET ANALYZING ALL ACCIDENTS

What has resulted from the little I have done along this line? All over our road we have people who run into these things and report them from time to time. I have put down specific things and analyzed them in this pamphlet—the specific injuries involved—and I suspect, friends, that you will find within the next few years that safety work will be handled in this way; namely, that you are going to ascertain what you want to do and how you should do it and then put the information in the hands of the proper persons and expect them to do it.

VICE CHAIRMAN RIDGWAY: May I ask if you have a suggestion that will win over and convert a superintendent who has no faith in safety, thinks it is all "bull" and foolishness, and not worth while.

MR. CARROW: If the analysis is carried out, as I intend it shall be on our road, it will provide the superintendents with all the information there is, and it will be up to us to determine whether we get the proper reaction; and if that is not forthcoming we will know that something is wrong with local conditions.

MR. ROWE: On the Lackawanna Railroad we have converted a great many of our superintendents to the necessity for preventing particular types of accidents. Each month I furnish to every superintendent and to the chief superintendent and the general manager a statement showing what each superintendent has cost the railroad for unnecessary accidents upon his specific division. A detailed statement is given of every accident. We not only give that to the superintendent of the main line, but to every superintendent. Every superintendent gets a copy of every other superintendent's accidents, and every month the general manager, at the suggestion of the claim department, picks out from that general statement certain things that we know were flagrantly wrong. He hops on the fellow's neck that is at fault and I tell you it has a very salutary effect.

When you show them in dollars and cents that it is a financial loss and it cost so much money, and you show them the amounts paid to each one and how the accidents could have been prevented, it gets under their skin. It is having a splendid effect; so much so, that so far this year we have had only seven deaths among employees.

We center attention on the specific thing that is causing injuries and say the superintendent of the Syracuse division did not have it but the superintendent of the Buffalo division did; there is no reason why one should be able to prevent accidents and the other fellow not do so.

MR. HOBBLE (Santa Fe): This question is raised because of the peculiar characteristics of the human being in regard to following a leader. It is necessary to convert a superintendent in order to secure proper co-operation from him in safety matters. If the superintendent is unsafe the men under him are unsafe and that particular division is not going to be safe unless the man the superintendent reports to is safe.

The proper and quickest way to get at it is to go to the head of the organization and have him say to the man below him: "We will hold you accountable." This has been done on certain big railroads of this country. Foremen have been advised that, in the future, promotions and demotions will be considered in relation to safety and personal injuries occurring among the men under their jurisdictions. Just as soon as the individual finds that it is going to have an effect on his rating and that he will be held accountable for his safety conduct he is going to be safe, whether he really has it in his system or not.

SOME SUPERINTENDENTS SATISFIED TO JUST GET BY

VICE CHAIRMAN RIDGWAY: You have mentioned the "big stick" method. I don't believe that you can make a safety convert of a man by any such method. You can fire him but it will not make a safety man of him; he would go some place else but he would not be convinced as to the merits of the safety idea. The humanitarian aspect is what we

want to get at. If any of you know how to make a complete convert and enthusiast out of a supervising officer who does not believe in safety I wish you would tell me.

MR. SCOTT: You cannot do it any more than you can make a Christian out of an infidel.

VICE CHAIRMAN RIDGWAY: It would be possible if you knew how to do it. Do any of you know?

MR. MITCHELL: Put them on the safety committee and let them think they are safety men. If he is a bad actor we do that with him.

MR. SCOTT: You are talking about a superintendent?

MR. MITCHELL: No. We have only one superintendent that does not meet my expectations in that respect. He wants to run his division to suit himself and I have never been able to get anything on him. I don't know whether it is luck or what it is, but he has got very good results and he has always had an alibi. If I could only get something to hang on to him, you know, then I might convert him, but so long as he shows results I have not much of a defense. I will have to give it up. I don't know how to convert an official to safety who is not in sympathy with it. We put out some pretty strong and explicit instructions. They come right from the president and they are sponsored in every respect by the other high officials, but this one fellow has never satisfied me. He has never climbed into line. He ran along behind and hung on. He keeps in sight because he has to. But he never got right in line.

MR. HOBBLE: As a point of information I would like to ask how many representatives of the railroads here have dispensed with safety meetings during this crisis? Are any of you still holding monthly meetings?

VICE CHAIRMAN RIDGWAY: None of us, Mr. Hobbie.

MR. HEAVEY: I cannot discuss the question of superintendents because I have never had that experience. I have not so many people to deal with and, perhaps, I am able to get co-operation from superintendents that you men with the big roads would not be able to secure. In our shops I found a few foremen that were a little inclined not to give us co-operation in the manner we required. I may be out of order in making this statement, but I am a great advocate of good house-keeping—in removing the cause; I go to the head of the department and in ninety-nine cases out of a hundred I get results. I have only regional supervision and I don't have the authority some of the supervisors have, but I get into the corners and if the superintendent says something about spending a few dollars to remove an unsafe condition I try to swing him over through force of argument. Lots of times I go to one of his foremen and get the work done.

CONVINCING A CHIEF ENGINEER

MR. ROWE: We have a most excellent chief engineer, but he has not been converted to safety, or, rather, he was not up to a short while ago. From time to time we called his attention to the necessity for radical changes from an engineering standpoint, but because the suggestions

came from non-technical men he has been averse to acting upon them—he knows how and we don't—that is all there was to it.

In July we had an opportunity to sow a little seed with that chief engineer that may be suitable to apply to your superintendents or other officers. For years we have been asking our chief engineer to find a way to cover ashpits. He said it could not be done, it was not practical, and it won't be done and it was not done. In July we had five people fall into one ashpit in twenty-four hours. Three we got out.

One of the men we did not get out was 30 years of age and the son of one of our engineers; he had a wife and three children. About two years before he had met with an accident—not in our employ—and fractured his skull. He had been so disabled that for two years he was unable to do any kind of work. It was a pitiful case. He was absolutely dependent upon his father for the support of himself, his wife and three little children. He had been employed by us exactly forty-five minutes when he got into the ashpit and they could not get him out until the next day.

The question arose as to how best to handle the situation. I took the chief engineer to the widow's home and asked him to look at the situation as I am obliged to look at it and as my men are obliged to look at it. He came to that house and if you know anything about such situations you know what to expect. The widow was broken-hearted. She is left absolutely poverty stricken; the insurance had been dropped and everything had been sold except absolute necessities. I had the chief engineer sit down and talk to that heart-broken widow. The little children gathered around—those little bits of children—and one little fellow lisped: "When are you going to bring my daddy home?" That got under the skin of the chief engineer and the very next morning he had equipment there to cover that ashpit. We cannot have such an accident there again.

If your superintendent is not a convert of safety have your safety man take him to a home of desolation, let him come in contact with the heart-broken widow and see the little children, and I tell you it is going to have an effect on that fellow that nothing else will.

NEW TYPE OF GRADE CROSSING SIGNAL

MR. MITCHELL: When I came in you were discussing grade crossing signals. I wish you would read the article and study the drawings and tracings published in the June issue of the *Railway Age*—the Morrison flashlight signal. It shows a light and has both motion and color; it moves, yet it does not flare up. It is most interesting. We have found the signal to be very successful and the state commissions have authorized us, in several cases, to do away with the crossing tower and put in one of those signals.

MR. CHAPIN: This question is not on our program but it was discussed at the A. R. A. Safety Section; that is, in regard to men turning the switch targets who jump onto the running boards of engine. It has been our experience that it is the tendency of conductors and enginemen to jump on the running board in front of a locomotive. That

is one step in safety operation which has not been mentioned in our meeting.

VICE CHAIRMAN RIDGWAY: We have no prescribed ceremony for the installation of new officers and I will ask Mr. Rowe to conduct Mr. Bentley to the chair.

VOTE OF THANKS TO RETIRING OFFICIAL

MR. SCOTT: Our esteemed Vice Chairman, Mr. Ridgway, who has so ably presided over this meeting during these sessions has labored under difficulties. I happen to know from personal experience as I was Vice Chairman of this Section at one time. The Chairman was called to other duties and it fell to my part to attempt to fill the chairmanship. Mr. Ridgway has done so well in presiding over these meetings that we ought to show our gratitude for the highly satisfactory results he has accomplished by giving him a rising vote of thanks. (The members arose amid applause.)

CHAIRMAN BENTLEY: Mr. Ridgway, the Steam Railway Section deeply appreciates your unselfish service.

The time that has elapsed since I was notified of the honor conferred upon me in making me Chairman of this Section for the ensuing year has been short, but we need a program for the coming year and not for next September alone. We come to these meetings year after year and we discuss and hear discussions and go away inspired by what we have heard—I know I have. We need an active program, to begin right now, so that we can get back on the job and carry that program through. Let our meeting next September be one of reporting what we have done, not alone the laying of plans for what we hope to do.

If we are to make the Steam Railroad Section most useful to the railroads and to the National Safety Council we will have to live closer to the National Safety Council and induce it to live closer to us. We must do it, because the Council cannot function for the benefit of the railroads unless the railroad safety officers function as an active part of the National Safety Council.

BULLETINS FOR COMING YEAR

We have a Bulletin Committee in the American Railway Association that is doing excellent work, but should we not develop National Safety Council bulletins as well? The bulletins we receive from the American Railway Association are posted and distributed among railroad men alone, whereas the bulletins of the National Safety Council are included in *The National Safety News* and are broadcasted all over the United States. Let some of the other industries in the country know that the Steam Railroad Section of the National Safety Council is capable of producing bulletins and that will call the attention of other industries to what is going on in the railroad world.

My experience has been that the employees' magazine is an excellent medium for communicating to and with the employees as to the possibilities of safety work. Our magazine is necessary as a safety magazine because the safety idea is the conveyance that carries propaganda out among the employees.

Safety officers of railroads have a wonderful opportunity for work through Rotary Clubs, Kiwanis Clubs, Lions Clubs and Automobile Clubs. That is true in the small towns of thirty and forty thousand inhabitants, not alone cities like Detroit, New York, Philadelphia and Pittsburgh. Wherever it is possible the safety officers should get into these clubs.

There is an opportunity for safety workers to become acquainted with the police authorities in the towns along our lines and to get our division officers to do what I am advising for safety officers—become acquainted with the people who control industry and who lead in the social activities of various localities; let them know what the railroads are doing.

KEEP UP SAFETY WORK IN THE SCHOOLS

I said so much about school meetings yesterday that I hesitate to refer to them, but if we get the idea in our minds that anything we do in the schools along our lines is not wasted we will have done a good work. Away down in the blue grass district of Kentucky, where they have feuds and where some of the people are almost uncivilized, I had a meeting in a little school house. A roughneck brakeman saw me coming through the yard and stopped to shake hands with me. I never had seen him before and he never had seen me before, but his little boy had come home from school and told him what I had tried to tell the children about safety. Again, in walking up the street of a town, a little child ran up and took me by the hand saying: "You are the man that told us about Bill Day."

You don't know where you sow the seeds of safety. The little boys in the schools may be the railroad men of tomorrow and if you educate them today to do things safely when they grow up they will be safe railroad men.

I shall announce the appointment of Committees later. I want you to remember that everyone is a committee of one and is to come here next year prepared to make a report of your stewardship. I am going to require, next year, a written report from every committee that is appointed, showing what has been accomplished and I want those reports to be in such condition that we can discuss and get actual, positive benefit from them. Thank you, gentlemen, I solicit your hearty support and I know I will have it.

The Section then adjourned.

Taxicab and Delivery Section

August 29, 1922

REPRESENTATIVES of members in the taxicab business and other members operating fleets of trucks and delivery vehicles met and after a thorough discussion formally voted to organize this Section. The following officers were elected to serve until the Twelfth Annual Safety Congress:

Chairman, John W. Weibley, President, Pittsburgh Taxicab Company, Pittsburgh, Pa.

Vice-Chairman, F. P. Walker. Secretary, General Necessities Corporation, Detroit, Mich.

Secretary, Clinton H. Fisk, Director of Streets and Sewers, St. Louis, Mo.

Chairman Weibley announced that he would select the Section's committee organizations later—reminding those present of the fact that he had already undertaken a prominent part in the Pittsburgh public safety campaign and that it might be several weeks before he could complete the sectional organization.

[At the suggestion of Chairman Weibley a number of the members met on the day following to hear an address on safety instruction of drivers by Mr. W. R. Rasmussen of the Price-Rasmussen Corporation, formerly Field Secretary of the National Safety Council.]

Textile Section

August 29, 1922

WILLIAM S. IDE, Chairman

Safety Engineer, Slater & Sons, Inc., Webster, Mass.

BOYD FISHER, Vice Chairman

Service Manager, Lockwood, Greene & Co., Boston, Mass.

H. W. DONALD, Secretary

American Mutual Liability Insurance Co. of Boston, Boston, Mass.

TUESDAY MORNING SESSION

CHAIRMAN IDE: Gentlemen, we will omit the reading of reports and ask Dr. Price to read his paper.

HEALTH AND ACCIDENT HAZARDS IN THE CLOTHING INDUSTRY

DR. GEORGE M. PRICE, JOINT BOARD OF SANITARY CONTROL, NEW YORK CITY.

I do not believe scientific treatment of a subject such as this one is possible. What a lot of the doctors tell you about this and that disease of these workers and other workers is, to put it mildly, bunk. Much has been written about diseases of clothing workers, textile workers, domestic workers, etc., and I doubt, with all that has been written, that there is any real foundation for such statements.

There are a number of reasons for this and I will explain a few of them. All treatments of diseases in a group of workers suffer from being too inclusive; in other words, from taking too large a group of workers and bunching them together. I am convinced that one cannot speak of clothing workers or of textile workers—there are so many processes in each trade or each occupation and they differ so much one from another that to speak of diseases of the whole group is absurd. This is exemplified in the group classified as domestic workers—servants, valets, barbers, manicurists, janitors and a host of others.

In textiles we have them classified as ironers, needle-workers, cutters and a great many others which may have nothing at all to do with the trade. You will find needle-workers in the trade of tailors, the process

being entirely distinct and having nothing whatever to do with pressers, cutters, designers, fitters and many others. How then is it possible to have scientific data upon such a widely different group when the processes are so different—when the body movements are so dissimilar? There is a vast difference in the daily process which each worker undergoes.

DIFFERENCE BETWEEN AMERICAN AND EUROPEAN PROCESSES

Again, the processes differ for many reasons, perhaps according to country, nationality, sex, diet, etc. I have lately been in seventeen countries and have investigated and inspected many clothing shops. There is a radical difference between a German tailoring shop and a French one; there is a still greater difference between all European tailoring shops and American shops. We have comparatively very few hand needle-workers. In New York City, under my jurisdiction, I have 100,000 clothing workers, there are about 15,000 pressers, 10,000 cutters, 10,000 designers and fitters, etc., about 50,000 machine workers and only 10,000 or 15,000 real tailors or needle-workers.

In Europe it is different. They have larger shops in Berlin and I found in one establishment, with about 1,000 workers, only five single sewing machines. In our shops, where we have a thousand workers, there would be 600 or 700 machines. In other words, abroad the tailor is a hand worker, sitting on a table with crossed legs, Turkish fashion, and sewing—our tailor is nothing but a machine worker, differing very little in his processes from any other machine worker. You might just as well be a machine worker in the textile as any other trade or factory. The worker is no more a tailor than any other machine worker.

Of course, there is a difference as to ancestors. In Europe the tailor is almost born to the calling. He has generations of tailors behind him; his father, grandfather, etc., have been tailors, and he has been one practically from childhood. It is not proper to compare such a man in the European trade with the American tailor, who may have been a baker or something else, and came into the tailoring trade during the busy season; he is not a real tailor, and his health is entirely dependent upon his former occupation.

It is impossible to group a large number of men and women under one conclusive occupation on account of their national characteristics. The Pole, Slav, Russian Jew, Italian, each has his own characteristics and to group them under one trade and to claim that we know something about the effect of occupations on these persons, I say again, is absurd.

This worker includes a diet, this one does not; this one this and this one that—so many different conditions affect us that it is almost impossible to claim that clothing workers are suffering from certain diseases, distinct from workers in other groups. Even cities, under normal conditions, differ. In New York the clothing worker lives under different conditions from one in Rochester, Chicago or Cleveland.

THEORIES NOT BASED ON SCIENTIFIC FACTS

Much has been written, not of the diseases of clothing workers, exactly, but of tailors. From the days of Rammaziki, when he could really write something about tailors—for then tailors were tailors—until the

present time quite a number of theories have been advanced upon their diseases, but I doubt whether the theories are based upon scientific data. You know how easy it is to take up a subject and prove that people are suffering from the effects of their trade.

In the United States only a few have written upon the subject. Dr. Schwab of St. Louis was first, Dr. Landis of Philadelphia, second, and in conjunction with Dr. Schereschewsky I have written my observation of 3,000 workers in 1913, but what I have published from time to time on the subject, I will have to confess, is without exact scientific basis.

Since 1910 and 1911, in the clothing trades in New York, we have made more than 66,000 physical examinations of workers. These examinations have been recorded on a uniform card and have been made under the direction of myself and assistants. After collecting all this data we tried to put it into scientific shape, but we came to the conclusion that it is impossible to use it as statistic matter, for the reasons I have indicated—it is impossible to generalize upon a large group of persons whose occupations and processes differ so greatly one from another. I have told you that the ironer or presser, constituting 12 or 13 per cent of all the workers, has processes entirely different from a machine worker, and that the cutters are a distinct group; so is the fitter, the draper, the designer, etc.

We have tried hard to find whether or not nervousness is a distinct trait among tailors. While we found a good deal of neuresthenia, we could not swear that this was due to the occupation. No doubt racial conditions, whether the workers are Jews or belong to other nationalities, have much to do with neuresthenia.

In Europe I found 2 per cent of tuberculosis among tailors; our figures do not show that much—at present not more than 1 per cent. Again, we find tuberculosis among men to be of 1 per cent; among women, hardly one-third of 1 per cent. This is due to the fact that our women workers are really not tailors. They are mostly young girls of 18 to 22 who come into the trade temporarily, just after they go out to work; they marry within four or five years; very few remain in the trade longer than five years. In fact, among a group of 30,000 workers in New York City, we find that 20 per cent change every year; one-fourth to one-fifth of the women workers drop out every year from the union and from the trade. How can the occupation effect their health when they are so short a time in the trade?

NO DISTINCT DISEASES OF OCCUPATION

To summarize: Clothing workers have no distinct diseases of occupation. That is my belief. Nor have any other large groups of workers. No doctor has available any scientific data which shows that clothing workers suffer more from tuberculosis, neuresthenia or any other disease than other workers. It may affect them, but we cannot prove it. Much more study is needed, a more careful study and of smaller groups in order to obtain distinct statistics on which to base any scientific data.

The clothing trade, to a very high degree, is fortunately free from accidents. Again, I cannot give you statistics, but it is obvious there is

so little machinery that there are few accidents. Last year a girl was scalped when she bent her head and her tresses fell into a revolving shaft; but you cannot say that was a trade accident.

The accidents that we have in the clothing trade are those due to broken needles and needles in fingers. They are numerous, but usually slight in effect; if first aid is applied immediately, infection is very rare. We also have burns from irons and electrical switches from the iron, and cuts from machines, of which a number are used. Accidents in our trade are few and far between.

CHAIRMAN IDE: There has been an effort to formulate a safety code for textile factories. Mr. Cole will tell us something of what has been accomplished along that line.

THE TEXTILE SAFETY CODE

A. B. COLE, UTICA MUTUAL INSURANCE COMPANY, UTICA, N. Y.

It perhaps would be well to develop very briefly the history of the standardization work for the benefit of those who have heretofore had no connection with this effort.

Fundamentally the reasons for standardization may be briefly summarized as follows:

The lack of standardization of safeguards has proven to be an obstacle in the process of accident prevention work.

Under the present conditions manufacturers will leave to the purchaser of machinery the necessary compliance with State requirements, which results in an added cost over and above that necessary for guarding at the source, a delay in the productive use of the machine or else an unwarranted exposure of the employee to the hazards of machine operation.

The present lack of uniformity in requirements for mechanical guards results in discrimination—discrimination on the one hand to the manufacturer, who in one jurisdiction may suffer little, if any, supervision, of extremely lax and inefficient requirements, and thereby enjoys a production advantage over his competitor in an adjoining jurisdiction who is subject to rigid application of the most strict requirements. On the other hand, there is discrimination to the employee, for in the one jurisdiction the hazards of his occupation are materially removed, but in the other he pays the penalty for the negligence of others.

MAKEUP OF STANDARDS COMMITTEE

It was a recognition of these deficiencies that brought together in Washington (D. C.) on Jan. 15, 1919, a conference under the auspices of the Bureau of Standards. As a result of this conference the American Engineering Standards Committee was created. This committee is composed of five national engineering societies and was charged with the responsibility of creating standardized safety codes. The responsibility called for the creation and selection of sponsor bodies and the assignment of the various codes or subjects to the respective sponsor bodies. Up to the present time some sixty-five of these codes have been created and the sponsorship determined. Codes like "Abrasive Wheels," "Ladders,"

"Head and Eye Protection" have already been completed and adopted in some jurisdictions. It is hoped that these codes, when completed and approved, will be universally adopted, and the sponsorships are so designed that the greatest weight of public opinion will be brought to bear in support of universal adoption.

The "Textile Safety Code" was originally assigned to the National Safety Council and the National Association of Mutual Casualty Companies as a joint sponsorship. Some two years ago the joint sponsorship made its designations and the executive committee handling the code began its activity.

The first public appearance of their efforts took the form of a Safe Practice Pamphlet numbered T-1, issued by the National Safety Council and captioned "Cotton Mills." A short time after the appearance of that publication, changes in personnel and business connections made it necessary that the Textile Code Committee be reorganized. For this purpose representatives of the Engineering Section of the National Society of Mutual Companies and representatives of the Textile Section of the National Safety Council met in Boston, in January, 1922. The whole code and its requirements were fully discussed, a plan of action was established and a reorganization effected. Mr. William S. Ide of Slater & Sons, Inc., Webster, Mass., was appointed Chairman of the Executive Committee with myself as Secretary.

The program of procedure adopted at that time was to the effect that each member of this nucleus Executive Committee should assume responsibility for different elements of the code. It was assumed that each member would become perhaps chairman of a sub-committee, reporting back on completion of the first draft under his particular jurisdiction. In this way assignments were made for "Woolen and Worsted," "Jute Spinning and Weaving," "Knit Goods" and "Finishing and Dyeing." The Cotton Spinning and Weaving pamphlet, heretofore mentioned, was accepted as the first draft on that subject.

PRELIMINARY REPORTS SUBMITTED

Reports from the various sections are briefly submitted, as follows: "Nothing further has been developed on cotton spinning and weaving. On woolens and worsteds a preliminary report is in the hands of the Secretary, which lists the machines and the specific hazards which should be considered. On knit goods a preliminary draft of a diagram setting forth processes and machines is in the hands of the Secretary."

It was anticipated that a preliminary draft of the code for knit goods would be available at this meeting. The designated sponsors for finishing and dyeing have furnished your Secretary with a report which is simply a conclusion that their efforts should be deferred until at least the preliminary work of the other elements has been completed.

In connection with dyeing and finishing the Master Dyers' Association of Pennsylvania has been instrumental in creating a set of safety standards applying to textiles, dyeing and finishing for that State. Mr. Hitchcock of the American Mutual of Boston, and also the writer, attempted to have this particular set of standards deferred, in considera-

tion of our activities, and sought to get co-operation between the Pennsylvania interests and ourselves. This code, however, was so near completion that the Pennsylvania interests deemed it advisable to finish their program.

In any event, that code, in tentative form, is now out and a copy is in the hands of your Secretary. Its development is materially different from that of the specific codes at present completed. It seems to have been created without any thought of correlation to other future codes—a matter which has been carefully considered by a special committee of the American Engineering Standards Committee, known as the Correlating Committee, of which Mr. Sidney J. Williams is Chairman.

DIFFICULTIES ENCOUNTERED BY CODE COMMITTEE

So far I have simply stated the development of the code and its present status. It seems opportune to draw your attention to some of the difficulties which the Code Committee will encounter and in so doing to enlist your aid, suggestion and advice in an attempt to surmount these difficulties.

Fundamentally we are dealing with a trade code, as compared with a specific product or a specific operation code. The ladder code, the power press code and the abrasive wheel code all deal with a specific, tangible machine or operation of limited scope and application.

The textile code deals with everything from the raw material to the innumerable finished products commonly accepted as textiles. In some of the code work there came a question as to where the code should begin. Our concern is where we should stop. This question was propounded to the correlating committee at their last meeting in New York and they adopted the speaker's suggestion that "the textile code should stop at the point where the fabric becomes a raw material for the needle trades." If there is any better definition of that stopping point, or any other stopping point more applicable to the requirements of the code, your suggestions are solicited.

I have intimated that there is no difficulty as to where we shall begin and, offhand, one would say, that the starting point is raw wool and raw cotton. But how about artificial silk, where the starting point may be a tree and the initial process one of chemistry? The finished fabric is a textile product, but where, in the scheme of things, does the jurisdiction of the chemist terminate and that of the textile operator begin?

We have some of the difficulties in the knitting mill—hosiery mills—to which the definition of our stopping point does not apply. We have, furthermore, an overlapping as between cotton and wool and silk. We have reworked wool and we have reworked cotton. A cotton knitting mill making fleece-lined underwear has a very large department where cotton is reworked by the wool process. Here our wool and our cotton overlap. We have knitted fabrics of cotton, wool, or silk from the circular knitter and we have either a cotton, silk or mixed silk fabric resulting from the so-called "warp" knitter. These constitute but a brief summary of some of the difficulties that are apparent at the present moment.

CHARTING PROCESS AND MACHINES

Your Secretary has under way an elaboration of that diagram prepared by Mr. George Bigelow of the Liberty Mutual Insurance Company, which was captioned "Cotton Spinning and Weaving," and constituted a chart of processes and machines. Your Secretary aspires to a chart which will start on the one side with a bale of cotton, on the other with a bale of wool and somewhere else with silk, and will develop the various processes, together with all the overlapping, that there may be published for the benefit of all parties at interest a complete diagram of the textile industry. I think you will agree that this is a laudable ambition, the execution of which appears to be at this time a very large contract!

Whereas this report on the textile code, summed up, is simply one of progress, it may be safely said that the members of the Executive Committee have, during the past six or seven months, given serious thought and consideration to the requirements of their individual responsibilities. We are about set to go ahead and produce real results. The undertaking is so large and so complicated that, by common consent, we are "making haste slowly." I have predicted in an article appearing in the *Daily News Record* of March 9, 1922, that the code would take at least two years. I shall be surprised if it does not take longer.

Every consideration seems to develop complication. We are dealing with an industry to which little real thought has been given in the matter of accident prevention.

CHAIRMAN IDE: We have a paper by Dr. Henry C. Marble, but as he is not able to be here we will ask Mr. Petibone to read the paper.

DISEASES OF OCCUPATION IN THE TEXTILE
INDUSTRY

DR. HENRY C. MARBLE, AMERICAN MUTUAL LIABILITY INSURANCE COMPANY,
BOSTON, MASS.

The textile industry in the United States is a large and important part of our industrial life. The mills, formerly located to a very considerable extent in New England, now extend well over all of the Eastern States, with a large number of new mills in the South. They employ all grades of help—young, middle aged and old—both men and women; some continue their employment for many years. The mills are now large and whole cities or towns have grown up about them.

In trying to find out just what particular hazards the textile industry carries, I believe this could best be done by taking three individual cotton mills and briefly looking into the causes of lost time by the workers. In order to do this I studied a very excellent set of statistics furnished by Mr. Boyd Fisher of the Lockwood Greene organization and selected from them three cotton mills located as follows:

1. A cotton mill in a small city, in which the mill is the only industry and the workers live in the company's houses. This city or town has no other industry.

2. A cotton mill in a moderate sized city, in which it has been possible to follow up the cases with fair accuracy.

3. A cotton mill located in a large industrial mill center.

Statistics for the year 1921 were used.

Such a group of statistics may not accurately represent the true state of affairs in cotton mills in general. The fact that a good set of records is available shows that there has been medical work done and that the health conditions there are probably better than in mills without such clinics.

The question before us today is: Why do mill workers lose time, through sickness or through accident, and in what proportion? Is there any health or accident hazard peculiar to the cotton mill?

CAUSES OF LOST TIME

From a study of the records of these three mills I find, first, that ten times as much time is lost by sickness as is lost by accident. Each worker in the mills lost approximately 3.7 days each year through sickness, while each worker lost one day in three years through accident. The exact figure are as follows:

Employees	No. Accidents		Days Lost By Accidents		Sickness Cases		Days Lost By Sickness	
	Total	Per Emp.	Total	Per Emp.	Total	Per Emp.	Total	Per Emp.
1,201	879	0.7	355	0.3	1,585	1.3	2,932	2.4
2,027	1,193	0.6	627	0.3	2,479	1.2	7,363	3.6
979	413	0.4	360	0.4	1,939	2.0	5,219	5.3
4,207	2,485	.6	1,342	.3	6,003	1.4	15,514	3.7

Such a ratio of sickness to accident is not unusual. Sickness, therefore, is ten times as important an element in the health of the working force as accident. If sickness is ten times as important we should study it with corresponding care.

What are these sicknesses that keep the worker out more than three and one-half days a year? Are they peculiar to a cotton mill? Are they aggravated by mill conditions?

The greatest cause of lost time, and the leader in the list of sickness, is coughs, colds or sore throat. I have grouped them together and will call them acute infection of the respiratory tract. One quarter of all time lost was from coughs, colds or sore throat—28 per cent of all sickness. At first thought, this figure seems very high, but comparison with other industries in New England employing the same ratio of women and men gives me the following figures:

In the New England Telephone Company, 61 per cent of all loss of time was caused by coughs, colds and sore throat.

In a large department store employing both men and women, 20 per cent of the lost time was due to the same cause.

PREVALENCE OF HEADACHES

In the statistics of these three cotton mills, only five cases of tuberculosis were found. In comparison with other industries surely the cotton mill is not extraordinarily high.

The next most important condition, and the one which occupies the second place on the list, is digestive troubles; 12 per cent of the cases

were suffering from digestive difficulties of one kind or another. This, to me, offers an interesting problem for study. The lack of outside exercise, the concentrated diet and the age of the workers all probably enter in as factors. Further investigation into this question is necessary.

Headaches represent $7\frac{1}{2}$ per cent. What industrial significance have these headaches? Whether or not the noise and the chatter of the great mill in any way aggravate these headaches one can only surmise. Eye strain must inevitably play a part, and proper refraction will help.

Diseased teeth represent $2\frac{1}{2}$ per cent; boils, $3\frac{1}{2}$; eye conditions, $2\frac{1}{2}$.

In all, I see nothing that might wholly be considered as a particular hazard of this industry. The high instance of digestive troubles and the headaches surely will bear further investigation. The acute respiratory conditions, although high, are not out of proportion to the percentage found in similar industries. They always are high where large groups of people are gathered in one room.

Relative to the accidents: One-half the accidents in cotton mills are to the fingers. The hand, wrist and arm make up 63 per cent of the accidents, with the hand representing a full 50 per cent. The remainder are fairly evenly distributed over the rest of the body, the eye receives 6 per cent. These accidents to the hands and wrists seem, to me, to be mainly accidents of speed. The machinery works rapidly, the shuttles fly fast, the whole mill is alive with speed. The weavers work with nimble fingers and the accidents in general are small, mostly occurring on the hand, wrist and arm, and are of relatively small duration.

In conclusion, we can only show that in three cotton mills sickness was responsible for ten times as much lost time as accidents. The sickness being sore throats, bronchitis, digestive difficulties and headaches. The accidents represent only one-tenth of the loss of time and these were mainly directed toward small injuries of the hand, wrist and arm.

DISCUSSION

DR. PRICE: The paper bears out my contention that it is absurd to speak about diseases of clothing or textile workers. To say that such workers suffer from three to eight days a year from sickness means nothing to you or me. It would mean something if you took a group of twenty other occupations and knew how many days they suffer. We know from statistics that all workers suffer from nine or ten days' sickness—ten days for women and nine days for men—a year. But it is not the occupation that causes the sickness, it is the condition of the shop, the humidity or open windows. To blame the occupation is absurd. Sickness may be due to one thing or another. It may be due to the fact that girls eat pickles and pie for lunch and that their diet is so low that the sickness is due to diet rather than occupation. Surely you cannot blame the occupation for it.

MR. C. E. PETIBONE (American Mutual Liability Insurance Company, Boston): If Dr. Marble were here he would very likely agree with Dr. Price. Dr. Marble came up to my office one day and said: "Who assigned this subject?" I passed the buck, said I did not know anything about it. "Well," he said, "I find on investigation the answer is that there is not

any disease of occupation and the best thing to do is not to write anything about it at all."

I think Dr. Marble endeavored to bring that out in his paper; he was not calling attention to five cases of tuberculosis. Five cases of tuberculosis in 2,000 employees is a small number, and I am sure, in my talks with Dr. Marble, he felt, from investigation of a great many of employees that have come to him, that the textile industry was free from any occupational disease or any disease that would be peculiarly due to the textile industry. They only suffer from the same conditions that anybody would suffer from.

OCCUPATIONAL DISEASES AND DISEASES OF OCCUPATION

MR. BOYD FISHER (Lockwood, Greene & Co., Boston): Those of you who attended the Safety Council meeting in Boston last year will recall that a member of the State Industrial Commission of Wisconsin made a talk on disease of occupation, urging that they be brought within the purview of the compensation law in addition to occupational disease. The distinction made between disease of occupation and occupational disease was that occupational disease was something peculiar to the members of a certain occupation. The disease of occupation, by contrast, was a predisposition to certain general disease, which, under certain conditions and unrestrained, seemed to be rather more prevalent. The official who spoke last year thought that the disease of occupation ought also to be compensated for.

I believe, to a slight extent, there is a predisposition to a certain type of disease in the cotton industry. I have given more attention to workers in the cotton industry than to any other trade and I am fully convinced that a worker can be overworked and also be underworked. Both of these conditions may cause sickness.

I am convinced, in the cotton industry particularly, where the hours are long, that in certain types of work the body does not function properly, the nerves become weary and certain things result. I believe that has a tendency to make the worker suffer from digestive trouble; has a tendency to make us resort to stimulants.

There is not enough good, healthy muscular exertion in certain types of work, and long hours may be wrong in such occupations precisely because it keeps people from getting out where they can play. It keeps them from getting proper exercise, where they can stretch their legs.

It is perhaps true, Dr. Price, where we have a larger extent of digestive troubles and headaches in industries, in certain types or occupations in the cotton field, that it is due to the fact that there is so little activity, and I think such a condition would justly constitute a disease of occupation.

TEXTILE WORKERS WERE "JUST TIRED"

MRS. HILDRED M. HAWKINS (United States Department of Labor): Would you think that was the reason, when talking to a number of textile workers and asking them for their reasons for loss of time, the answer they usually gave was "I was just tired"?

MR. FISHER: That is probable.

Mrs. HAWKINS: They all said: "Because I was tired. I have to stay out for a few days just to get away from it—get away from the whole thing."

Mr. FISHER: You may recall, when the textile industry began in this country, it grew out in the farming districts and was a family industry. The farmer would do his work on one day while his wife would tend to the textile industry; the next day the man would take care of the textile industry and the wife would do her housework. They would alternate and that allowed them to maintain their health, made it quite possible to work as long as there was daylight. For that reason we hear of thirteen, fourteen and fifteen-hour workdays twenty-five or forty years ago. Apparently, it was not so deadly at that time as it is at present, because now they are more inclined to stick to their trade and do their work day by day.

Mr. C. F. HORAN (Hood Rubber Company, Watertown, Mass.): Will Dr. Price tell us what causes nervousness and other troubles among the textile workers?

Dr. PRICE: In the first place, please, I do not wish it understood that I deny the effects of the occupation on health—that there are no occupation diseases. I have written rather extensively on the subject and I know there are many occupations and that most occupations have some effect upon the person. What I want to emphasize is, of course, that this is a study which needs to be pursued by scientific methods and by comparison.

EXCESSIVE HUMIDITY PRODUCES FATIGUE

As to your question: I believe you will find the answer in the so-called "blue papers" that have been printed by the British government after an inquiry into the effect of humidity in textile factories. A scientific committee studied the industry thoroughly for two or three years and a great many of the officials and textile workers were asked to appear. Their conclusions are quite valuable.

They determined that excessive humidity in textile factories is detrimental to the health of the workers; that fatigue is due to excessive humidity. This study was made to help the health of the workers and was really scientific. It was not sufficiently so to give comparison for use in other trades but in its own limitation it was an excellent one. Anyone who wishes, I believe, can get those papers.

Mr. E. F. KING (H. A. Hale, Jr., & Co., Boston, Mass.): I notice that quite a few machines manufactured abroad are guarded much more extensively than American-made ones. For instance, all the machines in the French system worsted mills are very well guarded. From an insurance standpoint, that is very valuable. But the machines manufactured in this country are only partially guarded—the gears are just guarded at the point of contact and the remainder is open. I would like to know if manufacturers of machines could co-operate with textile manufacturers relative to the safeguarding of machines?

MACHINES GUARDED BY MAKERS

DR. PRICE: In England as well as Switzerland, France, Germany, Russia and, I believe, Austria, the law calls for machinery to be guarded by the machine manufacturer. For this reason any machinery you get from there is safeguarded.

MR. KING: That would be an important point for the textile code.

MR. A. B. COLE: The question of guarding machinery is a large one. It has been, up to the present time, impossible of practical solution by reason of the great difference in each individual State requirement. A man in Illinois makes a machine which goes to Pennsylvania and he finds that he must submit to minute detail requirements, as set forth by the department having jurisdiction there. His next machine goes to New York and another to Massachusetts—and all over the country. He finds as many sets of standards, as many details of requirement, as there are markets for his product. That is the cause of half the confusion.

It is a recognition of that situation which has brought about this effort to standardize. If we had the same standard in Pennsylvania, Massachusetts, New York and Illinois we could get the co-operation of the police authorities in enforcing them and all this trouble would be practically eliminated. We can make the law so specific for the guarding of these machines that it will matter not where the machine comes from it will meet all requirements.

The Section then adjourned.

Woodworking Section

August 29, 30 and September 1, 1922

HARRY GUILBERT, Chairman

The Pullman Company, Michigan City, Ind.

WALTER S. PAINE, Vice Chairman

Research Engineer, Aetna Life Insurance Company, Hartford, Connecticut.

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Treasurer, A. T. Stearns Lumber Company, Boston, Mass.

TUESDAY MORNING SESSION

CHAIRMAN GUILBERT: We will dispense with a formal opening of the Section and proceed to business. Our first paper will be given by Mr. James C. Wilson.

SAFE PRACTICES IN LUMBER YARDS

JAMES C. WILSON, ASSISTANT SECRETARY, LUMBERMEN'S MUTUAL CASUALTY COMPANY, CHICAGO

This subject, covering, as it does, all forms of lumber yards should properly divide the different yards into classes, although the same general hazards appear to the speaker to be common to all kinds of yards. For illustration, we find that we are considering five different kinds of lumber yards divided as follows: 1. The straight retail lumber yard, either in the city or the country town. 2. The yard handling lumber, building material and coal. 3. The yard with machinery; a rip saw, cutoff saw and sometimes a planer. 4. The yard in connection with a factory, such as sash and door, phonograph, furniture factory, etc. 5. The yard in connection with a sawmill. We have found that all these yards employ workmen whose carelessness seems to be the greatest factor in accidents. The human element enters into these accidents very frequently, but we find a better class of workers in the smaller yards where the men are generally steady, regular employees. This is particularly true in the country towns, when ten or twenty years of service is not uncommon.

PILING, DRIVEWAYS, SHEDS AND RAILROAD SWITCHES

As a suggestion for safe practices in all yards, I wish to submit the following: The first thought in piling is to secure a proper foundation and keep the same in good repair. Where gravel is close and cheap put in concrete. Good cedar posts are next in permanency and economy. In several cases we have investigated accidents and found a pile had toppled over because it was built on ground where bark or sawdust was used as a filler and timbers laid on this foundation had settled, permitting the pile to go over.

The height of piles is a serious problem in congested yards; where space permits they should not be over twenty-five feet and as uniform in height as possible. Where derricks are used to stack, a regular inspection should be made of all equipment. Hooks must be sharpened regularly and the boom given a weekly inspection, while cables and sheaves require constant care. Boards used for steps up the sides of piles should be carefully selected of straight grain without checks or knots. It is of particular importance that high piles, and all piles which are to stand any great length of time, have the tops securely tied down, as many men are injured each year by boards blown from the top of lumber piles.

Driveways are next to be considered as they are in constant use and must be kept in first-class condition. Dirt drives should be higher than the yard, unless it is well drained. Cinders are in very general use and both dirt and cinder drives should be gone over regularly to fill up chuck-holes and ruts. In the old days many yards, especially at sawmills, used planks, but planks are very expensive now, hence these drives are found in bad repair. They should be removed entirely or kept in good condition. This brings us to concrete which in the new yards is now being extensively used—once in, it stays, and greatly facilitates handling stock. In all yards the railroad and switch tracks should be planked level with rails and all switch frogs blocked.

Sheds have been provided at nearly all yards for storing dried lumber and building material and most of them are double decked with plank runways. These sheds should be wide enough to permit at least a thirty-inch walk, which should have a railing made so that sections can be removed when storing extra long stock. This railing, if made like rollers, is a great help in piling or loading. Permanent ladders extending above the platform at regular intervals are much better than movable ladders. If stairs are installed they should be equipped with substantial hand rails.

Railroad switches present a hazard to most yards, some of them running inside into sheds; most of them pass along the yard. Wherever there is a door or driveway opening directly onto a track it should be guarded with a gate or bar and a warning sign should be displayed. Yard employees will do well to co-operate fully with train crews when switching inside the yard and if a car is to be removed while being loaded or unloaded all yardmen should get out or off the car and stay clear until the train crew is through switching. We have a large number of accidents reported where employees are injured by switching cars.

LOADING OF WAGONS, INSPECTION, THE CHAUFFEUR

Loading of wagons or trucks is a very important factor and is generally given close attention by the manager for delivery cost soon eats into profits. Where trucks with roller beds are used and where trailers are loaded waiting the tractor, careful attention must be given the supports of these loads. Such equipment must always be in first-class condition. Chain binding, by use of patented binders, is very common but once in awhile one of these as well as the old-fashioned hickory boom will fly up and knock out a few teeth. When long timbers extend beyond the main load a red flag should be used as a warning (some cities require this by law, all should comply). This prevents pedestrians and automobiles from running into the timber.

Inspection of all equipment is a vital necessity for a well-regulated yard. In the smaller ones the drivers attend to it and see that wagons, chains and harness are all in first-class shape. When a fleet of trucks and trailers is used a competent mechanic sees to it that all equipment is in good order. A truck out of commission is a losing proposition, while one in bad order endangers the employees as well as the public.

The chauffeur has presented a problem not much noticed when teams only were used. This is a public hazard which begins at the gate. All entrances should be watched carefully and a warning signal given before driving onto the sidewalk. This will prevent many serious accidents. Once on the street a carefully selected chauffeur is a good investment. It seems needless to take time and space here to dwell on careful driving, for it is a big subject and in our opinion the only solution to street accidents rests with the drivers. As a thought on this question it has struck us forcibly, time after time, when checking truck accidents, that the employer knew little if anything about the chauffeur. When he employs a clerk or bookkeeper a careful investigation is made, but ordinarily he gives no thought to the driver. He places in the driver's care a five or six thousand dollar truck with one or two thousand dollars worth of material and sends him out on the streets. A careful driver protects his employer's property and that of others but a careless chauffeur is certainly a dangerous man.

SPLINTERS, HERNIA AND MACHINE HAZARDS

Splinters are the hoodoo to the lumber worker and are so common that the usual procedure is to pull the splinter out and forget it or have Bill take his penknife and cut it out. Then infection follows, with loss of time and often an operation with a permanently crippled hand or arm. Every splinter accident should be reported to the manager and the injured man sent to a doctor.

Of specific suggestions on various yards the ones for yards handling fuel and building material are most common: Building material is heavy and sometimes hard to handle and should always be neatly piled. The condition of yards plays an important part in accident prevention, for a yard which is cluttered up with refuse and short boards—with lumber piles falling over—endangers employees and the buying public as well. All yards should be fenced in a substantial manner. This keeps out children

and tramps. This brings up the thought of the fire hazard, which is always greater in a dirty, poorly piled yard. Safety and fire rules are the same on this point. Sufficient clear space between piles and buildings, clean driveways and between piles; no rubbish, water barrels properly distributed and, in the larger yards, watchman service, reduce fires and accidents.

If coal is stored in dumps the trestle and chutes should be in good repair. If mechanical loaders are used all gears must be enclosed. A serious hazard in coal yards is the caving in of piles, especially in winter when the top is frozen. A careless laborer will shovel out from the bottom and undermine the pile. Yard bosses should instruct new men closely on this point.

Hernia seems to be a common ailment for men handling cement and roofing and employers should use care in selecting men for heavy lifting. If complaint of injury is made send the injured man at once to a surgeon for examination.

The machine hazard in small yards is bad, because their use is only periodical and generally a man is put on a rip saw whose regular job has been scaling or piling—special attention should be given such work and all machinery should be fully guarded. If the saw is in a congested corner, move it out and give it plenty of room.

Yards in connection with furniture factories and sash and door plants usually are in cities where piling space is at a premium and my previous remarks on piling, stepping and tying tops applies here, with emphasis.

The sawmill yard has its own troubles with weather conditions. Northern mills are located where snow is common four or five months in the year and slippery boards, all of them rough and full of splinters, must be piled or loaded into cars regardless of the weather. Summing up, the writer believes that the employee in the lumber yard controls his own fate and his safety rests largely on his own shoulders. "A careful employee is the best safeguard" and the safe practice is to practice safety.

DISCUSSION

MR. WALTER S. PAINE: It is our duty not only to select men who are in physical condition to do lifting, but to teach them how to lift. One of the best pieces of work the American Radiator Company and the National Safety Council have done was to send out bulletins teaching men how to do this kind of work; our company may have had some cases of hernia because men did not know how to lift the burden, rather than because of their physical condition.

DR. LEROY PHILIP KUHN: Those of us who have been interested in the safety movement for some time cannot help but remember that years ago safety activities were confined largely to the plants of the big manufacturers. The particular thing about Mr. Wilson's paper, which struck me rather forcibly, was the fact that safety is gradually getting into the smaller industries. In other words, it is going out to a man who needs safety just as much as the man who is employed in the large industries.

Another point was the necessity of splinter infections being cared for by surgeons. It has been my unhappy experience to take care of quite a large number of such infections after they have been cared for by the foreman or somebody in connection with the plant. Such a case, cared for in that manner for two or three days, opens a beautiful field for the most serious type of infection—one that gets into the deeper tissues and down into the tendon sheaths, and eventually destroys the movability of the finger. If a splinter accident is treated the first day, or even within thirty-six hours from the time the employee sustained the accident, as a rule infection would be minimized; the tendon saved, and infection would be controlled.

As a surgeon I cannot urge too strongly having finger splinter infections cared for on the first day. One of the most serious cases I have ever had of septic infection started with a little splinter in the index finger. It was treated by the employee, by his foreman and finally one of the men in the office of the lumber yard treated it. He came to me about the tenth day following the infection. The man nearly lost his life before we got the infection under control. These little things may be most important later on.

PROTECT FEET OF LUMBER YARD WORKERS

MR. CHRISTIE: One little point has been overlooked—proper protection for the feet of workmen in lumber yards. We have colored help and colored men do not like to wear good shoes; quite frequently they get a sliver in their foot. Only a few days ago we had one of the nastiest sliver accidents I ever saw; the sliver entered the bottom of the foot and came up through the top.

MR. W. A. WILSON (Frank Graves Sash and Door Company, Los Angeles, Cal.): It is important to anchor cars in a lumber yard, where there is a train on the track. We have had one or two serious accidents due to the car foreman and his help allowing cars to roll while unloading was going on. See that cars are properly anchored by either trainmen or yardmen. This will prove a safe practice in lumber yards.

CHAIRMAN GUILBERT: Mr. Marsh is unable to be present. The subject of "Safe Practices in Saw Mill Operation" will be considered as a round-table discussion.

MR. W. A. WILSON: Is this meant for a regular saw mill operation or saw mills and woodworking mills in connection with car building?

CHAIRMAN GUILBERT: Not necessarily. Mill operation—I think that would apply anywhere.

MR. PAUL BEHN (The Pullman Company): There is an excellent chance to prevent accidents by teaching the men proper methods of handling material, keeping your machinery in condition and making it a point to use guards.

PROBLEMS OF SAFEGUARDING VARIETY MILL

MR. J. C. WILSON: The saw mill, particularly the manufacturing mill in connection with logging operations, is one which can be safeguarded much better than the variety mill, like the woodworking plant of the

Pullman Company, because the mill and the woods, where the logs are brought in, are what we call a big operation. They don't change the saws and there is absolutely no excuse for taking the guards off. Generally they chase in and out and should be completely boxed and guarded; do not allow anyone in the transmission room except the oiler. Whether it be a circular or band mill, with what they call "niggers," kicking the logs over on the jacks, each one has a problem, and once guarded should be always guarded.

A saw mill is a nice place for a safety organization. I have known sawyers to be on the same job—on the same saw—for thirty-five years. If you get your edger and live rolls guarded, your overhead platforms and machines properly taken care of, you don't have many serious accidents in the big saw mills.

In city mills, where they cut dimension stock, a lot of it is handled by electric cranes—we have some in Chicago that are fully equipped for the mechanical handling of lumber. We have mills there that will take a piece thirty feet long, turning it out at the other end, never touching it by hand. These mills are properly guarded.

Mr. R. F. THANLER (Buick Motor Company, Flint, Michigan): Mr. Wilson spoke of hernias in the woodworking industry, saying that you should hire strong men for your jobs. I have known strong men handling lumber who strained themselves; they could not handle the lumber as well as lighter men. A small man who knows his business, one who has handled lumber all his life, will handle more material than a strong, able-bodied man, because he has the knack, as we call it. I have known big, husky fellows to come in on the job, try it out awhile, and quit, right alongside of smaller men, who have not half their weight or half their strength, but the smaller man had the knack of handling the lumber. In hiring men for your woodworking and lumber yards, is that taken into account in every case?

EXPERIENCED MEN POSTED REGARDING HAZARDS

Experienced woodsmen are the men who can handle lumber, as you know; they cut the trees as they used to in the old days and are raised with an axe in their hands.

In bringing logs from the pond to the mill you use a certain amount of conveying machinery. It is very hazardous for men to ride this conveyor, as they sometimes do, or ride the logs. Is any provision made for railings or footwalks along the conveyor? What methods are best for unloading cars? In small yards, where they have no machinery to do this work, a man has to get down and knock out the chain; if he is not a first-class man and knows his business he is liable to be caught by the rolling logs.

At the Buick plant, in Flint, we have no extensive lumber-yard operations—we handle just enough lumber to make our open jobs. We have a lumber storage yard outside, with neatly arranged piles of uniform height and dry kilns. We do not have many of the hazards common to the lumber industry, such as where rough lumber is brought in and cut in semi-rough condition, but we do have the dry-kiln hazard. Cars are

run into the kiln, loaded, and go out over a transfer which carries them in a transverse direction. We have had trouble in getting these cars from the kiln, and I would like to know of good devices or improved methods for handling cars, holding about 38,000 pounds of lumber. We have devised a clamp which fits onto the rail to hold the car until the men are ready to let it out—it serves as a bumper. I will be glad to receive information on this subject.

I would like to ask regarding first-aid stations. The workman is confronted with the splinter hazard, and we know that small injuries are sometimes the bad ones—little things lead to big ones, and, undoubtedly, first-aid stations should be located in lumber yards, but I don't know to what extent they are used. We have none in our yard, due to the fact that there is a first-aid station close by.

SPIKED SHOES SELDOM WORN NOWADAYS

Mr. J. C. Wilson: I did not discuss the questions of log hauling, unloading of cars, or things of that kind. From the logging pond to the deck the first-class equipment has a runway at least three feet wide, with cross cleats, and a hand rail on each side, because very few lumber jacks or the fellows on the log pond wear spiked shoes. It is very dangerous for a man to ride on the chain or log—once in awhile a log will swing around, break the rail, tip over and go off the runway.

Unloading of cars has caused a good many fatal accidents and many minor accidents are caused by logs tipping over when unloaded incorrectly.

A car now in use by some of the railroads has a device running its full length, and by turning a lever the side clamps are knocked loose. The old method was to use a six-inch stake at each end of the car and one in the middle, but with that way of loading, when the logs were rolled off, a lot of the boys were hurt. I went down with a load of logs myself, one rainy day, and the Lord only knows how I got out without getting killed, but I didn't get even a bump. There is now a mechanical device which will dump the whole side at once and it is very safe.

The first problem of tracking into a dry kiln is to get a proper foundation. If you put in a good concrete foundation you can use little cars that will carry a good load; the heavier load you carry, of course, the heavier equipment you will need.

FIRST-AID CABINETS AND THEIR USES

Last week I talked with a man who had just perfected a Dakin solution, similar to the one used so extensively in the world war, except that the solution put up by Drs. Dakin and Carroll had to be used fresh—it lost its properties in less than twenty-four hours. This man has worked out a stabilized Dakin solution that will retain its strength in an open bottle for one year, losing less than one-half of 1 per cent. It will soon be on the market as a standard in first-aid kits instead of alcohol and boric acid.

We recommend a first-aid kit for every yard and every plant; the bigger the yard the greater the need. I think there should be a first-aid cabinet for every ten men in a plant, but don't stick it up on the wall

and leave it like a fire extinguisher. Have a near-by workman take charge of it if he has been properly trained to use its contents. You can destroy just as much tissue as you save with iodine if it is improperly applied and the cabinet is valueless unless properly maintained and used.

MR. H. O. PRESTON (Texas Company, Port Arthur, Texas): We deal principally in oil but we manufacture some cans and require considerable lumber for the cases; we have a fairly good sized shook mill. For a time we had a number of first-aid kits but as our force grew in numbers we found that we could obtain better results through the employment of a nurse. Under the direction of a local physician she took care of all minor injuries.

We used to have quite a number of accidents from men being caught in belting, but when re-building, as the result of a fire, all belting was placed below the floor level. One man is in charge of oiling and another of the belts. No one is allowed under the mill except the foreman, the oiler and the belt man. This has been quite a factor in helping us reduce accidents.

We have 150 employees and in a plant of that size you can carry a full-time nurse. She makes out all accident reports and visits the sick or injured in their homes, in addition to her usual work.

CHAIRMAN GUILBERT: We will now have a paper by Mr. G. S. Goldwater.

PREVENTING LUMBER-YARD FIRES

G. S. GOLDWATER, FIRE MARSHAL, DETROIT

The subject of "Fire Prevention and Fire Protection in Lumber Yards" is one that has many sides and which can be treated from several angles. The destruction of lumber by fire is a constant waste of material resources which the Nation can ill afford. The enormous losses by fire each year are due largely to the carelessness and negligence of employees, although many are the result of natural causes and many fires in lumber yards originate through incendiarism. A large proportion of these fires are preventable and a moderate amount of knowledge and care is all that is necessary to greatly reduce this class of losses. The proper care in preventing fires, and limiting their spread when started, is chargeable to lack of precaution, to negligence, ignorance and carelessness. What precautions you should take depend upon your individual problems; in no two cases are they just the same; they depend on conditions, not theories. You know the condition in your yard or plant and it is up to you as business officials to recognize them.

The most important feature in fire prevention is a system of regular and rigid inspections. In lumber yards where hazards are many, inspections should be made daily. These inspections should be very thorough and all recommendations from a fire-prevention standpoint should be made in writing to the office; hence the inspector should be a man of intelligence and good judgment. His duties are: 1. To make regular inspections and report his findings in writing daily. 2. To study the fire prevention and protection equipment; to understand their operation and to keep informed as to their condition. 3. To report on work done by the cleaners.

4. To see that waste bins, cans, etc., are used by employees. 5. To see that all company rules are obeyed, especially that forbidding smoking. To report violations of rules. 6. To check watchmen's reports and to instruct watchmen in the handling of the fire appliances, the starting of the pump, turning in fire alarm, etc. To see that fire pails are kept filled. 7. To report instantly wherever fire appliances are found to be missing or defective.

If it is impossible to employ an inspector exclusively for the purpose, this work should be done by the superintendent or manager; department heads should be held responsible for the condition of their sections. In spite of all your care and precautions fire will break out. Hence you must be prepared to extinguish it, if you can, or to control it until the fire department arrives.

FIRE-EXTINGUISHING EQUIPMENT

For the plant or yard the necessary number of employees, either workmen or watchmen, should be organized into a strong and well-drilled fire-fighting organization for both day and night service; the number must be sufficient to handle effectively the hose lines taken off the yard main system and must be regularly drilled in the handling of such lines, ladders and other fire equipment, and be able to assist effectively the city fire department which may respond to the fire at the plant or yard.

Yard fire hydrants should be standard, with hose house built over the hydrant to hold the fire-fighting equipment. These hydrants should be installed throughout the premises, the number depending on the capacity of the fire pump and area of yard. Hose should be coupled and attached to hydrant with playpipe ready for immediate use. Hydrants should be provided with wrench, and hose should be folded so it can be drawn out without twisting or kinking. See that hose house doors open high enough above the ground so they will not be obstructed by snow.

The protection of yards is usually intrusted to watchmen, who guard against the encroachments of evilly disposed persons and exercise supervision, especially at night, over the care of the plant or yard in regard to hazards and general maintenance. Too often a watchman employed is either physically unfit, not sufficiently intelligent, or unable to speak English. This is foolish economy because, especially at night, the premises are practically intrusted to the sole care of such man or men. The importance of the work of a watchman warrants securing a man with the proper qualifications, the following being the most important: 1. Good character and intelligence. 2. Physical strength and soundness. 3. Ability to speak English or other language used by employees. 4. Sufficient mechanical ability for his job.

GUARDING, TO BE EFFECTIVE, MUST BE THOROUGH

Guarding must be thoroughly done to be effective; halfway measures are a waste of time, effort and money. Frequent tryouts of the guarding system should be made by the executive heads of the plant to prove the system. Guarding is most important in open lumber yards, where incendiaries are more or less active. The foregoing may be said to give a

brief review of the present safety needs of large and small lumber yards. They have been considered from the mere standpoint of such common-sense observations as may be exercised by anyone.

LUMBER YARD FIRES

Lumber yards which cover large areas, where enormous quantities of stock are stored, both in the open and in sheds of wood construction, are a menace from the fire-hazard standpoint to any town, village or city except in cases where they are in an isolated location. The layout of the yard should be that roadways would lead to the front of each and every lumber pile or shed contained within its area, through which trucks may be driven for loading or unloading purposes. These arteries of travel are very useful, not alone in carrying on a fire-extinguishing operation, but in many instances, because of their width, prevent fire from communicating to lumber piled on opposite side. The most serious situation to be apprehended in any lumber yard is a fire originating in one of the large wooden sheds (usually erected to protect stock from the weather), in that it immediately places in jeopardy a large number of piles of lumber adjacent thereto.

Delayed discovery of a fire originating in one of these sheds implies that considerable heat will be radiated in all directions, of sufficient intensity to ignite the lumber contained in the surrounding piles for a considerable distance. The hazard next in importance to that previously described would also be produced by belated discovery of a fire in a pile, in that a quick extension of the fire is certain to occur and involve the adjoining piles on sides and rear. To make the point clear, it is intended to say that where a fire originates in a lumber pile and it is discovered promptly, and proper action is immediately taken to cause its extinguishment, the chance of its communication to adjoining piles is practically remote.

The stick-piled method, where a circulation of air is desired between the pieces of piled lumber is more apt to produce a quick extension than the solid-pile method, as the fire readily travels through the voids created between the different layers. It should be clear to all that the greatest fire hazard in piled lumber, as regards to the fire's extension, is on sides and rear of the piles, because of small area separating one from the other, and the irregular length of the lumber in the pile—the longer pieces extending a considerable distance beyond the shorter pieces—which create what might be called deflectors, and are productive of a fire's rapid extension from pile to pile on rear ends; the smooth or even face on the front of all piles is less dangerous as to a fire's extension.

NO FIXED RULES FOR PROCEDURE

In preventing the fire's extension it might be good practice to utilize all available streams of water in wetting down surrounding sheds or piles, totally disregarding the original structure or pile in which the fire originated, but no fixed rule can be made; the confining of the fire to as small an area as possible is most desirable, and whether all hose lines should be used in accomplishing this result, totally disregarding the original fire, depends upon the judgment of the person in charge of the force.

What an officer should be on the alert to guard against is the fire communicating to the interior of a pile, and all hose streams should be utilized to the best advantage in wetting down the ends and sides, with a view to preventing the interior communication. A lumber-yard fire is an operation in which the skilful direction of all streams is absolutely essential if prompt results are to be obtained, and where an extensive area is involved they should be utilized to the best advantage—the work of actual extinguishment being deferred until the extension hazard is safely controlled. With this observance of suitable precautions for fire prevention and extinguishment it should be possible to free ourselves from the greater portion of the heavy fire waste which now burdens us.

DISCUSSION

MR. DICKINSON: I have worked out some data on the strength of guards that may possibly be of interest as the question has come up on several occasions as to the weight of material necessary to use on guards if they are to hold knives and cutters on planers and shapers. Mr. Paine kindly sent us a couple of planer and shaper knives and we ran several tests on actual penetration. I can show you on the board. We fastened the testing machine, which is an arbor or head, and one of the planer knives in this manner (indicating) and clamped a piece of sheet metal on parallel blocks, getting the total force necessary to drive the cutter through the metal. It was then comparatively simple to estimate the number of foot-pounds energy consumed—by going back to the old formula for kinetic energy. It is something of an involved formula, but you can figure out the kinetic energy of a flying knife of known weight and knowing the resisting power of your metal guard. We found one-eighth inch metal too thin, one-quarter about an even break as the knife would probably just force its way through. Probably three-eighths is about right if you really want to guarantee that your cutter will not go through the guard. On smaller stuff, like shapers and light machines, you will find that quarter or even eighth-inch, in some cases, will be satisfactory. I think this was one of the first cases where any real engineering tests were made to ascertain the strength of the material needed. The work was done by a member of the engineering staff of the Bureau of Standards, Mr. Freen, in conjunction with myself, at the request of Mr. Paine.

MR. JONES (Rochester, N. Y.): What R. P. M. was this figured on?

MR. DICKINSON: Between eight and ten thousand foot speed of the cutting edge.

SAVING MONEY BUT INCREASING SEVERITY OF INJURIES

MR. JONES: That is your idea of proper speed?

MR. DICKINSON: Ten thousand is about the running speed of those cutters, I think.

MR. JONES: In shaper practice we have as high as 11,000 R. P. M. to contend with.

MR. PAINE: There are one or two problems in which every man in woodworking plants is interested. One is the problem of dealing with first aid cases. Dr. Kuhn, will you give us a few facts?

DR. KUHN: First aid kits are all right if they are kept clean. If you have a clerk who has been instructed by a trained nurse or a doctor, or someone who understands the use of the kit, it is all right, otherwise they are absolutely useless in a plant.

The employer may be of the opinion he is saving from two to five dollars on first-aid, and in the long run, say on twenty-five cases, he is saving forty or fifty dollars. Then along will come a case that his first-aid man or his nurse handles with so much authority that the patient eventually loses a finger. That will cost three or four hundred dollars. Another case, perhaps a scalp injury will develop erysipelas, and with hospital and doctor bills will cost five or six hundred dollars. Unless you have someone who thoroughly understands how to use the material in the first-aid kit, better not have it in the plant at all and send your patient to a doctor. I believe the doctor who treats a patient for a splinter infection or some little trouble that a clerk or the first-aid men might treat the patient for costs the company three to five dollars, but if it saves the company on that same case a hospital bill or the loss of a finger, you see how first-aid material is more or less useless.

In the medical profession it is considered that 80 per cent of results achieved by the use of the Dakin solution is due to technique. Up to the present time the solution, if applied as you would iodine and left alone with a bandage around the finger, is more or less useless. If this new remedy, brought out from Dayton, can be substituted for iodine, alcohol, boric acid, etc., it will be a revolution in the experience of applications for first-aid injuries.

USE OF IODINE EFFECTIVE IN MANY CASES

A great many physicians have discarded the use of Dakin's solution because they could not get a nurse in the hospitals to apply the solution and keep it in proper condition to obtain results—it is hard to get the kind of nurses who will carry out orders. So we are not using it and we do get results from continuous hot boric applications. The great mistake that is made with tincture of iodine is simply this: The first aid man will apply it strongly. We have had patients come into the office with second-degree burns that took much longer to cure, as a result of the application of strong iodine, than to get the wound healed. Iodine, placed in a 50 per cent solution on a finger where the skin is thin and tender, will produce a third or fourth degree burn that takes a long time to heal. Used in a proper manner there is nothing better for the putting off of infections than tincture of iodine, 50 per cent solution.

MR. PAINE: I have seen first-aid administered and the cost was far more than anticipated, because some man picked up an idea at a meeting like this and carried it out without further explanation from a physician or surgeon.

We are perfecting a woodworking code, which will be presented shortly to the American Engineering Standards Committee. It has been going the rounds among practical men for three years and it is very

near time we accomplished something definite. On one problem we have not yet come to a definite solution.

ARRIVING AT PROPER MEDIUM FOR GUARDS

For instance (indicating on blackboard), you box in the head of a variety shaper, one of the knives comes loose and forces its way through the hood. The hood is of thin material and you can see the results. We have had knives pass through hoods of this type, go clear across a room and half an inch into a post—we have had men killed from flying knives of that type.

The question is, of what thickness must the material be in order that we may construct a hood, especially where machines are equipped with exhaust systems, so that the knives cannot pass through. If we make it as thick as theoretically would be required have we gone into a method of prevention that is not warranted?

Three-eighths-inch steel, you can see, is almost armor plate for such knives. I am going to ask that safety engineers lay low for about five minutes, so that we can get practical men to talk on this subject; we want to nail this problem down right now. Do you think we should construct hoods of three-eighths-inch material, as this formula shows to be required, or have we gone beyond reason?

MR. SANFORD: I should say a practical test ought to meet your needs. A thinner material might work out, provided the guard was so attached there would be some little give to it. Getting off the subject, I saw one accident where a twenty-four by two-inch wheel burst and broke a cast iron guard—a piece of the guard went right through the shop. Another wheel of about the same size and speed was covered by a dust hood of about one-eighteenth-inch sheet steel. When the wheel burst the hood was torn all out of shape; the wheel split in two, one piece dropping at the operator's feet but the other remained in part of the hood. The guard was torn all to pieces. I think if you make the guard so that it has some give to it, it will act better than if it is made rigid.

MR. DICKINSON: The tests were made by using parallel blocks not more than one-half or three-quarters of an inch apart—we had practically a power-punch action. In fabricating a guard, with any real radius of curvature, you would get a certain elastic action. But what would be the result if a knife struck the guard where it was bolted onto the table? You can never tell where a knife is going to hit—if it hits the guard near where it is bolted, you would get practically a power-shear action; if it hits the hood in the middle of the arch, where there is considerable curve, you would have quite a little give and the shock would be partially absorbed and penetration will fall very much lower.

You cannot build a guard and guarantee that it will give that yield when a knife hits it, because it may hit where the guard is folded. That is the reason we figured punch or shear action, rather than bending or net action in the case of a flying knife.

WORKMEN HAVE IDEAS REGARDING PROPER GUARDS

MR. JONES (Rochester, N. Y.): To what extent is a guard three-eighths of an inch thick used? I don't believe you can get men to use a

shaper guard without allowing them something to say about its construction.

MR. DICKINSON: Shaper guards would not have to be over one-eighth inch. They use a knife that is a half or three-quarters of an inch in thickness and four to six inches deep.

MR. JONES (Rochester, N. Y.): There was never a knife flew off a head of any kind without reason—out of balance, loose bolts, or faulty surface on the heads. Why not go back to the source? Attention along that line would be constructive and the means of eliminating accidents to a greater extent than guards. A guard must be so constructed that it is just as easy for an operator to use it as not. If you have a guard that will slow up production he will never use it.

MR. DICKINSON: I agree wholly that you should go to the primary causes and eliminate accidents if possible, but in this particular case that is practically impossible because we have the human element. You have tremendous speed variations on your machines and you may have a shop that is hot in winter and the temperature is allowed to drop to a low point at night—it may be zero at night and 70 in the daytime. A cutter sometimes gets so hot you cannot put your hand on it and expansion and contraction will loosen the bolts holding it. Men of science agree as to difficulties in safeguarding woodworking machines.

MR. PAINE: When this question came up we had a committee meeting and went into it thoroughly. It was my thought not to take safety engineers into consideration on this question, but with the secretary of the committee and one or two members, go to the manufacturers and ask them exactly what they thought should be done. I saw one or two places where they keyed in the knives—they said that had been worked out in the navy. We could key them in or build the knives or grind them in such a shape that they would anchor if keyed; then we would have no trouble. We went further than that. We found a man who had had twenty years' experience and had worked himself up to sales manager of one of the large producers of woodworking machinery. He said, from his practice and experience, the theory of keying in and grinding was nil; that the contraction and expansion would occur and no matter how we keyed them in they would fly out.

GUARDS WILL NOT FIT ALL MACHINES

We asked others their opinion and they said: "Yes, that statement is correct. In order to be safe it would be better to hood the knives, but we don't want to go to the expense of building armor-plate guards." In a number of cases, where we have keyed the knives and placed emphasis on the bolting, nevertheless, because of natural causes, the knives came through $\frac{1}{8}$ or $\frac{1}{4}$ inch metal hoods.

We thought that it might be possible to construct guards of material about one-eighth of an inch, or even a little thicker, and if we could so build guards as to prevent knives flying out we might meet both objections—the practical one that has come up regarding getting at the original source (which we find out we cannot correct) and the objection of the builder who does not want to put an extra amount of metal into the

guarding of his machine. So it seems that the only practical way out of the problem is to arrive at some solution by specifying material of a certain thickness that will take care of flying knives, and then, not satisfied with the one solution, but from that point down to work out the problems of specific machines; taking knives of a certain size, operating at certain speeds, and work out a table for the guidance of those building hoods in the form of guards—where they have placed exhaust systems over knives of this type.

MR. SANFORD: I think that would be all right so far as manufacturers of machinery are concerned, but it might not be practical for a man having a machine in his shop to work out a guard suited to his own particular needs; he would buy an ordinary commercial guard and let it go at that.

MR. JONES: Care would have to be exercised in banding and framing the hood in order that it may take care of various blower conditions. There is no general rule, I believe, that would be applicable or that would fit every type of construction.

MR. PAINE: That is a good, practical thought; that is what we want.

MR. JONES: I had in mind particularly three-eighths inch metal for hood construction on some shapers. You want to exhaust shavings and it would not be practicable on particular types of construction.

MR. DICKINSON: The construction of the hood would have to fit the particular type of plant and the location and make of the machine and protection would have to be based on the number of planer knife revolutions, so that if a knife came loose it would not be going through the guard. The hood could be of light sheet and the main protecting guard of heavy stuff.

MR. PAINE: We are collecting information in order to get a good, practical guard. The next step will be to hand the information to the ventilating engineers.

QUESTION OF GUARDS REFERRED TO COMMITTEE

MR. PAINE: I would like to offer for consideration a resolution drawn by Mr. Farra:

"Subject: Classification of causes of accidents covering injuries in woodworking industries, so as to have a uniform method of tabulating the nature and cause of injury in woodworking plants.

Resolved, That a committee of three be appointed by this Section to present a report on the subject as above stated. The committee to make a definite report before the next annual meeting of the Woodworking Section.

"E. ROSS FARRA.

"W. S. PAINE."

(The motion was put to a vote and carried.)

The Session then adjourned.

WEDNESDAY MORNING SESSION

CHAIRMAN GUILBERT: The first order of business is the report of the Nominating Committee.

MR. B. C. CHRISTY: To the members of the Woodworking Section, Mr. Harry Guilbert, Chairman—The Nominating Committee wishes to

submit for your consideration the names of the following members as your officers for the year 1923:

Chairman, Mr. Walter S. Paine.
Vice Chairman, Mr. Geo. Sanford.
Secretary, Mr. E. Ross Farra.
Chairman Program Committee, Mr. M. C. Evans.
Chairman Bulletin Committee, Mr. Harry Guilbert.
Chairman Membership Committee, Mr. Herbert Wiberg.

Respectfully,

B. C. CHRISTY.
E. ROSS FARRA.
J. M. SANDEL.

(The nominations were confirmed by the Section.)

CHAIRMAN GUILBERT: The first address is by Dr. LeRoy Philip Kuhn.

ACCIDENTS IN WOODWORKING INDUSTRIES

DR. LEROY PHILIP KUHN, CHIEF SURGEON, ILLINOIS MANUFACTURERS' MUTUAL CASUALTY COMPANY, AND LUMBERMEN'S MUTUAL CASUALTY COMPANY, CHICAGO

During the past fourteen years I have given my entire time and attention to the specialty of surgically treating injured employees and I find these men require as much technical skill, to bring about satisfactory results, as the oculist, neurologist or surgeon may give to difficult patients. The safety engineers and safety inspectors know quite well how thoroughly they may do their work—they also realize how easily and rather quickly they may work, but not with the same results. It is the surgical result you employers, claim insurance men and safety workers wish to obtain, in the most efficient manner possible, returning the injured employee to his accustomed duties at the earliest possible moment with the smallest percentage of permanent disability.

It is a common conclusion among medical men that any doctor can take care of an accident case. I used to think so but I am not of that opinion now. The employer and claim insurance man are doing the injured employee a great injustice if they fail to see that the wounded soldier of industry is receiving only mediocre medical attention. Further, if they fail to follow closely the medical progress of the injured workman until he has resumed his usual duties the sin of omission is as great as the sin of commission.

The various compensation laws of the different states now require medical treatment of any indirect physical disability arising while the patient is under treatment for the hurt sustained by the accident, or any remote complication occurring, that can be indirectly traced within shooting distance of the trauma produced by the injury. In other words, we must return the workman to the employer in as good or better condition physically than he was at the time of the accident. Naturally the medical man must have a working knowledge of all these details when he assumes responsibility of the care and treatment of an accident case.

The most serious type of accident that I have found among woodworkers is that of kickback from a revolving rip saw or planer. As you well know rip saws move at about 2,400 revolutions a minute; the planer is more rapid, approximately 3,400 per minute. Safety engineers have not been able to find an entirely satisfactory guard for either the planer or rip saw and as a result the surgeon and the undertaker are sometimes called upon.

EFFECTS OF KICKBACKS

I do not know of any hurt to the human body which requires more careful, painstaking watching and thorough diagnosis than a kickback against the abdomen. From my own statistics, obtained largely through the lumber and woodworking industries since 1911, I find the majority of these accidents result from unguarded rip saws or where the guard is placed some distance from the saw. On one or two occasions the workman was using the guard, but he allowed the material he was handling to climb up to the top edge of the saw, then it was suddenly thrown backward against his abdomen. Boards or small pieces of wood are thrown back with a tremendous force. The workman falls, prostrated for a time, then he usually gets up faint and dizzy, going home or continuing work until pain or some other symptom forces him to stop work and ask for medical attention. If the foreman or superintendent is wise he will hasten this man to the nearest hospital and insist upon a surgeon of ability assuming charge of the case.

I have had patients finish a day's work, only to find themselves in a state of collapse by evening. On several occasions an immediate exploration of the abdomen revealed a tear of some portion of the intestinal tract which, if uncared for, would have caused death in twenty-four or thirty-six hours. Some of these patients are in profound shock from the time of the accident, others apparently have little pain. All of them should be regarded as serious surgical cases until such time as it is definitely known there is little if any damage to the internal organs. It is far better for the physician in charge of one of these kickback accidents to understand he is dealing with a serious surgical patient right from the outset.

Summary of author's cases follows:

Total number of patients.....	42
Number operated upon.....	14
Operated on day of injury.....	10
Of those operated upon day of injury 9 recovered, or a mortality of 10 per cent.	
Number operated on second, fourth and seventh day following injury...	4
Of those operated upon second, fourth or seventh day of injury, one recovered, or a mortality of 75 per cent.	
Total number of patients not operated upon	28
Fifteen of this number ordered to report because of nature of type of injury to abdomen. Thirteen of this number not operated. All advised to submit to early exploratory operation but persistently refused. Five of the 13 died, or a mortality of 39 per cent.	

The autopsy findings of the five patients dying, who persistently refused operation, revealed the fact that if they had given consent to allow opening the abdomen I might have saved their lives, as you can see by the number cured who were operated. The deaths resulting following

operation occurred because of the profound shock, with the blow to the abdomen and the strain of surgical procedure necessary to repair the injury. All of the patients recovering, who had been operated upon, suffered tears of intestinal tract or urinary bladder which would have caused death had they not submitted to surgical operation. Without doubt all patients should be placed in a hospital immediately following injury. A surgeon with any experience at all can usually come to a fairly definite conclusion within a few hours as to whether or not it will be necessary to explore the abdomen.

PROMPT OPERATION OFTEN NECESSARY

External evidence of trauma, such as discoloration of the skin where the board strikes the abdomen, and the history of the blow are not necessarily guides. Recently I had a patient with a good deal of discoloration of the skin and marked rigidity of the abdominal muscles where the board struck the abdomen. Pulse 88, with a great deal of profound shock—all symptoms necessary to warrant opening the abdomen. I advised immediate operation but the patient refused, leaving the hospital that night against orders. I followed his progress until he resumed work at the end of a week and I understand he has worked ever since without any disturbance resulting from the blow.

One week before this accident a patient came under my care who sustained a kickback with less severe evidence of trauma to the abdomen, little if any rigidity of the abdominal muscles and practically no pain. I waited thirty-six hours before advising operation. When I opened the abdomen I found a small hole in the lower portion of the ileum with localized peritonitis. The opening was repaired and drainage established. Patient went along nicely for a few days, then died of general peritonitis.

When one decides to operate the sooner it is done following the blow the safer it is for the patient. He has more chance of recovery. Employers and superintendents should co-operate with the doctor in charge of these unfortunate patients by insisting upon the injured workman going to a hospital where he can be properly treated until all danger of internal injury has passed. Frequently patients refuse exploratory operation until they see the necessity. Then it is difficult to repair the damage and carry the patient through safely. The contents of the bowels or bladder emptying into the abdomen cause a rapid change in the patient's physical condition.

I have come to the conclusion that where evidence of trauma exists, either from kickback or planer, the best plan to adopt is immediate operation. It only requires a short time to explore the abdomen and it cannot cause the patient very much suffering. On the other hand, if an operation is not decided upon until symptoms demand such procedure, it is frequently too late to do much of value.

It has occurred to me that since the safety men, the safety engineers, and those having to do with the guarding of planers and rip saws, have been unable to obtain a satisfactory guard to protect the patient, why isn't it advisable to put something on the patient that will

protect him. We cannot protect the saw, it seems. Now, let's protect the patient. How will you do it?

Three or four years ago, in a safety meeting in Chicago, I suggested the ordinary baseball protector that catchers wear in baseball teams. I didn't get very far with it. It did not seem to appeal to those present, and the matter was dropped.

Recently it has come to the attention of our Safety Committee in Chicago that Spalding or Wilson's or someone of those companies that make these baseball protectors, can make a protector fitting across the abdominal portion of the body, padded either with some material that is used in the ordinary baseball protector, or it could be made of aluminum. Aluminum will stand quite a blow without giving, and is not very heavy. I understand the average baseball protecting apparatus now is not pumped with air, as it used to be. It is made of some padded material. Now, the padded material, or the aluminum will certainly protect the abdomen of the patient enough to ward off the chief force of that blow. Supposing it dents the aluminum, or tears the padding. It has stopped the force of the kickback sufficiently to possibly save internal abdominal injury, and if it accomplishes that, it saves surgical procedure. Of course, these protectors would have to be tried. I would hate to be the one to try one of them, although I believe there is a way that that could be tested. Usually these kick backs come back with a great deal more force than the average major league pitchers pitch a baseball, and if a baseball can be protected from the catcher's abdomen by the use of this apparatus, it seems to me it would be of service to the employee. At any rate, it seems to me it is worth the trial. They can be made, I understand, for something like \$3.50 or \$4 apiece.

The second part of this discussion is with reference to the subject of hernia, commonly known as rupture. It is one of the physical defects that should be known when a man takes employment. A family history is advisable because it is recognized that a considerable per cent of hernias appear to be hereditary due to general muscular weakness.

HERNIA GENERALLY OF LONG STANDING

Hernia associated with trauma is one of the greatest bugaboos the medical profession has had to contend with since the enactment of workmen's compensation laws. A great deal of study has been given to the question by a committee appointed by the National Safety Council to investigate and submit a report one year later. A questionnaire was sent to all industrial surgeons and other medical men familiar with the subject, ascertaining how many hernias in their experience had been found due to trauma, directly, or traumatic influences. By practically unanimous voice these surgeons classify hernia as due to anatomical defects and muscular weakness rather than trauma.

As a rule I have trauma the means of discovery rather than the cause of hernia. Employees come to me with a perfectly clear history, *e. g.*, lifting heavy lumber or a misstep causing severe strain; that evening or the next morning they notice a "lump" in the inguinal region which, they state, was never there before. When questioned about pain,

nausea, or weakness following the accident they state none was present. Always certain the accident was the cause, yet none of the symptoms present which should follow such a strain. I have operated upon many of these cases, accepting the history as given by the employee, only to find a hernia of long standing. It is apparently an easy matter for the family physician to testify on the witness stand that the patient received sufficient trauma to cause hernia, whether or not he had any of the symptoms immediately after the strain. Many times this same patient has gone on to operation without the slightest evidence of recent trauma to be found. This difference of opinion is quite sufficient to place the responsibility on the employer.

The question of the aggravation of an already present hernia, which industrial boards hold is sufficient for liability of employer: The patient has had a hernia for a long time, suddenly he makes a misstep or lifts, when he feels pain in the hernial region so that he must stop work and go to the doctor. If an operation is performed at once or within thirty-six hours we find ecchymosis and alteration in color and consistency of the surrounding tissues. The nearby muscles, fascia and spermatic vessels all give evidence of recent trauma. On the contrary, if none of these symptoms are present one should not hold trauma responsible for aggravating the already troublesome hernia. Of course the patient must come to the operating table within the time a surgeon is able to differentiate recent trauma from long-standing trauma. Frequently the employee is subject to delays, necessary for insurance companies investigating truthful statements, etc., so that by the time he is operated upon it is a difficult matter for the surgeon to state how long the hernia existed and how much damage was done by the lift or trauma complained of by the employee.

In my opinion, traumatic hernia is a joke, but so long as 99 per cent of the medical profession are of this opinion and 1 per cent think otherwise there is a rich field for argument before industrial boards, and insurance companies pay the bills as the easiest way out of the difficulty.

INFECTION ARISING FROM MINOR ACCIDENTS

The third part of this subject, that of infections arising from small injuries or splinters, is of vast importance. We all know of permanent disabilities which have resulted following a minor condition which was apparently too trivial to attend at the time of accident. Recently I removed a splinter two inches long from a man's hand; he stated he thought he had removed it entirely. He worked a week, then was sent to a hospital where an interne examined the hand but was unable to locate the splinter. The patient continued to work for two weeks, the wound being treated every day. He was finally sent to me because it was thought some constitutional disease prevented the healing process. I put the patient to sleep and removed a splinter from the deeper structures of the palm. I have known such a splinter to produce infection sufficient to cause death.

Nail-hole puncture wounds of the foot, untreated for a day or more, may easily cause tetanus and death before the physician has opportunity

to render the patient the necessary aid unless the superintendent or employer has directed the patient to the doctor immediately following injury. I believe the foreman is the one to hold responsible to see that the employee obtains proper medical treatment following an accident. He is the first to be advised by the injured employee. The foreman's course of training for the safety of their men, conducted last year by the Chicago Safety Council, should help along this line.

One of the chief difficulties to contend with is the indifferent mental attitude towards safety among those who would most directly benefit by its adoption. In order to bring safety home to the man, give him some real safety work to do and his interest will advance rapidly.

It is generally acknowledged that the lumber industry has not been sufficiently active in the promotion of safety. We should now see the necessity for its encouragement and realize the duty which we are called upon to perform. Where we have a state law requiring that a guard be used the men should willingly obey as our faith in government naturally leads to such observation both on the part of the manufacturer and the employee.

DISCUSSION

CHAIRMAN GUILBERT: There must be inadequate guarding of machinery to cause all these kickbacks. The doctor, in supplementing his paper, suggested that the workman wear a protector something like the one worn by baseball players—made of aluminum or one heavily padded. I don't think I would want to wear that kind of apparatus on a hot day. It seems that if the machines were properly guarded the accidents would be avoided and the protector would be unnecessary.

MR. HOWE: It has been my experience that a kickback is usually misinterpreted. A great many people speak of kickbacks as a combination of fly-back and kickback. When a piece of material is caught in a saw and is kicked back it comes with terrific force. Where a piece climbs the saw, instead of lying flat on the table, it will be thrown by the edge of the saw and this is usually termed a flyback. The best way to get away from that sort of accident is to have a splitter directly back of the saw, at least two or three gauges thicker than the set of the saw. A properly designed guard will make your lumber lie flat on the table and not let it close up on the saw; therefore, a properly designed guard and splitter should prevent both kinds of accidents, in most cases. Once a piece of material starts to close up on the saw there is nothing that is going to stop it coming back with terrific force and it is likely to strike the operator of the machine and seriously injure him. If your fence is adjusted properly at the side of the saw, you are not likely to get a flyback. Keep your guard on, and keep the splitter upon your saw the proper thickness and you will not be likely to have these accidents.

MR. NEWTON (New York): May I ask, doctor, if hernia should in any sense be considered a medical case or a compensation case? In some states I believe it is considered medical, but in New York it is a compensation case.

DR. KUHN: It seems to me that every hernia case is sooner or later going to develop into a compensation one. The way compensation laws are written in Michigan, Illinois, Indiana and Iowa, hernia eventually comes before the industrial boards and, usually, the employer has to pay the bills. They seem to me surgical rather than medical cases. The question of hernia is an old one. Why not put the patient in the hospital immediately following his history of the injury and let the surgeon decide whether it is recent or long standing? He can very easily decide if he gets the case within twenty-four hours following the alleged strain.

MR. YOUNG (Globe Indemnity Company): I would like to ask the doctor a question: How many of the forty-two cases were simply contusions or abrasions and how many were actual lacerations extending into the abdominal cavity?

ADVOCATES OPERATION IN ALL KICKBACK CASES

DR. KUHN: Of the fourteen that I operated upon I found some internal injury, practically all in the small intestines. The intestine has a very thin peritoneum covering and we might have a little hemorrhage from some of them that would continue bleeding until serious symptoms developed.

MR. YOUNG: The point that I wanted to make was: Can that condition be due to a blow which does not penetrate the abdominal cavity?

DR. KUHN: The slightest blow may cause an injury if the patient has just had a hearty lunch or if the urinary bladder happens to be full.

MR. YOUNG: Was there an actual penetration of the abdominal cavity by the splinter in many cases?

DR. KUHN: Only one; a large splinter was driven into the capsule. This case, of course, could be diagnosed from sight; but in the last case I operated upon there was no discoloration. I could not tell where the board struck the abdomen; the only symptoms were those of nausea and vomiting and rigidity of the muscles. Kickback histories have taught me not to procrastinate, but to get into the abdomen at the earliest possible moment. I advise an operation on every one of them; the very one that you think does not need an operation may prove serious.

MR. CRUISER (Ford Motor Company): The safety division of the Ford Motor Company believes that we have developed or designed a guard which will reduce the possibility of injuries due to flybacks or kickbacks. We have had no fatalities on woodworking machinery and our minor accidents are down to a minimum. We will gladly furnish blue prints of this guard. It costs very little to make; there is no patent on it and you are free to use it. If you develop an improvement in the design of this guard we ask that you give us the information.

GUARDS NOT ALWAYS USED

DR. KUHN: May I add a word in reference to the protector I mentioned? I do not mean a protecting apparatus from the shoulders down, only one from the ribs to the lower portion of the pelvis. It would be much smaller than the average baseball protector that a catcher uses.

CHAIRMAN GUILBERT: When I worked in a saw mill I wore a leather

apron, but neither a leather apron nor an aluminum apron or protection will withstand a real kickback blow. I feel that woodworking machinery, adequately guarded, would prevent kickbacks and I don't think there is any excuse for any company, big or little, having accidents of that nature.

MR. ROBERT G. SHELLEY (Employers Liability Company): Follow the forty-two accidents, in the proper and authorized investigation were the saws found to be guarded according to standard? Could the accidents have been prevented?

DR. KUHN: That is a point to be decided by the safety man of the insurance companies from which these accidents were derived. I traced the history as well as I could in every case. In one or two cases the guard was in position and being used. In thirty cases the guards might have been in the plant but were not in use.

CHAIRMAN GUILBERT: Do you know what guards were used, those thirty guards you spoke about?

DR. KUHN: I do not.

CHAIRMAN GUILBERT: Mr. Parks, gentlemen. His discussion is "How to Lay Out a Woodworking Plant for Safety and Efficiency."

SAFETY AND EFFICIENCY IN A WOODWORKING PLANT

BURRITT A. PARKS, BYRON E. PARKS & SON, GRAND RAPIDS, MICH.

So much has been written of late concerning safety and efficiency in manufacturing institutions that it would be presumptuous on my part to assume to advance any new principles or ideas along these lines. It may be of some value, however, to place emphasis on the interrelation between safety and efficiency in laying out a woodworking plant.

The woodworking industry is one of the oldest in existence and yet in many ways it has been slow in development and loath to adopt new principles of manufacturing. The principal causes of this condition are that many of the men in the industry are of the pioneer type who have grown up in the trade and are to a certain extent satisfied with conditions as they exist and also because technically trained men in the executive positions are few and far between. The development of practically all modern industries to their present state of efficiency has been largely due to the technically trained engineer and it is only in recent years that the engineer's influence has been felt in the industry.

The majority of woodworking plant executives do not fully appreciate the intimate relation existing between safety and efficiency in the designing of their plants or the production of their wares. It may almost be stated as a maxim of manufacturing that what is done to promote safety for the employee or plant will also increase efficiency. All accidents cannot help but have a demoralizing effect upon the employees, depending in amount upon the seriousness of the accidents, their frequency and the extent to which the employees learn of such accidents.

The attitude of the management is always reflected throughout the organization and a management which is indifferent to the adoption of

safety measures and the promotion of accident prevention may expect a smaller production per man, a greater spoilage of materials, a greater labor turnover, increased overhead and a general lack of *esprit de corps* on the part of all employees, on which a maximum of production and efficiency in manufacturing so much depends. Safety promotion not only considers the prevention of accidents to employees but also takes cognizance of the prevention of accident or loss to plant and equipment. We may, therefore, apply the principles of safety and efficiency from the lumber yard right through to the shipping-room.

THOUGHT GIVEN TO PROPER LAYOUT PAYS BIG DIVIDENDS

Much thought may well be expended on the layout of a lumber yard, although in many cases I am inclined to believe it receives the least attention of any part of the plant. A proper arrangement of sidings, storage yards, dry kilns, routing of lumber into the plant, fire protection, etc., will pay excellent dividends on the study and expense involved in obtaining the best solution of the problem that the site will permit. In the first place, economy in purchasing will dictate the size of the lumber storage facilities, which should probably hold a year's supply. This will allow of taking advantage of market conditions and avoid delays incident to transportation difficulties. To my mind the ideal storage yard should be equipped throughout with industrial trackage, laid parallel with the receiving siding. With this arrangement lumber is unloaded and sorted directly onto small lumber trucks, or "bunks", and then by means of properly located transfer tracks the truck loads are placed in storage ready to be taken to the dry kilns.

The dry kilns should be so placed in a battery as to be readily served by the same system of transfer tracks that serve the storage yard. A dry-storage shed of ample capacity, also equipped with trackage, will allow for an accumulation of dry material and thus avoid delays in receiving lumber at the cutoff saws. The same system of transfer tracks that serves the storage yard, kilns and dry storage may be advantageously extended to the cutoff saws, where there should be provided hydraulic or screw operated lumber lifts.

MINIMIZING FIRE HAZARDS

It will be apparent that the arrangement of storage yard, kilns, dry storage and cutoff saws outlined above will necessitate but one handling of the lumber from the railroad car until placed on the table of the cutoff saw. The efficiency in handling lumber and the decrease in opportunities for accidents in this part of the plant are self-evident. This arrangement has the further decided advantage in that in case of fire in the storage yard the truckloads of lumber may be quickly moved, partially isolating the fire and allowing for access to same by whatever fire-fighting methods are available. If the lumber storage yard is not equipped with trackage the height of lumber piles should be limited to 18 or 20 feet with spaces between as ample as possible for ease in handling lumber to and from the piles and for access of fire-fighting equipment in case of need.

The receiving and handling of lumber should be given the greatest thought in providing transportation facilities to and from the plant, yet railroad sidings to the power plant for the delivery of machinery and coal and to the shipping room for the handling of the finished product, should receive careful consideration, keeping in mind that sidings to the lumber-storage, power plant and shipping room should have separate access to the main tracks, if possible, so that switching may be done on any siding without its being necessary to disturb cars on any other.

The type of buildings for any manufacturing plant should be carefully chosen to suit the purposes for which they are intended. In the past the purpose of a manufacturing building seemed to be little else than that of keeping out the weather and supporting the machinery and equipment inside. The modern manufacturing building must comply with several more requirements than those mentioned. A building should not only keep out the weather but should let in plenty of light and ventilation; it should not only just support the loads required of it but should do so with a proper margin of safety and as great an absence of vibration as possible; it should not only provide space for machinery but should also provide ample space around machinery, with generous aiseways, in that greater efficiency in movement of materials and safety to employees will result; in short, it should be designed in advance for the work to be done—not simply built and then attempt to crowd in more machinery and equipment than the building will properly accommodate. In order to comply with the above requirements the building should be so designed that the glass area is a maximum, with windows extending to the ceilings. Also to insure proper daylighting in the center a building of the multi-storied type should not be over 50 to 60 feet wide.

PROPER DESIGN OF BUILDING ESSENTIAL

It has been shown many times that excessive vibration not only causes rapid depreciation of machinery but also interferes materially with the quantity and quality of the product. Therefore, a building should be designed not only with considerations of strength in mind but also rigidity and absence of deflection. If shafting and pulleys are used to transmit power the floor structures should be laid out with this end in view, providing ample headroom and substantial supporting members for shaft hangers and bearings.

Of the types of construction in use the reinforced concrete building probably best complies with the above requirements of a good building, although a properly designed slow-burning mill-type makes a very satisfactory building and has the advantage over the reinforced concrete in that machinery, shafting and equipment are more easily installed and alterations to machinery arrangement made.

Much has been written concerning the layout of machinery in a woodworking plant to obtain efficient production and prevent accidents, consequently it will only be desirable to emphasize some of the more important points to be kept in mind. In the first place, machinery should be carefully chosen for the work which it is desired to perform. Some

machines are suitable for performing various operations, but wherever possible machines should be chosen for specific operations as it is often difficult to locate machine performing several operations so as to obtain an efficient and orderly flow of material through the plant. It is also bad practice from a safety standpoint, as it is difficult if not impossible to design guards suitable for all of the operations of which a machine is capable, and if various guards are supplied suiting these various operations they must necessarily be of a temporary nature and are likely to be removed and not used.

It has also been my observation that machines which are provided with efficient guards by the manufacturers are more desirable than machines which have to have guards built by the purchaser. Homemade guards are frequently unsubstantial and do not entirely serve the purpose for which they are intended. Chain drive and gear guards in particular should be installed by the manufacturer, for they should preferably completely enclose the gear or chain drive. Such a guard not only serves to protect the workman but also materially affect the life of the machine by keeping dust and dirt from the bearings and other moving parts.

In laying out the machinery in a new machine room or rearranging it in an old one, with the end in view of obtaining the most efficient layout, a routing chart should be drawn up. This routing chart should list each separate part entering into the finished product, with the proposed volume of manufacture per unit of time. Such a routing chart, giving the sequence of operations, will establish in a general way the arrangement of the various tools and machines throughout the department.

ROUTING CHARTS

A paper templet, to scale, should be made of each article of equipment, such as all machines, tools, benches, racks, etc. Each templet should indicate the name of the machine or operation, the path of the product through the machine, the point of application of power, position of operator and position of helper, if any. A floor plan of the machine room to the same scale as the templets should be prepared and then the templets placed on this plan and moved about and located in accordance with the routing chart until the most satisfactory arrangement is found, the marks on the templets allowing the machines to be set in proper relation to flow of product, power supply, lighting, etc.

After an arrangement of the equipment has been completed a careful study should be made of how the product is to be transported from machine to machine, making ample provision for aiseways and location of trucks at machines to allow of efficient handling of material in and out of machines. Consideration should also be given to the necessity of providing spaces for accumulation of material between machines where the speed of handling varies.

The next important problem in laying out a machine room is to decide on the method of transmitting power to the various machines. There are, in general, two methods of driving machinery—shafting, pulleys and belting and the electric drive. The electric drive may be further

divided into two classes, the group drive and the individual drive. The decision as to which type of drive to use is dependent on several factors. In large plants with widely distributed machine rooms the electric individual or group drive is practically the only means of transmitting power efficiently and economically. In small and moderate sized plants the most efficient method of transmitting power is undoubtedly by means of line shafting, pulley and belts. The transmission of power is one of the few features of a plant where safety and efficiency may seem to some antagonistic.

Electric transmission, properly designed and installed, is undoubtedly preferable from a safety standpoint to a multitude of pulleys and belts and possibly if proper statistics were available it could be shown that the electric drive was the most efficient from the standpoint of cost, when taking into consideration the fewer accidents resulting from the electric drive than from line shaft drive. In any event the decision as to the proper method of transmitting power in any plant must be made upon a proper consideration of the various factors involved, the utmost safety and efficiency being kept in mind at all times.

If line-shaft drive be the final decision, it goes without saying that every means should be adopted for preventing accidents, such as providing proper guards for belts and pulleys, using safety-type set screws, cutting off projecting keys, covering unused sections of keyways, and covering or otherwise guarding all revolving parts which otherwise are likely to catch a man's clothing.

Another feature which will add materially to the safety of a line-shaft installation is an automatic stopvalve on the engine, with electrical tripping device. By locating push-button stations frequently throughout the plant the engine and consequently all machinery may be stopped at a moment's notice and many accidents which would otherwise prove serious to both men and machinery be nipped in the bud.

USE OF METALLIC CONDUITS FOR ELECTRIC WIRING

While electrical transmission of power, when properly designed and installed, is better from a safety standpoint than line-shaft drive yet if poorly installed it may be more of a menace than pulleys and belting. In the first place all electric wiring in a woodworking plant should be installed in rigid metallic conduit. Open wiring is always dangerous to both men and plant and particularly so when inflammable dust may so easily be ignited by sparks. All motors of the direct current or slipring alternating current type should be of the enclosed pattern, in order to avoid danger from fire caused by sparks from the brushes. The squirrel-cage induction motor may well be enclosed also to keep accumulations of dust and dirt from the windings, although the danger from sparks is not so prevalent as with the types above mentioned. The motor-starting equipment should also receive thoughtful study and all types of open switches and starters with exposed live parts avoided as one would the plague. Such equipment is a constant menace to both plant and men and should not be tolerated in this day and age.

Motors, unless connected direct to the machines which they drive, should be located overhead on suitable brackets or platforms and the platforms should be large enough in all cases to provide ample room for the repair man. Motor compensators or starters should be of the remote pushbutton-control type and should be located on the platform with the motor. This places them in a position where they cannot easily be tampered with and the only part of the equipment with which the workman is concerned is the pushbutton control station near his machine. Where group driving of machines is used it is advisable to use two or more pushbutton control stations, so that the motor for driving each group of machines may be started or stopped from several different points. The remote pushbutton control starter is not only absolutely safe from the standpoint of the operator but it also effects economies in the consumption of current, for a workman has but to touch the start or stop button, as the case may be, instead of operate a clumsy compensator or open switch which he will avoid using as much as possible.

EXHAUST SYSTEM FOR REMOVAL OF WASTE

One of the important adjuncts to a woodworking plant is the exhaust system for the removal of shavings and sawdust from the various machines. If well designed it will pay large dividends in promoting the safety and comfort of employees, increasing production and making available for fuel a waste product that would otherwise be difficult and expensive to dispose of. Woodworking machinery produces large quantities of shavings and sawdust and if it is not removed as soon as it is made it soon accumulates on the machines and surrounding floors, interfering with operation of the machine, adding to the discomfort of, if not chance of accident to, the operator and necessitating frequent stops to clear away the refuse. This refuse also forms a valuable fuel and if not delivered to the boilers by an efficient exhaust system it cannot be fired in the furnaces without a great amount of labor being necessary to collect it and deliver it to the boiler room.

Exhaust systems should be carefully designed and installed and should fulfill the following requirements: 1. It should handle both light and heavy refuse satisfactorily. 2. The hoods should be designed where possible to also act as guards. 3. Hoods and piping should be laid out so as not to interfere with the operation of the machine, access to working parts or obstruct the room. 4. It should be laid out to avoid danger of clogging and should have frequent clean-out openings through which to clear the system in case of necessity. 5. The exhauster should be selected by striking the proper balance between first cost, power consumption and power cost. 6. The separator should be ample in capacity to obtain efficient separation of the dust and deliver the refuse to the furnaces with a minimum of excess air. The advantages, in fact, the necessity, of a good exhaust system are generally so well understood that it does not seem necessary to more than mention the salient features.

Artificial illumination has been given very little thought and study in the majority of woodworking plants which I have observed. In one large plant they were still using gas lights in one of the machine rooms,

although the remainder of the plant was lighted with electricity. It hardly seems necessary to state that gas lighting has no place in a wood-working plant, particularly where electricity is available.

Even where plants are lighted with electricity the prevalent system, if system it can be called, consists of a drop cord and bare lamp over each machine or bench, with a few thrown in for general illumination. Good illumination will add so tremendously to the safety and efficiency of a manufacturing plant that arguments in its favor seem almost superfluous. "Spotted" fixtures over machines are often advisable, but at the same time the general illumination ought to be sufficiently brilliant so that men can see to get around without stumbling over objects on the floor and so that production may be maintained with artificial illumination at the same rate as with daylight. There are many efficient lighting fixtures and reflectors at reasonable cost on the market today and a well-laid-out lighting system, augmented by ceilings and walls painted a light color, will pay dividends in increased production and decreased accidents which will surprise any executive still adhering to antiquated methods.

Other features adding materially to the safety and efficiency of the plant, such as adequate fire protection, proper heating and ventilation, satisfactory elevating and conveying machinery, suited to the needs of the plant, etc., might be dwelt on at length but can hardly be treated within the brief scope of this paper. In closing, I wish to once more remind my hearers that as a general proposition whatever is done to promote the efficiency of a manufacturing plant will likewise promote the safety of the employees and any measures adopted to promote safety will bring substantial returns in increased efficiency.

CHAIRMAN GUILBERT: Mr. Parks is to be congratulated upon his paper. I wish it would be possible to have all woodworking plants equipped as Mr. Parks has outlined.

Mr. J. N. Hatch will give the next paper.

SELLING SAFETY TO OPERATORS OF WOODWORKING MACHINES

J. N. HATCH, FOREMAN, AMERICAN SEATING COMPANY, GRAND RAPIDS, MICH.

To get the best results from safety measures requires, first of all, salesmanship, and the best results will be obtained only by salesmen who can get the viewpoint of the workers—they do not take kindly to one who does not know as much about their machines as they do themselves. So, in order to get the workers interested, let them make suggestions as to how to guard the machines by just leading them up to the point, as guards made from their own suggestions will be the ones you will get results from. Do not make the men use your guards before allowing them to make suggestions, for what you have may work all right on some jobs and hinder production on others. The men should be the ones from which to get the real facts.

It is just as important to use different methods with men as to use different guards on different machines, so one that is a good judge of

human nature will get the best results—will prove the best safety salesman. A guard should not be used as an ornament. Unless it is practical you had best throw it away, for if the men think it is there just to give the shop a well-guarded appearance, rather than to get real results, the interest and value are lost.

At the American Seating Company we have employee representation and are thus able to give the men a voice in the matter of safety. We have a safety committee from the House of Representatives and one from the Senate that go through the factory each month and investigate and get suggestions from the men; then only do the committees take action by submitting reports at the next meetings of their bodies. Tags with numbers are left on the parts of machines found dangerous by the committees and are not removed until they are corrected by the safety engineer, who turns in the tag. By this method the committees can keep up with conditions in all departments.

But to return to the specific question of salesmanship—selling safety to operators of woodworking machines. To accomplish this various methods may be employed, but we have found the first-aid contests between departments and the employees' magazine as the biggest contributing factors.

BIG REDUCTION IN ACCIDENTS

Take the first aid, which was established in 1921, and let us make some comparisons: In 1920 the total number of days lost due to accident was 1,346. In 1921, with the first aid in operation, this figure was reduced to 377. I might be able, with a little figuring, to tell you what this has meant in dollars and cents to the company and in dollars and cents to the workers, but suffice it to say that the compensation paid out in 1920 was \$6,914.41, while in 1921 it was but \$1,317.28—a saving of \$5,597.13. Again, that bugbear, infection, was made the subject of a vigorous campaign to have minor injuries treated in the first aid and our records show that the lost time due to infection was reduced from 349 days in 1920 to 13 days in 1921. In one department of our plant the accidents were reduced from an average of fifty-two a month to none at all for the twelve consecutive months ending March 31 last.

Needless to say, safety devices alone did not accomplish all this. It required the co-operation of every man in the department and this, in turn, meant that every man in the department was first "sold" on the value and importance of safety—a feat which could not have been engineered had not the management been more than passively interested in the subject.

Mr. H. M. Taliaferro, our manager, was one of the handful of men who early came to a realization that industry had become a slaughterhouse and set about to make a study of safety on the theory that accidents were not unavoidable. He was one of the organizers of the Safety Council in Grand Rapids, just as he was among the first to see that in industry the human element had been overlooked in the mad rush for mechanical development. Mr. Taliaferro said to us in the beginning: "Strange as it may seem, the hardest thing will be to get the man on

the job to see the point." He insisted that a man's dependents had a right to expect to see him return whole to them after his day's work and that we must "sell" him first of all on the importance of self protection.

MEN DESIGN MOST VALUABLE SAFEGUARD

So the industrial relations department started its wheels in motion, always keeping this objective in mind, and in the case of the department cited the safety committees, co-operating with the men and the safety engineer, adopted safety devices, many of them invented by the men, while a contest between departments was started on the basis of time lost monthly.

But this was not all. The first aid was at work, in which the full-time nurse played an important part in obtaining the co-operation of the men while *The Seater*, our plant paper, was getting the message across through news stories, illustrations and editorials, and at the same time building up spirit in the organization, which makes that valuable asset—the goodwill of the customer—possible.

Before closing, here's another big little point: See that the foreman is thoroughly sold on safety before spending money and effort on a safety campaign. He is the one closest to the men.

DISCUSSION

CHAIRMAN GUILBERT: Have you any figures showing the number of people employed in 1920 and 1921?

MR. HATCH: Mr. Kelly can supply those facts.

MR. KELLY: About 900 for both years; about a thousand at present. First aid was only in operation for eight months and the gain was made over that period. All the men operate on either piece work or a premium basis—that proves it does not depend on production if your place is well guarded and supervised.

MR. CAMPBELL (Toledo): I would like to ask Mr. Hatch if there is any particular argument he would recommend or instruct the foremen to use with employees to sell them on the matter of safety?

MR. HATCH: I believe in having a heart-to-heart talk with the operators. If you get a bunch of men together and begin to talk to them their minds will wander and I don't believe they get the point, but take the individual operator, if you are in earnest in what you are saying, and describe some accident that might happen on his machine—tell him of the possibilities of his losing a hand or a finger, something like that. You can put it across in that way. Draw a picture so that he can see himself as others will see him in case he meets with an accident and you can sell the safety argument.

SELLING SAFETY TO THE INDIVIDUAL

MR. STILES (American Seating Company): We are all talking safety, we are all sold on it—that is the reason we are here—but we are all overlooking the greatest way to get safety across to the individual, and that is the make-up of the American people. We all like to win and the way

to get safety across is by creating competition. Create competition between one department and another and the movement will go better than it is today. Lead your men instead of pushing them.

MR. W. N. FITCH (Fisher Body Ohio Company): Because we are all workmen we are alive to the situation. One of the best ways to sell the foreman is to get him into your dispensary and make him acquainted with your doctor. When a man is brought in with a bad laceration or a hand or finger sawed off, have the foreman come in and see the agony of that accident; he will understand what that man is going through. Have him come in again when you have a patient there with a bad infection. That will help the foreman to talk intelligently to his men; he will appreciate what safety means for his department and he will take a lot more interest. I know a foreman who lost a finger while showing a man how to operate a machine—his attention was attracted for a moment and the accident occurred. Another man was working on a shaper; a piece of lumber got stuck and he reached back to get it out—the machine mashed all the fingers on his hand. Ignorance caused that accident and if the foreman had been alive to the situation he would have warned the man of his danger.

WOODWORKING OPERATIONS SAFER THAN IN OLD DAYS

MR. MURPHY (Berkey & Gay, Grand Rapids): The woodworking industry is becoming comparatively safe. Twenty-five or thirty years ago, in the days of the old square-head buzz planer and shaper, they had no guards or things of that kind and nearly every machine man was without a finger or two, but today the young fellows learning the trade in machine-rooms are getting accustomed to safety, and in five or ten years we will all get so that we won't lose a finger occasionally.

When a man has been doing a thing in a certain way for a long time it is hard to get him to change. When you put a guard on he will have to do his work with a different motion and, of course, it retards him. You expect a machine hand to constantly keep in mind the work he is doing, but that is practically impossible. If he could always concentrate his mind on what he is doing he would not get hurt, but quite frequently something attracts his attention and the first thing you know a board is bound in the saw and an accident happens. Here is a peculiar thing: half the men you ask cannot explain how an accident happens. When a man comes into a factory make him use the guards and he will get accustomed to them.

I know of an instance where a company bought and installed a new dovetailer, but the workman said that he could not use it; he had to have his old machine back. In two or three weeks the old dovetailer broke down, so they set up the new one while the old one was being repaired. It took two or three weeks to do this but when it was ready the workman said that he did not want it—he could do more and better work on the new one; he was perfectly satisfied and the old machine was never put back.

If guards are placed on machines and executives and foremen insist upon their being used the men will soon learn to appreciate them. Do

not allow the operator to have his own way, because if you do the old-timers will throw the guards away. The young fellows will use them because they are accustomed to do so.

MR. OUELLETTE (Ford Motor Company): Many times our foreman does not want to shut down a machine for a few hours to make repairs—he thinks it will cut down his production. Just the other day I had this experience: A shaper head vibrating 0.002 is considered safe but I found one with a vibration of 0.040 and the foreman made an awful holler when I wanted to shut it down. He said: "We are depending on that shaper to keep up the line." "Are you going to run that shaper and take a chance of killing someone?" I asked. "I don't want to do that," he said, "but I would like to run it until noon." "Will it pay you to run that until noon and take a chance?" I talked the matter over with him in dollars and cents and put it up to him from a humanitarian standpoint. We shut the machine down. It only caused a small production loss, but if a man had been killed it would have cost the company \$4,200, according to the compensation law. Talk dollars and cents and humanity to a foreman and you will get him over to your side.

INSTRUCTING NEW EMPLOYEES

MR. JENNINGS (Eastman Kodak Company, Rochester, N. Y.): For five years I have been interested in safety work. When we hire new employees we send them into the committee room, tell them what we expect them to do and provide them with a book of safety rules. As I go through the factory I tell the men that whenever they find a condition that is not right to call my attention to it. From ten to fifteen matters are called to my attention at each inspection and I take them up with the employees—tell them who reported them and what action will be taken.

One man may do something that he shouldn't and the foreman may bawl him out. That is not the best thing to do and I never practice it—you can catch more flies with molasses than you can with vinegar. I talk to men the way I like to have them talk to me, and I never have to go to a man a second time.

I am great for competition. In 1920 we had eighty-six accidents, in 1921 twenty-three, and this year, up to the first of September, six. I got a large bulletin board and painted the departments' records on it. I showed it to every superintendent in the factory, saying: "There is your report for 1920 and 1921. Let's see how big a reduction you can make." We have 186 presses in our most hazardous department; they had twenty-eight accidents in 1920 and last year only three. Every month they take particular notice of that board—they see who had accidents and that bulletin board, with the accidents written on it, made a great difference in our factory. Competition makes enthusiasm, with reduced accidents.

We pay our employees for turning in suggestions for improvements on machinery, on reduction of cost or improved products. If a man is working on a machine and finds a way to improve it, or the manner of operation, that man is entitled to turn in a suggestion. If the suggestion is approved by the committee he is paid an award. It all depends on

what the award may be. It might be \$10, it might be \$100. Last week one of our employees drew \$300—our employees have received as high as \$1,000. That stimulates interest and makes a man look his machines over more thoroughly and pick out the hazardous part; if he can find a hazard he takes it up with the proper authorities and puts in his suggestion. He gets a reward if it is accepted by the committee.

The Section then adjourned.

FRIDAY MORNING SESSION

THE meeting was called to order by the Chairman. At his request Mr. S. J. Williams, Chief Engineer, National Safety Council, acted as Chairman pro tem. Mr. G. E. Sanford (General Electric Company, Lynn, Mass.) announced, as Chairman of the Program Committee, that certain saw guard manufacturers would show and explain their guards and answer questions regarding them, after which others would endeavor to show the limitations of such guards in actual work.

CHAIRMAN WILLIAMS: I would like to add a word to what Mr. Sanford has said, for the reason that this meeting is the first of its kind, according to my memory, that the National Safety Council has put on at any of its conventions. All of you know the sort of organization that the Council is and you know that the Council has always wisely followed the extremely careful policy of not doing anything that would permit anyone in or out of the organization to think that its purpose was to sell safety devices.

But when we come to certain accident prevention problems we find that it would be foolish to shut our eyes to the fact that the big element in the situation is the safety devices which are commercially manufactured and sold. When we come to circular-saw guarding it is ridiculous to shut our eyes to the guards actually on the market. In ninety-nine cases out of a hundred, if any one wants to guard a circular saw, he must also buy a guard. He cannot make one; only the big fellows can make their own economically. Any safety inspector or safety engineer that asks a manufacturer to put a guard on a particular machine is confronted with the question of what guard to put on—what guard will do the work most successfully? Therefore, last winter, when the officers of the Woodworking Section had a meeting, we agreed that it would be a good idea to put on a frank and impartial discussion of circular-saw guards, including those now on the market, not from the point of competitive sales arguments, or for any one manufacturer to boost his goods and knock the other fellow's—not that at all—but from the standpoint of a free, full, open, impartial, calm and friendly discussion of whether circular-saw guards, as they are available today, are efficient for the prevention of accidents.

So we sent invitations to all of the known saw guard manufacturers. The invitation had no string to it—no charge or obligation of any sort, direct or indirect. They were invited to come here and take part in the discussion and show their guards if they wanted to. Although only four

have appeared I am glad to say that these include guards that are very commonly used. Therefore, we have a pretty good representation in quality if not in quantity.

CIRCULAR SAW GUARDING AND ITS LIMITATIONS

The program this morning is to ask each gentleman to take not to exceed eight minutes to tell us what, in his opinion, a circular-saw guard can do, showing from the standpoint of the guard he has here, if he has his here, how it operates on different kinds of work; not only on straight ripping but for grooving and other special work. Then we shall have remarks on the other side of the question, from the standpoint of the large user of saws, and then a general discussion from the floor. You can ask questions; as long as you keep your temper you can say anything you like.

MR. W. M. FRISBIE (Ypsilanti, Mich.), having one of the guards manufactured by him, then gave a demonstration of the way in which it was operated and the work it was designed to do. In answer to questions he said:

You cannot use a guard with a steel shank for grooving work, because it will be in the way. It is usable on a tilting table by a bracket being fastened to the frame of the machine. You don't see the point of operation; you are supposed to use your gauge.

MR. FRANK HOWE (Howe Safety Appliance Company, Granite City, Ill.) gave a demonstration and explanation of the operation of the saw guard manufactured by his concern. In answer to questions he said: As to cutting off thin pieces, we have found that in using a guard of any kind you have got to change your method from the way you have been doing it. A great many men are willing to make some changes to get the benefit of a guard; some are not. Where a man is willing, most of the conditions can be overcome and much benefit is derived from guards properly used.

In edge grooving, on pieces twelve or fourteen inches wide, you would have to take off your guard.

Very often a man will send in an order for a guard "to use on saws of from ten to twenty inches." If he wants to use it on a twenty-inch saw he should have a No. 4 guard. If he has a ten-inch saw he would want a smaller guard, a No. 1. I saw a system which was working very nicely in one concern. They used twenty-four, eighteen and 12-inch wheels; in this case it was emery wheels instead of saws. They used twenty-four inch wheels until they wore down to where they could put them in eighteen-inch guards and use them for some time there; then put them under twelve-inch guards—they got good results all the time. You cannot use a guard for a twenty-four-inch wheel on a twelve-inch one and get good results and you cannot use a twelve-inch guard on a twenty-four-inch wheel.

Mr. Howe then gave a demonstration and explanation of his swing cut-off saw guard.

GUARDS EFFECTIVE ON PRODUCTION WORK

MR. R. JONES (Surty Company) gave a demonstration and explanation of the manner of operation of the saw guard manufactured by his concern, and added:

If they want to set the tilting table up to a 45 degree angle, the low side of the guard rises and lowers automatically. The guard can be practically doubled in width to cover a great deal of flat dado work.

MR. J. E. McLAUCHLEN (Oliver Machinery Company, Grand Rapids, Mich.) demonstrated and explained the operation of the saw guards manufactured by his concern.

Mr. Sanford introduced the superintendent of the pattern shop of the General Electric plant (Erie, Pa.), Mr. F. E. DeLano, who has had thirty-five years' experience in prominent plants.

MR. DELANO: My object in showing these slides is simply to point out some of the different kinds of guards that are in use; I will endeavor to show some of the limitations in pattern shop work. (Several slides were thrown on screen showing different kinds of guards in use in various places.

I have some specimens of work done on circular saws and which cannot be done with the guard in place. (Several small pieces of pattern work were shown, an explanation given as to how each one was made and the different operations through which it was passed.)

I became interested in this subject and wrote letters to some of the leading shops in Pennsylvania. I would like to read some of the replies.

Here is one from a leading job shop that employs 125 to 150 men: "I consider guards on a circular saw a nuisance in a pattern shop. I had a guard installed nine years ago, but I don't think it has been in use one day in this time as the men regard it as dangerous. The circular saw in a pattern shop is used by experienced men. No workman is deliberately going to saw his fingers off on an ordinary plain piece of work if the saw is exposed so that he can see it."

Here is a letter from a jobbing shop employing about twenty men: "I consider a guard on a circular saw to be a nuisance in pattern shop work. If we were compelled to use guards on all our circular saws it would restrict our output at least fifty per cent."

That applies to pattern work only. I am not speaking about anything else.

I have had only one accident in the past five years and that happened to a handy man. He was stripping some lumber into pieces about three-quarters of an inch square. We were unable to use a guard on the saw as there is not space enough between the saw and the fence to allow for stripping lumber to this dimension. The man cut his thumb slightly. We have never had an accident on circular saws used by pattern-makers, as they are all experienced men.

GUARDS USED ON UNIFORM RIPPING WORK

MR. WILLIAMS: The other speakers have stated that in ripping narrow pieces it was possible to use, say, a two-inch strip in between, as a

guard. I am anxious to find out if there is any reason why that cannot be done.

MR. DELANO: I don't see why he could not—that is, on straight ripping work.

Here is another letter from a pattern shop that employs from five to ten men. It says: "I do not consider a guard over a circular saw to be practical in a pattern shop as there is such a variation in the work that the guard would have to be adjusted every time it is used; if the saw is covered with a guard it prevents sawing close to the line. In pattern work the saw should be exposed at all times, in order to do accurate work. It would not be hard to use a circular-saw guard where the work is plain ripping and where the stock is of uniform thickness. This condition is very rare in pattern-shop work. As our pattern-makers are thoroughly experienced in the use of the circular saw there is little liability of accidents. The pattern-maker handles work on a circular saw with the same efficiency as he does with a bench tool and he is less liable to be cut on a circular saw as he always has a certain fear of it and is constantly on his guard." I believe that is absolutely true.

Here is a letter from a factory in New York City: "Would say that in thirty-five years of practical experience with saws of all kinds I have yet to find a universal circular saw guard that was even usable. The majority, in my opinion, are criminal to ask a man to operate, due to the fact that construction is faulty and workmanship worse; they multiply the hazard rather than minimize it. Were it possible, I would recommend special guards to be designed and provided to suit the different kinds of work as may be required." It might be possible to do that.

Here is the report of an accident that occurred in a large shop in Massachusetts. The machine was guarded, the guard was on the machine and was in good working order. The operator was on repetition work and was sizing down a piece of stock 36 inches long, 21 inches wide and 1½ inches thick. His hand followed the work into the saw and cut off the end of the thumb midway between the joint and the tip.

I would be glad to have anyone look over these samples. I think they will be convinced that none of this work can be done on a circular saw with a guard. This comprises 90 per cent of the work done in the pattern shop. I have had experience in quite a number of pattern shops and I think I am safe in making that statement.

MR. R. MCA. KEOWN (Wisconsin Industrial Commission, Madison, Wis.): With reference to the other 10 per cent of work done in the pattern shop, I would like to ask whether it would be practical to use a guard or whether you would leave it off?

PATTERN-MAKER HAS LITTLE UNIFORMITY IN WORK

MR. DELANO: In most large pattern shops they have a swing saw where everything is cut off; ripping up is done on a rip saw—the pattern-maker, unless he is in a very small shop, has very little of that class of work to do. That 10 per cent would comprise ripping work to an accurate width and cutting it off to an accurate length; in that case he would seldom get more than two or three pieces alike. There is no uniformity in

the work and the guard in most cases would have to be adjusted, roughly, up to four inches.

MR. WILLIAMS: Some of the guards that have been called to your attention adjust themselves to the thickness of the stock.

MR. DELANO: For straight ripping work it would be all right; of course, a good deal of that work is grooving. Many times we have to groove our stock after we get it to the dimension. I think four-inch stock could be run through with a guard.

MR. J. T. BURKE (Toronto): The accident that happened in Massachusetts—how did it happen if the guard was on?

MR. SANFORD: The man pushed his hand beyond the guard. He thought the machine was fool proof. His thumb was upon the stock.

MR. F. A. FREDERICKSON (Industrial Commission of Wisconsin): With reference to that grooving job, where the material stands on edge—it is possible, where they have the gauge set, to have another gauge on the opposite side, bringing the material in between those two gauges. Your pattern-makers are experienced, you say. If they are, they feel that the saw is absolutely safe. On the other hand, it is experienced men that are injured. If they would use a little thought in doing their work they would have less accidents.

OPERATORS USE JIGS ON CERTAIN WORK

MR. WILLIAMS: Is there any practical objection, Mr. Delano, to that arrangement of the two gauges?

MR. DELANO: Not at all, it is very practical.

MR. ROBERT G. SHELLEY (Employers Liability Assurance Corporation, London): I would like to ask if any of the stock worked out in the pattern shops is handled in a jig. Among the automobile industries, especially the body making, I find that in trimming pieces—making edge grooves, and so forth—the operator has a jig. The piece of wood to be worked is placed in the jig, and placed over the saw with both hands, his hands being all the way from six to twelve inches away from the saw.

MR. DELANO: We do not use a jig because we have no uniformity of work. We do not make more than a few pieces of the same kind. There is so much variation that we could not handle it in jigs.

MR. E. GEISLER (Ford Motor Company): I would like to show some guards. We have tried several commercial guards, but we have had better success by making guards to suit individual work. For instance, here is what we have used, and call a box guard. (Mr. Geisler produced several of his home-made guards and explained their operation.)

In the pattern shop we have more trouble with fly backs than from any other cause. Probably, in the past couple of years, we have had twelve to fifteen men injured by the material flying back, but we overcame that difficulty quite satisfactorily by placing a one-eighth-inch metal band in front of the machine. The direction of the flying wood usually is straight. With this band (indicating) it is necessary for the operator to stand six or eight inches away from the direct line of his saw. Since we have placed this band in front there have been quite a number of

pieces of wood flying back, but we have not had one accident or injury. Everyone is well pleased. The practical inventor of these guards is Mr. Ouellette.



This box guard completely covers the saw and slides back as the stock is fed in.

BOX GUARDS AND THEIR LIMITATIONS

MR. F. D. OUELLETTE (River Rouge Plant, Ford Motor Company): Those guards are adapted for production work only, and each guard is made for the work it is planned for. In dado, grooving, or that kind of work, where you have a number of pieces on production, as in a body

plant, there is nothing better than a box guard. You have your gauge set up against the front of the guard and the guard returns by the action of the spring after the saw has passed through the wood, leaving the saw covered practically all the time. In the pattern shop I don't believe it would be practicable. (Mr. Ouellette then showed some special anti-kick-back devices.)

MR. G. E. SANFORD (General Electric Company): (Throwing slides on screen.) I want to refute the statement that most frequently it is the experienced men that are hurt. Some of you will ask: "How does the new man get experience?" It is this way: When you get in a new man, help him out, don't razz him, but try to have him start in right. Don't have him take a piece of stock over to the wrong machine and then laugh because he makes a fool of himself.

This man (indicating picture) is a firm believer in the splitter. He didn't want anything over his saws. He has had forty-eight years' experience. He is one of the men that would take a guard off a saw if he found one on it. He says he won't use a guard.

Another one of our old gentlemen with 42 years of experience (indicating another slide). He said: "Why, Mr. Sanford, I cannot afford to cut my fingers; I play a clarinet in one of the city bands." He says if a man pays attention to his work he will not get his fingers in front of the saw and will get along pretty well.

CANNOT USE JIGS ON MANY KINDS OF WORK

Here (indicating slide) is something that happened to an inexperienced man. The machine in this case was a swing saw and was thoroughly guarded. Acting on the supposition that the guard made the saw fool-proof he tried to take a full-depth cut. That is what remained after the power had been shut off.

Let me mention an accident that I know of on a certain guard. The saw fence was in place and the man had a number of pieces of stock that he was cutting down to a certain width. He was taking off the waste pieces on the side—anywhere from slivers to a couple of inches wide. About half an hour after the guard had been put on the machine a piece about three-eighths of an inch thick jammed in between the saw and the guard and came back, catching him in the side. There wasn't a serious injury—it was the mental shock as much as anything else.

I don't believe that we have any objection to circular saw guards on repetition work, but where a man is getting one cut on one piece of stuff and the next cut on something else—maybe working for five minutes on one line of work—a manufacturer cannot go to the expense of making a special jig or guard for each simple operation—we would have the stock-room half full of jigs.

As soon as you get into variety work you have to get along without guards, but a man who pays attention to the job is not likely to be hurt. Someone spoke of workmen throwing blocks of wood around the room. How many of you men would tolerate that?

MR. W. S. PAINE: In working out the woodworking code I took it upon myself to send out inquiries on the particular guard that Mr. San-

ford referred to. Each one who answered said that the guard had prevented accidents and had been perfectly effective.

MR. FREDERICKSON: I happened into a place the other day where a man had been in the plant forty-eight years and he took the guard off the saw. He thought, the same as Mr. Sanford's man, that he could not get hurt—but he did. If a guard had been on the saw he would have his fingers today. We should protect, as far as possible, not only the inexperienced but the experienced men.

EXPERIENCED MAN HURT WHILE DEMONSTRATING

MR. ROBERT G. SHELLEY (Employers Liability Assurance Corporation): Mr. Sanford said that the employee should be fully instructed in the hazards of the machine. This incident happened to a man who was running a plant for a friend of mine. He was demonstrating a machine and showing the new operator that if he didn't be careful he would lose his fingers. It was fully guarded. He was showing the man, if the guard was off, how an accident would happen. The result was that he cut off his own finger. About six or eight months ago his foreman was instructing a new operator on the same machine; he removed the guard and he cut off his finger in exactly the same place. There are two cases where it was not the operation, the new man, but a foreman and the owner of the plant each lost a finger.

DR. L. W. CHANEY (U. S. Bureau of Labor Statistics): The records of woodworking establishments with which I am familiar show constantly that the inexperienced man is injured not only more frequently but more seriously than the experienced man. I don't believe that records can be made to show the contrary.

MR. WILLIAMS: Mr. Sanford's remarks ought to be separated into two points. He contributed an affirmative point of view to this effect: That instruction of the operator on this, as on any other sort of machinery, is highly important, and that mechanical guards cannot take the place of instruction, particularly on the sort of operation that is found in a pattern shop, which is constantly varying and therefore difficult if not impossible to guard. On that I think we are all in accord. Instruction must not be overlooked and mechanical guards must not be thought of as a panacea.

Mr. Sanford, however, went beyond that, and drew a conclusion which I believe is not at all justified when he showed the pictures of five men who had been working on this class of machinery for a large number of years without accidents. These particular cases do not prove the general proposition.

SUMMING UP OF DISCUSSION

For the purpose of possibly guiding this discussion to some definite conclusion, am I correct in summing up the discussion so far as follows: We apparently agree that on what we may call straight work—straight ripping or cross cutting, not grooving or dado work—a guard is perfectly practicable; a good guard, such as those shown here is practicable and can be used, will prevent accidents and is, in fact, desirable. I haven't heard that point disputed.

Furthermore, that on production or repetition work, such as the gentleman from the Ford Motor Company described, special operations can be guarded by the use of special jigs for holding the work.

On the other hand, on pattern-shop work where the operations are constantly changing, it is very difficult, and in a large number of cases practically impossible, to provide a guard. I have not heard that disputed.

MR. FRANK HOWE: Pardon me for referring to my experiences, but I have been in the woodworking trade for eighteen years and at one time I had charge of 118 pattern-makers—I happen to be one myself. Pattern-makers are said to be so experienced and know so much about the saws with which they work and so capable that they cannot get hurt! And yet we had hundreds of accidents before we guarded our machines in the Commonwealth Steel Company.

When it comes to pattern-shop work there are a number of ways of overcoming some of the very things that have been talked about. When making segments you can cut your lumber to the thickness you require and then make the segments in a different way from that described by Mr. DeLano, and guards can be used in some of the operations. I have seen some of the best pattern-makers, capable men, cut off their hands when they have taken the guards off the saws.

Someone spoke about special work in a pattern shop being 90 per cent of the work done; in my opinion it covers less than 10 per cent. When you say that you cannot guard a tool 90 per cent of the time you are getting pretty high.

COMBINATION SAW ELIMINATES KICKBACKS

MR. M. C. GOODSPEED (General Electric Company, Erie, Pa.): Two or three weeks ago our pattern shop superintendent said he was using a combination saw which eliminated kickbacks. A combination saw is made of one rip to three cross-cut teeth. To prove this he laid a piece of soft wood with one end on the table and resting on a saw running full speed. The stick rode there, the saw cut in and it gradually worked the stick forward until the stick got about half way through, then it upset and fell over on the saw table. He said that in the year or more he had been using those saws he had had no sign of a kickback.

There can be a reduction in unguarded jobs, I believe, but there are some jobs that cannot use standard guards. Allowing that to be the case, is it not true that you have this condition: When a man is doing repetition work and gets careless and sleepy he must be guarded, but on the job where he does a single cut or a single small piece he goes with his mind on that particular thing; he is thinking of what he is doing and, therefore, is not in anything like the danger that you have on repetition work.

MR. FRISBIE: Accidents are fewer from the front part and less serious than from the rear. Usually, if a man gets cut or injured from the rear of the saw it is very serious and means the loss of a hand or he may be struck by a kickback. That has been my experience.

The Section then adjourned.

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