

1933
TRANSACTIONS

**National Safety
Council**
Incorporated

TWENTY-SECOND ANNUAL
SAFETY CONGRESS



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PLAINTIFF'S EXHIBIT

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Plan of Publication

THE TRANSACTIONS of the Twenty-second Congress of the National Safety Council are published in two volumes. The first, containing the General, the General Subject, and the Industrial Section sessions, is supplemented by a smaller volume containing the sessions of the Street and Highway Traffic Section, the Child Education Section, and Home Safety.

THE LARGE GENERAL volume is being sent automatically to the Industrial members of the Council; the smaller volume is sent automatically to members who are believed to be chiefly interested in those sessions. It may also be secured on request by other Council members.

THE PLAN OF PUBLICATION is the same as that adopted for the sessions of the Twenty-first Congress and found to be very satisfactory. It is a condensed record. The papers of each session or division of the Congress have been assembled, edited with care and discernment to abbreviate or delete the less essential portions, and the concise results are presented for study and reference. Although not "complete" in the sense that every word is reproduced, it is a readable, interesting record which emphasizes the memorable parts of each paper and address. The original manuscripts are on file in the Council Library, available for additional reference as desired.

ALTHOUGH THE National Safety Council endeavors to eliminate from discussion at its conventions matters which are not pertinent to its purposes or which are contrary to its policies, the Council cannot accept responsibility for the views expressed either in the papers presented or the discussions thereon.

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Council Purposes and Policies

The fundamental purpose of the National Safety Council is to conserve human life. It seeks this goal through a continuous campaign of accident prevention that is nationwide in scope, applies to all lines of hazardous activity, and directly or indirectly reaches our entire citizenry. It is a non-profit organization, non-sectarian, and free from political affiliations. Since its organization in 1913, it has won respect as an essential national institution.

Inseparable from accident prevention is the Council's work in improving health conditions and preventing vocational diseases in American industry.

Today there are 4,000 members, representing every state in the Union, and many of the Canadian Provinces. There are 400 foreign members. The membership includes industrial corporations, firms, individuals, public officials, schools, chambers of commerce, clubs and civic organizations. About 70 per cent are industrial concerns, including the big steel companies, the oil companies, most of the railroads in the United States, the automotive industry, and others of outstanding importance in our national industrial field.

The history of the Council is an absorbing story. Unfortunately it cannot be detailed here. Suffice to say that the First Co-Operative Safety Congress was held under auspices of the Association of Iron and Steel Electrical Engineers in Milwaukee, in 1912, and, as a result, the National Safety Council was organized in New York the following year with fourteen members. During the first year the membership increased to 971.

The pioneers of American safety went to work on the sound premise that accidents were an unnecessary part of our social order and that through application of proper remedial measures they could be avoided. They set about to nationalize this theory, and to develop the detailed methods and materials through which accidents could be prevented. The members of the organization now are more than ever convinced that accidents are unnecessary and that they can be and are being prevented. Striking examples of reductions in many different fields prove this contention.

Results of Organized Safety

Since the National Safety Council was organized in 1913, the national accident death rate in all fields excepting motor vehicle has been reduced 42 per cent. The motor vehicle accident problem is a comparatively new one, yet there are evidences of progress. Nineteen thirty-two, for example, witnessed the first drop ever recorded in fatal motor vehicle accidents—a reduction from 1931 of more than 12 per cent. Even prior to this drop in total deaths—which was partially the result of a decline in gasoline consumption—it was apparent that accidents among commercial vehicles had decreased; that grade crossing tragedies had considerably decreased during recent years; that deaths of school children had decreased; that deaths in states having effective license laws with centralized administration and in cities having community safety councils had increased much less than in other states and cities. These facts indicate that the engineering, educational, and legal remedies for the highway accident problem, are producing results where conscientiously applied.

Since the National Safety Council started as an industrial safety organization, the best results are to be expected in this field. Here spectacular achievements have

been made. The steam railroads, for instance, have reduced the accident rate among employees 76 per cent during the past 10 years. A group of our largest steel industries have cut their accidents 90 per cent since 1913. During 1932, 42 plants of the Portland Cement Association went through the entire year without a single lost-time accident among thousands of workers. Two, three, four, and even five year "no-accident" records among smaller plants and in certain departments of the larger plants are not at all uncommon.

Along with these reductions the whole psychology of accidents has changed. Employer and employee both look at the proposition from a different viewpoint than they did some two decades ago. Accidents now are really out of date. In many plants they are considered a disgrace that casts a cloud over good management and efficiency. There is very little room today for the careless worker in modern industry.

The safety problem is a universal one—and always will be—just as long as human beings inhabit the earth. Safety applies to everybody and to everything, physical or material; to every human act, to every man, woman, and child. It is only natural, therefore, that the idea which seems to have so firmly taken root in the United States should branch forth into other countries of the world. Organizations similar in purposes and activity to that of the National Safety Council have sprung up in many countries. Council posters have been widely copied for foreign use and several Council publications have been translated into other tongues.

All of these are hopeful signs of the times in the world of Safety. The National Safety Council is still young—as institutions go. A great amount of worthwhile work has been crowded into its short life. Foundation work is always slow, whether one is building safe skyscrapers or safe men. The National Safety Council has been digging away at the bed-rock of public consciousness. It has made real progress and its achievements furnish ample inspiration for continuing its humanitarian efforts.

Cooperation

The purposes and policies of the National Safety Council are not always understood by those not in close touch with the Council's work. To meet the need for a brief and definite presentation of the Council's objectives, the following has been approved by the Executive Committee as an official statement of policy:

"The National Safety Council's objective is the elimination of accidents to men, women and children, as being deplorable, unnecessary and wasteful. It seeks memberships, cooperation and contacts to insure that its services may provide the instrumentalities and finances to accomplish this objective.

"Through education it seeks to demonstrate that the safe way is the right way and the best way, from the standpoint not only of human satisfaction but of social efficiency and economy. It seeks those ways and means for safety that satisfactorily fit into the practical affairs of life.

"Its financial policy is to return in service all moneys received, so operating without profit, and to undertake only those activities which can be assured of reasonable permanence. Much of its administrative personnel consists of volunteer workers.

"The National Safety Council holds itself open to give fullest and most cordial cooperation to all individuals, industries, organizations, communities, states and nations that are in accord with the principles and objectives of the organization, and the National Safety Council likewise asks and seeks cooperation from all these in carrying out its purposes."



Annual Meeting of Members

MONDAY MORNING SESSION

October 2, 1933

The Annual Meeting of Members of the National Safety Council at the Twenty-second Annual Safety Congress, convened in The Stevens Hotel, Chicago, with President J. I. Banash presiding. An impressive invocation was given by the Reverend John Timothy Stone, D.D., president of the Presbyterian Theological Seminary, Chicago.

Dr. Stone also delivered the address of welcome to Council delegates, dwelling upon outstanding features of education, service, and entertainment which Chicago offered to its visitors. He emphasized the educational value of A Century of Progress Exposition and Chicago's contributions to intellectual and spiritual progress through its great educational institutions. "It is not the material things of Chicago which impressed me most," he said. "It is the city's spirit of service. And I know of no organization which typifies that spirit of service better than does the National Safety Council."

Responding in a few brief words of appreciation, President Banash then read his annual address.

The President's Address

By JAMES I. BANASH

President, National Safety Council

Our Twenty-second Safety Congress convenes under conditions much more encouraging than those of the past three years. We are again facing the future with confidence and our faith in our country and in ourselves is growing daily.

An organization as great as the National Safety Council, founded by industry and dependent upon its industrial membership, naturally parallels the fate of the industrial fabric of our country. How has the Council fared during these last few trying years and what of its future? These are questions of vital interest to all of us.

It is hardly necessary for me to remind you that the Council has suffered financially. So has every industry and every association, but it is gratifying to observe

that the Safety Movement has lost none of its prestige and that it still enjoys the confidence of the public in a constantly increasing degree.

In common with our industrial members on whom we depend so largely for support, the Council has found its income cut to less than one-half of the peak, which is not surprising and to some degree could be anticipated. Nevertheless, the essential services have been maintained and the great work of molding public opinion has been carried on, even with the limited resources available.

As a matter of actual fact the Council has lost some members, but it is heartening to us to realize that only in rare instances has it been due to any dissatisfaction with the Council's services. In fact, it has been estimated that on a budget approximately equivalent to that of the year 1926, we are rendering three times the service, which is always available to the members. A number of members returning to the fold with the improvement of business conditions, particularly since last May, has been most gratifying and the acquisition of new members in that period, while not startling in number, has proved that the value of this organization is widely recognized.

Since the inception of the National Safety Council as a clearing house of safety information and a stimulator of public thought, more than thirty other organizations in this field have started and passed out of existence. Nevertheless, the National Safety Council, founded under the auspices of our industrial leaders and set up to furnish the information which industry needs, has not only continued to provide industry with properly coordinated safety information, but is rapidly attaining the position where the tremendous store of experience in its archives is being sought for the general benefit. This is not a static movement but is continually being molded and adapted to the needs of today and the future.

Let me express here our gratitude to those organizations and individuals who have continued to support the Council through the lean years. It is due to them that the work of twenty years has been perpetuated and that the Safety Movement has been kept intact ready to serve humanity in the big responsibilities and opportunities ahead of us. It is due to them that we do not need to face the speculative possibility of what might happen were the Council to be suddenly discontinued.

It is quite apparent to all of us that we are now in the midst of changes which may alter our social and economic order. Plans contrary to accepted principles of past generations are now under consideration for our economic rehabilitation. What the eventual outcome will be no one can prophesy with certainty, but we are without doubt now witnessing one of the finest examples of cooperation since the war. Certain drastic conditions now in effect demand the best thought of every executive to aid in accomplishing the aims of the National Recovery Act. Many have doubted the advisability of some of the provisions of this act, but personal opinions and political differences are being forgotten in an effort no less patriotic than that of winning the war, and the country has rallied under the Blue Eagle in a whole-hearted effort to remedy our economic ills.

How will the Industrial Recovery Act affect the Safety Movement? One small paragraph in the Basic Codes of Fair Competition published by the Federal Administration does indeed recognize safe and healthful working conditions as an essential of fair competition. This will undoubtedly increase the prestige of Safety work. It will also break down some of the resistance to accident prevention efforts. On the other hand, we must not delude ourselves with the idea that the mere inclusion of this paragraph in any code will work miracles. It will be of little value if we

relax our efforts. The world has come to regard the National Safety Council as the leader in accident prevention and we must be prepared to make the most of our opportunities. Will this mean a more direct interest in accident prevention by the federal government and the states? Will it mean more laws? Will any one expect statutes to replace education? These are among the possibilities to be considered.

Let us emphasize the point that the National Safety Council is not a lobbying organization and does not seek safety through legislation. Information has, of course, been given when requested. Perhaps some legislation has been founded, in part at least, on such information, especially in relation to drivers' license laws, but I can think of nothing more disastrous to our cause than to have safety become a mere matter of statutes. The experience of centuries has shown that we cannot make men virtuous by legislation and even the limited experience of the Safety Movement in the past twenty years has proved that legislation alone is not enough.

In the present state of our civilization it does not seem that we can do without laws, as there are too many individuals who fail to recognize of their own accord their obligations to their neighbors and to their employees. The privilege of operating a motor vehicle upon public highways must not be granted forever to those who are unfit and irresponsible. An employer must not be permitted to operate an establishment which menaces the lives and health of his workers. Nevertheless, when we attempt to include every detail in the laws, we run into trouble. This country is too large and conditions vary too greatly. For these reasons inflexible regulations suddenly enforced may impose a severe burden on industry while failing to achieve the desired results. In fact, industry as we know it might not survive completely arbitrary control of this kind. All of us can think of examples of ill-advised regulations.

The National Safety Council has participated in the preparation of some codes which represent standards for the guidance of industry, based upon the experience of a representative cross section of industry. As guides, these codes are invaluable, but as inflexible arbitrary minimum standards suddenly enforced, such regulations might work serious hardships in many instances where literal compliance with minor details is not immediately practicable.

No, the National Safety Council's opportunities are not in the field of legislation and police work. In its first twenty years it has made people realize the devastating effects of accidents and shown them preventive methods. While the Council was arousing the public to its responsibilities during these years it was also accumulating a vast fund of practical information from the varied experience of the members. It is this store of knowledge combined with the reputation for disinterested service that makes the Council the national leader in accident prevention. I am confident that we shall see more and closer cooperation between industry, the Federal Government and the Council and that there will be increasing recognition of the Council and its activities.

Let us now review some of the accomplishments of the last year. In spite of an income that was cut in half, the Council has maintained its essential basic services to members. The five monthly magazines, the *National Safety News*, *Public Safety*, *The Safe Worker*, *The Safe Driver* and *Safety Education*, have continued to serve the members and the public in their respective fields. The 1933 edition of "Accident Facts" provided the most complete and up-to-date summary of accident statistics available anywhere. The value of this publication grows from year to year. The Council also issued 22 separate statistical reports for the various industries and

continued the revision of the Safe Practices Pamphlets to keep them as nearly up-to-date as practicable.

One of the important achievements of 1932 was the National Traffic Safety Contest in which more than four hundred cities participated. Through the generous co-operation of the National Broadcasting Company, this contest was concluded with a special program over a nation-wide hook-up. The contest has been continued this year with equal interest on the part of the communities participating. Twenty-two regional conferences in various sections of the country have helped thousands with their shop and community safety problems.

An essential part of our work is to keep the public informed of the extent of the accident problem and to tell them how to avoid injury. We have continued to supply the daily press, the trade publications and the radio stations with information, and the material so furnished has reached a vast audience. These mediums of public information have shown a genuine appreciation of the seriousness of the accident problem and an earnest desire to help.

It has been a matter of deepest regret that some of our public safety activities have been curtailed, particularly service to communities. With restricted income it was necessary to cut down somewhere and it is hoped that the best choice for the benefit of the greatest number was made. Nevertheless it seems proper to point out that the services which had to be curtailed can be expanded with great rapidity when the means become available. Thanks to the financial support of the National Bureau of Casualty and Surety Underwriters, the promotion of safety education in schools has been maintained. Through this most valuable activity the next generation should be better fitted to cope with the increasing tempo of American life.

These activities deal with problems that have sprung up since the Council's organization. The greater part of the membership dollar must be expended for service to members. Consequently these added activities in the field of public safety must be financed from special contributions and the sale of publications. Such financing at best is precarious and does not permit an aggressive policy carefully thought out in advance to do the greatest amount of good.

Many educational and philanthropic organizations have received much of their support from bequests and endowments. The National Safety Council is now encouraging members and other public spirited citizens to make bequests in their wills to help perpetuate and extend such activities which cannot be made self-supporting. It is hoped that such funds will be made available for these tremendously important endeavors.

One comparatively bright spot in a none too cheerful year has been the general reduction in accidents, motor vehicle as well as industrial, during 1932. Of course, we must recognize the part played in this reduction by decreased business and decreased traffic activities, but there is little doubt that such improvement could not have been made had safety workers throughout the country relaxed their efforts. We must not forget that safety men have been working often under most discouraging conditions with reduced staffs, among disheartened employees, and sometimes under conditions made more hazardous through economy in maintenance.

It would be a serious error to regard as permanent any such progress made during the past year. Already increasing factory output and increasing travel have been accompanied by an increase in accidents, sometimes out of all proportion to the exposure. We have continually advised that even in organizations thoroughly alive to the necessities of Safety work, well organized to accomplish results, the momentum

built up over a period of years cannot continue without continual stimulation. We cannot coast too far in safety work before accidents will increase. With many new employees on unfamiliar jobs and most particularly through the results of drastic economies in maintenance over the past few years, we are at this moment confronted with most serious problems to prevent an accumulation of accidents which may overshadow the good work done in the past. In recent months the newspapers have recorded a number of spectacular accidents which must warn us that vigilance cannot be relaxed, and that where reductions in staff or in maintenance have been necessitated through lack of funds, they must be reinstated at the earliest possible moment.

To careful observers in this field it also seems that the physical impairment of both men and equipment on these accounts will complicate our problems when industry gets back into normal production. Nevertheless, we have been holding on during a period when even standing still was considered progress. We had logical ideas for the future, but of necessity the stringency of current conditions demanded all of our attention. Now we must come out of the trenches and renew the attack. Can we keep pace with the demands of a rapidly changing world? After some twenty years of consistent effort we know that our status twenty years from now will depend upon our ability to adapt our technique to the needs of the day.

One problem to be faced is the increasing cost of workmen's compensation. In spite of the improved experience of many industries, the losses have become increasingly heavy to the insurance carriers. There are many reasons for this. The smaller establishments have not improved their experience to any great extent. Insurance carriers must pay heavier claims from reduced premium and investment income. Courts are becoming more liberal in their awards, and the problem of occupational disease is assuming most serious proportions in many industries.

The Safety Movement cannot control the legal phases of the problem; it is concerned solely with the preventive side. It brings together the engineer, the physician and the personnel worker so that all angles of the problem may be studied and remedied. Much research work will be needed as science develops new processes for industry. Only through knowledge of the facts can justice be rendered to both worker and employer. Our knowledge of the effect of many industrial processes and materials on the health of the worker is still vague and many cases have been decided on emotion rather than reason. While our human sympathies are naturally with the victim of injury or disease, we must realize the unsoundness of a policy that may penalize an industry for a disability not caused by occupation.

Industry has at times been burdened by well meaning but ill-advised legislation, which often handicapped the employer without accomplishing the desired results for the worker. The National Safety Council is a common meeting ground for all interests concerned. Its position as a clearing house of safety information and its splendid reputation have made its publications regarded as authoritative. To maintain this reputation it is necessary to weigh carefully all statements coming from Council headquarters and every effort is exerted to this end.

The next ten years, I am sure, will make new demands on the Safety Movement. The toll of the highways will again begin to mount when motor-vehicle traffic resumes its normal increase, unless more strenuous efforts than in the past are available to counteract the trend. Furthermore, the economies of accident prevention will be increasingly important in industry.

Under the National Recovery Administration it does appear that enlightened

business will suffer less from the competition of those who cut costs by exploiting labor, but at the same time prices must be kept within the public's ability to buy. The total cost of labor and of material may increase, but to keep going industry must show a profit. For these reasons the savings through the actual reduction of accidents and increase in the health and general well-being of the worker will be needed even more in the future than in the past.

So much for the economic side and we need not apologize for emphasizing economic values. Nevertheless, it is the moral and spiritual values of the Safety Movement that gives it such a wide appeal. Today we are thinking more of human values than in past years. We are hoping that the coming years will have a sounder basis of prosperity than in the past and that this prosperity will not only be enhanced, but that it will have a wider distribution. The Industrial Recovery Act has mentioned the provision of safe and healthful working conditions as a fundamental of fair competition and a basic right of the worker. We would extend the same principle to include the community in which he and his family live.

In looking back over the first twenty years of the Safety Movement we have seen many obstacles overcome. Hostility, ridicule and apathy have all hindered efforts to protect men from the consequences of their own failures. Now we have reached the point where our work has at least the passive approval of the world. Nevertheless, the goal of universal safety will not be attained until every person old enough to be accountable for his actions realizes his own responsibility.

Every industry with a vital safety organization is a powerful influence in the community. The leadership in the movement has come from the membership of the National Safety Council and the world will continue to look to us for direction in human conservation.

The tellers of the meeting were then appointed as follows: George G. Traver, Ed Potter, and F. C. Lynch.

Minutes of the previous meeting were approved unread.

Nominating Committee Report

The Report of the Nominating Committee was then presented by Frank H. Cogan, Chairman, Member of the Executive Committee representing the Marine Section, as follows:

"Complying with your instructions, the Nominating Committee appointed by you with the approval of the Executive Committee, and as provided for in Section 4 of Article 6 of the By-Laws, and as further provided in Section 5 of Article 6 of the By-Laws, presents herewith the report of Nominations for Directors to serve until the Annual Meeting in 1936.

"The names of the following directors whose terms expire October 2, 1933, are submitted for re-election:

Ernest W. Beck, C. W. Bergquist, E. F. Blank, R. I. Catlin, Dr. Louis I. Dublin, Harry D. Immel, Ira V. Kepner, Dr. R. M. Little, H. T. Martin, George Opp, Dr. L. A. Shoudy, E. C. Spring, Lucius S. Storrs, Alfred H. Swayne, Arthur M. Tode, S. E. Whiting, Dr. C. E. A. Winslow, A. S. Regula, H. A. Schultz, and Ernest L. Simmonds."

The secretary was then instructed to cast the ballot, a total of 951 votes, for the nominees and none against them.

The Resolutions

C. W. Bergquist, Chairman of the Resolutions Committee, presented the following resolutions which were formally adopted:

WHEREAS, during 1932 a total of 88,000 lives were sacrificed in accidental mishaps, including 29,500 motor vehicle deaths, 28,000 home fatalities and 15,000 occupational deaths, and

WHEREAS, this unnecessary waste represents a financial loss of approximately two billion dollars and an immeasurable social loss, and

WHEREAS, accident reports of recent months indicate that the national industrial accident trend is increasing ahead of and out of proportion with the increase in employment and man-hour exposure, THEREFORE

BE IT RESOLVED, that members of the National Safety Council, assembled at the 22nd Annual Safety Congress and Exposition, do hereby pledge to increase our efforts and assistance in a renewed determination to stop this increase and reduce accidents in all fields of human activity throughout the coming year and that our activities be concentrated more especially in the following channels:

1. *Industrial Safety*—The safeguarding of all mechanical equipment and the constant use of such devices; the revision of hazardous manufacturing processes; the widening of our engineering pursuits; regular and complete safety inspections and research in all industries, followed by prompt application of approved remedial measures; more psychological studies of the mental aspects of accidents; extension of safety contest plans; a wider recognition of the close relationship between industrial health and safety; and full cooperation of the National Safety Council with affiliated Community Councils throughout the country.

2. *Public Safety*—Continued effort toward securing strong drivers' license laws in every state; uniform traffic laws for all states and cities; standardization of traffic signs and signals; modern highway engineering programs; strict enforcement and observation of all traffic laws; a more intensive effort to reach the individual driver; special emphasis on the teaching of safety in the schools and homes; and the establishment of more Community Councils.

3. *Home Safety*—The broadening of our educational work, particularly with the schools, the General Federation of Women's Clubs, the American Legion, the National Congress of Parents and Teachers and kindred groups; and an earnest effort to reach the individual housewife with an educational program on home hazards.

AND BE IT FURTHER RESOLVED, that since, under the President's Program for Recmployment, employers of labor everywhere are assuming new financial obligations through the addition of new employees, we pledge unceasing efforts toward realization of the important economies of efficient accident prevention, thereby helping directly the employers who have generously assumed the new responsibilities imposed by the National Recovery Administration. And we further pledge our allegiance to President Roosevelt for his able leadership and his unswerving determination to bring the American people out of economic chaos into their rightful prosperity.

AND BE IT FURTHER RESOLVED, that a copy of these resolutions be sent forthwith to the President of the United States, at the executive mansion in Washington.

BE IT RESOLVED, that to President J. I. Banash the members of the National Safety Council do hereby express their sincerest thanks for his unselfish devotion

to our cause, for his vision and high purpose, and for that splendid and inspired leadership which has enabled the Safety Movement to drive concertedly forward to one of its greatest years of accomplishment.

BE IT RESOLVED, that the deepest appreciation of the entire membership of the National Safety Council be hereby extended to our volunteer officers and executive committeemen for their wise counsel and for that unselfish contribution of time, thought and energy which our organization has so sorely needed to weather successfully one of the most critical periods of its existence.

President Banash then presented Wallace B. Phillips, Chairman, Pyrene Company, Ltd., London, England, and Vice-President of the National Executive Committee, National "Safety First" Association.

*Orig. paper
Sajad, m. h.
Phillips, W. B.*

Safety's Contribution to Civilization

By WALLACE B. PHILLIPS

Vice-Chairman, National Executive Committee, National "Safety First" Assn., London, England

Civilization is very old, and the Safety Movement is a mere child. This great movement did not, as is commonly supposed, originate in America. The origin of accident prevention on a definite basis goes back to 1891, in which year Sir George Livesay, a pioneer of welfare work and the far-seeing head of the South Metropolitan Gas Company, London, England, made the first move in accident prevention when he adopted the jury system to investigate the cause of every accident and to determine methods of averting a similar occurrence.

A decade later the late Lord Leverhulme happened to be a personal witness of an accident at the Port Sunlight Works of Lever Brothers in England. With characteristic energy he set to work to evolve a system of accident prevention which today is a pattern for industrial plants.

From these small beginnings the movement has developed slowly and rather painfully, but nevertheless surely, culminating in this great Congress.

We are as yet groping in the dark for cures for accidents. We realize the limitations of rules and regulations. We can guard machinery almost perfectly, but not the intricate human machine. Safety work has long been recognized as dealing essentially with the mental side of accident prevention. Human rather than mechanical failure is the cause of most accidents.

Within recent years systematic attempts have been made to arrive at a more complete determination of causes of man's behavior, and the progress made in the study of accident causation is but one of many directions in which psychology is revealing the laws which govern human action.

Safety work is a war against that lust for speed, for output, or for wealth which has no regard for the cost in human life and limb; a war against selfishness on one side and apathy on the other.

In Great Britain, the National "Safety First" Association, which I have the honor to represent, has recently compiled a statistical review of fatal road accidents in England and Wales during the six months July to December, 1932. In this period 3,129 people were killed, of whom 575 were children. An analysis of the chief contributory causes of these accidents shows that human failure accounted for 85.8 per

cent. This startling fact indicates very clearly that only the fringe of scientific accident prevention has yet been touched.

Thanks to the great strides made by your National Safety Council, the United States leads in the numbers of associations, corporations and individuals supporting the Safety Movement. Those of us who have had the good fortune to be associated with your managing director, W. H. Cameron, will, I am sure, agree with me that a great deal of the success so far achieved has been due to his untiring energy, perseverance and organizing ability, coupled with his unflinching faith and belief that the Safety Movement is one of the supreme necessities of modern life. We need more, much more, of this kind of enthusiasm, and I say this knowing full well that there are many thousands of men and women in the United States who feel the same way about the movement as does Mr. Cameron. But in the place of thousands we need and must have millions.

In Great Britain the National "Safety First" Association is the fountain head from which pours a steady stream of safety propaganda throughout the nation. This association owes its inception to the war, when, due to the menace of air raids the streets were darkened at night and accidents greatly increased. Sir Herbert Blain, our president, was at that time assistant managing director of the London General Omnibus Company and its associated companies. He had long been a strong believer in safety principles, and he decided that something must be done to control the rising curve of street accidents. He called a meeting of the heads of the various municipalities, transport companies and all organizations interested in street traffic, and as a result the London Safety First Council was formed. After the war, interest in the work, which had been confined to London in its early stages, became nation wide, and eventually resulted in the creation of the present National Association. His Royal Highness, the Duke of York, is our patron. For many years he has taken the keenest personal interest in our work, and is always ready to lend his assistance in furthering the interests of the Safety Movement.

The Association is also supported very earnestly by the government and those departments principally concerned with safety, including the Home Office and the Ministries of Transport, Education, Health and Labor all give their very strong cooperation. They are actively represented either on the Council or on the various committees. Through the friendly cooperation of the press of the entire country, the principles of safety have been so widely broadcast that it must be an inhabitant of a very isolated spot who has not read something on this subject.

If in the United States it were possible to secure the same degree of federal support as is granted the British Association, it would insure your success to an even greater extent than has yet been achieved.

Aside from the United States and Great Britain, Canada is the only other country possessing a strong, well-supported, nationally known safety organization. Great Britain has recently inspired three of her dominions—Australia, South Africa and India—to start such organizations, and a small group of enthusiasts in each country is aiming to make the Safety Movement a vital factor in community life.

Associations have also been formed in France, Belgium, Holland, Germany, Austria and Japan, and from our knowledge of the leaders of those organizations we feel very confident that within a few years their work will be as fruitful as that of the larger societies. There is also some form of safety organization in Italy, Switzerland, Norway, Spain and Russia.

It behooves the various national safety organizations to work together more closely and be more mutually helpful than perhaps they have been in the past, not because

of any lack of willingness, but mainly because there has been no time to look beyond each one's individual progress. It is also essential that the larger associations lend a helping hand to the newer organizations. Within a few years it will become desirable to form an international Safety Council and call together the nations of the world in a great congress.

The National Safety Council very proudly and justifiably announces in its 1933 edition of "Accident Facts" that, had the accident rate continued at the same level as in 1913, 175,000 more lives would have been sacrificed in the succeeding twenty years than were actually lost in the United States during that period. The great problem concerning us is not only to maintain this excellent record but to improve upon it. How are we going to present facts in a manner that will educate a public composed of all races and grades of people to stop, look and think? In other words to be careful.

We must commence with the child. The things firmly entrenched in our minds during childhood are never forgotten. In Great Britain we have held for many years annual safety first essay competitions among school children. In London alone more than 200,000 essays from about 1,250 schools are submitted each year, and many thousands of children attend our film pictures and lectures throughout the country. This year, as on several previous occasions, Their Royal Highnesses, the Duke and Duchess of York, have graciously consented to award the prizes awarded by the London Safety First Council to the London school children who have submitted the best essays.

It is a striking fact that in spite of the enormous increase in the number of motor vehicles and in the dangers of the road, the number of children killed last year in the metropolitan area was practically the same as in 1918, whereas the number of adults who fell victims to fatal accidents in this same area has trebled during that period. A similar though not so marked difference with regard to children injured in street accidents is noticeable; the number of child victims in 1932 being about twice as many as in 1918, while the number of adults injured has quadrupled.

Another form of educational work producing excellent results is a Safe-driving Drivers' Freedom from Accident Competition which is open to paid drivers of all member firms. The vehicles involved included omnibuses, long distance road coaches, trucks, delivery vans, etc. In London over 53,000 drivers were entered during the last year; 32,990 diplomas, 2,140 silver medals, 211 gold medals and 4,072 bars to medals were awarded to these drivers. To qualify for a gold medal, a driver must have a record of ten consecutive years without any kind of accident, and for a silver medal, five consecutive years.

Laws and regulations may help, but they can never cure the evil. We must awaken the conscience of the people to the stupid waste of life, due more often than not to the repetition of a dangerous practice which a person trained to think safe would never have commended. Accident prevention aims at enabling man to enjoy the privileges of life without the pain. Safety's contribution to civilization is the antidote which it provides for the evils arising out of mechanical and scientific progress. Some of these, such as accidents, are due rather to man's slow adaptation to changed environment than to any inherent evil in the actual means of progress.

Our civilized world has been receiving the greatest possible benefits from the work that has been done, but if we of this generation are going to leave a creditable heritage for those who follow us in years to come, we must bestir ourselves far more than we are doing today.

ADJOURNMENT.

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Banquet and Dance

WEDNESDAY EVENING SESSION

October 4, 1933

The annual banquet of the National Safety Council, combined this year with a dance, was held in the Grand Ballroom of the Stevens Hotel. Interspersed with the service of delicious viands, the guests were entertained with orchestral music and several novel features, not the least of which was the impromptu leading of the orchestra in popular numbers by one or two of the guests. Following the banquet, Chairman James I. Banash announced the election of officers of the National Safety Council (which had taken place that day) as follows:

President—John E. Long, supervisor of safety, The Delaware & Hudson Railroad Corp., Albany, N. Y.

Vice-President for Public Safety—Robert I. Catlin, assistant vice-president, Automobile Department, The Aetna Life Insurance Company, Hartford, Conn.

Vice-President for Engineering—J. E. Culliney, manager of safety, Bethlehem Steel Corp., Bethlehem, Pa.

Vice-President for Finance—G. T. Hellmuth, general claims attorney, Chicago North Shore and Milwaukee Railroad Company, Chicago.

Vice-President for Safety Councils—Law R. Palmer, conservation engineer, The Equitable Life Assurance Society, New York City.

Vice-President for Administration—C. W. Smith, safety director, Standard Oil Company (Indiana), Chicago.

Vice-President for Membership—R. T. Solensten, vice-president, Elliott Service Company, New York City.

Vice-President for Industrial Safety—George H. Warfel, assistant to vice-president, Union Pacific Railroad Company, Omaha, Neb.

Vice-President for Health—Dr. Cassius H. Watson, medical director, American Telephone & Telegraph Company, New York City.

Vice-President for Education—Albert W. Whitney, associate general manager, National Bureau of Casualty & Surety Underwriters, New York City.

Treasurer—William E. Worth, works manager, Twine Mills, International Harvester Company, Chicago.

Secretary and Managing Director—W. H. Cameron, Chicago.

The newly elected president of the National Safety Council, John E. Long, supervisor of safety, The Delaware and Hudson Railroad Corp., Albany, N. Y., then was introduced by the chairman, and addressed the Council members as follows:

Original -
11290-Gen - The President's Speech of Acceptance

It seems to me that there are two big problems which are constantly facing the National Safety Council. One is to keep safety knowledge abreast of the advances being made in industry and transportation. We must push into new fields of research and analysis. The second is to co-ordinate the efforts of those who are responsible for safety in our industries and communities and stimulate effort all along the line.

We must not fail to realize that *relatively* few employers are carrying on safety programs that really produce results. Many are not yet convinced that accident prevention is thoroughly practicable. They fail to realize the small cost of an effective program and the large benefits obtainable. We still have thousands of small and medium-sized concerns to win over. And there is still fatalistic indifference toward the public accident problem.

Much more could be said about the accidents happening outside of industry—on our streets and highways, in our homes and in public places. Fundamentally, the problem is the same everywhere: first, genuine acceptance of responsibility, and then organization of protective measures.

During this Congress week our discussion naturally centers on methods and technique, but even more than the essential equipment and methods, we need courage, determination and persistence.

It is my earnest hope that the coming year will be one of accomplishment both for the safety movement as a whole, and for your individual contributions to the cause. You have rendered distinguished service in the past, and I trust that I can count on your continued loyal support in the future.

I am grateful for this opportunity of co-operating with you in our constant attack upon the accident problem. Perhaps it is unnecessary for me to say that I sincerely appreciate the honor you have conferred upon me. Knowing something of its obligations, I am a bit apprehensive of my ability to measure up to your expectations. However, it has been said that the only prayer ever answered is the prayer of service and labor. I will give you the best I have.

Chairman Danash then introduced the speaker of the evening, Reverend Preston Bradley, D.D., pastor of the Peoples Church of Chicago, whose address was entitled "The Romance of Life."

At an early hour the tables were cleared away and the remainder of the evening was devoted to dancing.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS
 NATIONAL SAFETY COUNCIL



Accident Records

TUESDAY AFTERNOON SESSION

October 3, 1933

The session devoted to the discussion of Accident Records was called to order by Chairman E. F. Blank, Director of Safety and Welfare, Jones and Laughlin Steel Corporation, Pittsburgh, Pa., who presided. The chairman welcomed the delegates on behalf of the National Safety Council and immediately introduced the first speaker.

How to Collect and Tabulate Accident Records - *del. 11290-11291*

By B. O. PICKARD *del. 11292-11293*

Manager, Pacific Coast Marine Association's Accident Prevention Bureau, San Francisco

The speaker said in part: I believe that I can best serve you by placing before you my own experiences with accident record tabulations. But, first, I should like to impress upon you the fact that before 1927 (the year the Pacific Coast Marine Association's Accident Prevention Bureau was inaugurated) there were no available reliable data on accidents occurring in the marine industry.

At that time the reports of injuries were prepared primarily for the use of insurance claim agents, attorneys, doctors and the State Industrial Accident Commissions; the principal interest in an accident was the nature and possible costs of the resulting injury; the accuracy of the details written on the forms, especially as far as the cause of the accident was concerned, was seldom checked, unless the injury proved fatal, or a catastrophe occurred and public opinion became a factor. The report forms were not standard except for each of the Industrial Accident Commissions. Many accidents resulting in injuries of a presumably minor nature were not reported at all. Supervisors, as a whole, were not interested in accidents or accident prevention, and frequently did not hear of one occurring in the gang, or men they were bossing.

Our Bureau is now six and one half years old, and has at this writing analyzed more than 40,000 reports of accidents resulting in personal injuries to the employees of more than 100 Pacific Coast ship owner and stevedoring companies. In connection with the analytical system, which is now used, I established a few fundamental

principles, some of which I shall quote in order that certain statements will be understood.

1. Differentiate between the terms "accident" and "injury." The injury is actually one of the results of the particular accident specified in the report, which type of accident probably occurred frequently before some unfortunate employee became a victim.

2. An accident prevention bureau is not interested in an injury except as one of the results of an accident. It is interested in the elimination of all accidents that cause wastage, not only of human bodies, but of material, property and time.

3. An accident is the end result of a certain number of exposures to industrial physical hazards.

4. To prevent accidents, we must first learn our physical hazards and group them according to varied operations. We can then control each hazard as far as is practicable. Eventually, we can limit the exposure to the uncontrollable physical hazards through the development of safe working conditions, safe equipment, standardized safe practices and standardized safe habits.

5. An accident prevention program must be predicated on the belief that (a) accidents can be prevented; (b) an accident is an error or mistake on some individual's part; (c) errors or mistakes are controllable through supervision; (d) if the error is tolerated the accident will recur as soon as the law of averages catches up; and (e) accidents will be prevented only if responsibility for non-prevention is assigned.

One of the most important "facts", which must be deduced from reports of accidents, is the nature of the physical hazards classified in the order of their relative importance. Physical hazards in industry may be considered as represented by a combination of the following: (a) the place of employment, (b) the nature of the work, (c) the equipment or material involved, (d) the types of accidents, and (e) the contributory causes of accidents. Probably the most important of these physical hazard factors is the "accident types."

I classify "types" by determining the primary cause of the accident, ignoring as far as is possible the cause of the injury. I differentiate, therefore, between the cause and effects of an accident. For example, here is an actual occurrence that will better explain what is meant:

"A man while climbing a ladder was struck by a moving sling load and was knocked off the ladder; he fell to the bottom of the hold, landing on a fellow workman who was working in the square of the hatch."

The accident type in this case (or the unexpected occurrence which started the chain of circumstances which injured the two men) is, according to this system, the uncontrolled "moving sling load"; the "place" of the accident is the hold of the ship; the "nature of work" is hoisting cargo; and the "contributory causes" are the uncontrolled moving object (moving sling load) and climbing ladder while cargo or material was in motion in the hatch.

The No. 1 man was injured only slightly when he was struck by the sling load, but he was more seriously injured when he landed in the bottom of the hold. The second man was injured when he was struck by the man who fell on him. Neither man would have been injured, neither would there have been any time or material wasted, if the moving sling load had been properly controlled, or if the man had not been permitted to climb the ladder during hoisting operations.

In this instance the exposure to the hazard of hoisting cargo in an open hatch could have been eliminated entirely had the hatch-tender in charge of hoisting in the

hold been instructed to refuse absolutely to hoist cargo while a man was on the ladder, or anyone exposed in any way to the moving sling load.

Classifying, as the Bureau does, more than 6,000 accident reports each year, it has been deemed necessary to take advantage of what is known as the Hollerith Card System, followed by the tabulating machine facilities of a tabulating service company in San Francisco. The following information is quoted from the accompanying injury report and then punched on a Hollerith card:

(a) Date; (b) Case No.; (c) Employer, if any; (d) Ship by name, if any; (e) Port by name, if any; (f) Occupation of injured man; (g) Place of accident; (h) Nature of work; (i) Cargo; (k) Age of injured man; (l) Type of accident; (m) Seriousness of injury; (n) Type of injury; (o) Part of body; and (p) Contributory cause.

The classification called "Type of accident" is an outgrowth of the general cautions that are used in practically every industrial accident analysis. In my system it is really a grouping of accidents by "type", and under types of accidents we use the following major headings: Slipping, Stumbling, Tripping, Jumping, Losing Balance or Falling; Falling Objects; Moving Objects (not falling objects); Flying Objects; Hand Handling; Striking against Objects not being handled (not including tripping or stumbling); Stepping on Objects; Hand Tools; Machinery (operating, adjusting, cleaning, oiling, repairing); All other types, and not apparent from reports.

The details in this "Accident Type" classification are offered primarily as the answer to the Bureau's peculiar problem. I should tell you that the details are a development of six years of experience in an industry that has certain outstanding physical hazards. Many details could be expanded. In fact, the first, second and even the fifth classification, which I attempted, contained many experimental details that have been found unnecessary and are now discontinued. When it is suspected that an accident type exists, that deserves special study, the detailed accident type is isolated for a year or two and thereby I am enabled to analyze it.

The seriousness of the injury (Section M) is divided into three headings—minor, disabling, and fatal injuries; minor injuries being those which do not result in any loss of time; a disabling injury is considered as one which causes loss of time in addition to the day or watch on which the injury occurred, or prevents the injured man from carrying on his regular duties on the day or watch following the injury. The only excuse for this classification in an accident prevention program is to balance or equalize the reporting variability of the different companies. If I had the power to compel a report on every injury resulting from an industrial accident, I would make no distinction between a splinter, a cut, or a fatality.

Under contributory causes (Section P) my rule is, that the accident must be considered from the viewpoint of "why it was not prevented." The contributory cause assigned should be the best answer, that can be obtained from the report and a knowledge of the practices involved, to the question—"Who or what was responsible for not preventing the accident?"

From many of the reports only one answer can be obtained and this type is simple to code. However, in other cases the cause is not clearly evidenced. These cases are those involving habits of the men, and practices, methods and operations. A distinction between a practice and a habit is at times difficult to draw. To standardize the classification, the following definitions are used:

"A habit is something indulged in by individuals as such. A practice is indulged in more or less universally by a group of workmen. Many times the action of a man is both a practice and a habit."

In assigning the contributory cause, that cause which is most important, most easily corrected, and which will do the most toward preventing a repetition of the accident is the one used.

Placing responsibility for the non-prevention of an accident on a workman will not necessarily prevent its repetition, hence, whenever reasonable, it is my belief that non-prevention should be charged to the supervisory force; for, in the last analysis, it is the supervisory force that is responsible for the non-prevention of the accident. Practices, and even habits, can be corrected through this agency.

A classification that has proved extremely interesting to the supervisors, and most valuable to me, in driving home the common nature of accidents and their relation to continued exposure to unsafe methods, habits, working conditions and equipment, is the "danger of work" segregation.

After the detailed information for accidents is coded and punched on the Hollerith Card, tabulating machines are used to assemble and tabulate such information as is desired for each employer, ship and port; for each group of employer companies; for each trade, etc. Quarterly, semi-annual and annual reports are based on these tabulated assemblies and presented to the companies and associations in both tabulated and graphical forms. Safety posters, special drives on a certain type of accident; on a certain type of work; on a certain practice; or on a certain habit, are based on the facts thus assembled.

In closing this paper I should advise you that I have now determined after six annual surveys, that there is so little change year in and year out in the accident types that this classification study in the future will be checked only at five year intervals. However, the contributory cause classification, combined with "Nature of work" will be made each year, because they are providing facts which are quite valuable in correcting certain prevailing unsafe practices and habits, and in assigning responsibility for the non-prevention of accidents.

How to Analyze and Use Accident Records

By E. J. KREH

Manager, Accident Prevention, Philadelphia Company, Pittsburgh

The speaker said in part: Reliable analyses must be based on accurate and complete data. Therefore, accurate information on the basic cause of every mishap is of major importance. It is not difficult to demonstrate through intelligent use of accident facts the following:

- (a) Accident reports keep supervision informed of the faults in man and equipment.
- (b) Accident facts guide management in correcting faults which interfere with maximum efficiency.
- (c) They can be made to pay big dividends. When these advantages manifest themselves, there is no more difficulty.

After complete and accurate reports are assured, a minimum number of basic records should be established and so arranged to provide quick and ready reference.

In addition to these established periodic reports for executives, superintendents, and foremen, the safety engineer must initiate other research which his judgment dictates as being advisable. As he progresses, further research will suggest itself. No plan

may be outlined which would be used by all forms of business, but the following practical examples should illustrate the means which might be employed.

Finding the Cause for Accident Proneness

When the accident report reaches the office of the safety engineer, it is profitable to review all previous reports involving that employee during the past several years. This review permits discovery of any proneness to certain failings. If such is noted, a complete list of past accidents may then be forwarded to the supervisor or foreman, suggesting that he study the men, the tools, the equipment, the lighting, or what other elements may be indicated. A notation is made of the action taken, and if any other mishaps occur involving the same employee, the file is again reviewed.

Example—Report is received stating that an employee had a foreign body lodged in his eye while working under a car. Review of his previous accidents shows four similar occurrences, and four other mishaps where knuckles were barked when a wrench slipped on a nut. All these are listed and sent to the foreman. He studies the man and finds that while he works under the car, dirt and other foreign matter falls, for which reasons, the man squints, and with eyes half closed, attempts the adjustment of the wrench. The result is improper adjustment and consequent slippage. Goggles will cure both types of accident. The foreman will be prompt in coming to that decision, and because he makes it himself, he is more likely to make sure that his rule is obeyed.

A report from a motor coach operator describes a fall inside the coach. A review of his past record shows three similar accidents, as well as five collisions due to vehicles running into the rear of the coach after it had made a stop. The data are forwarded to the supervisor, who correctly concludes that the man is making sudden service stops. He verifies this by observation and proper training follows.

Lineman reports fall from a pole. Record shows three other falls or near falls, all alleged due to spurs cutting out. Record sent to the foreman who observes peculiar awkwardness on the pole. Physical examination followed. High blood pressure and dizziness discovered as the cause.

For street car operators, coach operators, and commercial fleet drivers, some companies find it desirable to maintain a daily running card record of each man. Each day he is credited with the number of hours worked or miles operated. As each accident occurs, it is noted on his card, together with the type and cost. At the end of each month, ratings are established on the basis of hours worked or miles operated. This rating is then compared with the garage or car house average. This procedure permits constant identification of the poor operator, after which, his record may be studied and cause of failure inquired into. Observation while operating, consultation, mental and physical check-up or additional training may follow.

Finding the Cause of Equipment and Material Failure

An accident report states that a pipe tong slipped. The report shows that the tong was in good condition. The man involved did not have a similar accident. Review of the accident facts shows six similar accidents during the year involving other men. The logical conclusion is that the fault is not in the men but may be in the tool. Facts are presented to the superintendent, who inspects all the tongs on the system. He finds that the key used in the tong is not the proper size and thus discovers the cause for slippage.

Another accident report describes "splinter in hand off a mop handle." Review of record cards for mop handle splinter accidents locates six. With that information, the superintendent is justified in looking into the grade of wood in all of his mop handles. He finds all bad. Takes the matter up with the manufacturer, who supplies a better grade of handle.

Accident report describes foot injury due to falling object. It is the first time this man was involved. Check shows seven others in the same department, all involving the same process. Facts are presented to the foreman. He studies the operation and concludes that a conveyor should be supplied. It remedied the accident cause, and also speeded up production.

An automobile accident report describes an occurrence wherein a vehicle ran into the rear of a work truck while it stood on the street at night. An inspection showed the truck was equipped with legal lights in good condition. Check of this type of equipment showed five similar types of accidents all occurring at night. This prompted the department head to conclude that additional markers and red lights should be supplied, and the truck painted, as well, in the rear with stripes readily distinguishable at night.

Several of the foregoing examples give evidence that accident facts aided in the improvement of methods and practices and assisted the superintendent to increase his efficiency. What better argument can be found to show justification for accurate data, and use of accident facts?

Group Studies

Periodically, it may be desirable to study the accident record of all men under each foreman. Particularly is this desirable of those supervisors who have a higher accident rate than other groups similarly engaged. Many interesting facts may be found which are valuable to the superintendent in improving the qualities of his supervisors. Suppose you find that many accidents are due to lack of knowledge. Doubtless, that information convinces the superintendent that the foreman should be instructed to give more attention to planning the job and to the training of men. A frequency of accidents due to infraction of safety rules indicates lack of discipline.

Review of foreman's record for one year shows three accidents due to falling objects, one due to ladder slippage, ladder was not tied nor equipped with shoes—two due to running through the shop, one due to horse-play, three eye injuries received in operations requiring the use of goggles. All of these show violation of the prevailing safety rules. With these data in hand, the superintendent is equipped with information to reach proper conclusions and take proper action. In such instances, accident facts render a definite service to the managers of men, which will lead to improvement in qualities of supervision.

Group Studies by Type

Because so many factors are involved, many elements in accident cause will remain hidden, unless types of accidents are studied in groups. For instance, what effect does age, experience, time, place, occupation, physical condition, and lighting have upon the frequency of falls. To learn this, it may be necessary to study all falls occurring over a long period of time. Much interesting and useful data can be developed which may be used to great advantage. These are examples.

Electrical Accidents

Group studies showed that they were much more frequent in summer than in winter. This provided data for both employees and foremen. It made good bulletin board material. The analysis also showed that while electrical burns occurred with less frequency than other types, the severity and the cost were greater. This was splendid information and enabled supervision to see the importance of maximum use of protective equipment.

When the cause of electrical accidents was broken down further by departments, and by jobs, occupational hazards were discovered and change in methods and equipment took place. As an example, electrical burns to street car operators were found to be due to the design of the fuse cut-out box.

Back strains were found to occur with greater frequency at the beginning and end of the work; two-thirds occurred in the winter, and only one-third in summer.

Eye injuries showed the occupations most effected, discovered jobs which were not protected, and provided one of the best mediums to show the value of eye protection.

Group studies to determine the effect of age and job experience on the accident rate usually show that the inexperienced hand has the highest rate and also that the young man is more often involved. These facts point out the importance of training young as well as new men.

The Time Accidents Occur

The study of peak hours is sometimes valuable as was demonstrated when it was discovered that the major cause for trouble in one department in the peak hour was aisle congestion. Another division showed that "running through the shop near the quitting time" was a major factor. Without doubt, these causes would not have been discovered without this information.

Part of Body Injured

Before all workers are compelled to wear hard toed shoes, it would seem reasonable to learn the extent and the nature of the foot hazard. Some departments have none, while others have many. The degree of frequency should be the guide. This data also provides the safety engineer with sound argument to sell this protective equipment to workers and supervisors.

Occasionally, many factors must be studied at the same time to arrive at a correct solution. A group study of falls inside a street car involved these factors: Age and sex of passengers, weather conditions, straight, level, or curved track, type of equipment, floors, stanchions, the operator, the route, direction, number of passengers on the car and many other factors.

Conclusions Reached

- a. That most accidents occur when the car has less than twenty passengers on board.
- b. That the majority are women over forty years of age.
- c. That the majority involve casual women riders hampered with bundles.
- d. That high heeled shoes are an important element.
- e. That most occur in the off peak hours.

All of these show that the major effort should be directed toward the education of this type of passenger. It was further covered that—

- a. Wet and snowy weather plays an important part.
- b. That the majority occur when the car is starting.

These items focus attention upon the need for training in acceleration, and sanding car floors in wet weather.

The study may also show that the majority occur in one part of the car. This encourages observation which convinces one that the location of stanchions or hand-holds should be changed. Study may also indicate that the floors of the cars might be improved whenever new car design is considered.

Accident Locations

Particularly valuable from the standpoint of vehicle collisions, but may also be applied to the industrial plant. When records are maintained showing the locations of accidents, these may be studied as the frequency and circumstances warrant. A plan can be made of the intersection and the manner of each occurrence illustrated on the plan. These plans may then be submitted to the company traffic supervisor, as well as to the municipal traffic engineer. This may justify changes in timing of signal lights, curb cut-backs, erection of warning signs, restriction of parking, painting of overhang lines on the street and other similar remedies.

Cost

It is wise to keep the executive and supervisory family informed of the cost of accidents, as well as the hidden and incidental losses which accrue therefrom. It is desirable to present this data at regular intervals showing results by divisions, by departments and by companies, so that comparisons may be made. Occasionally, it is wise to set up this cost on the basis of units of production. If for example, the executives and foremen of a coal mine understand that their production cost per ton mined has risen fifty cents, all because of one accident, it focuses their attention on preventive measure. In litigated claims or those pending adjustment, the payment is made usually a long time after everyone has forgotten the incident. It is desirable to inform manager, as well as foremen, of the final result. Periodically, it is found profitable to set up a statement showing cost of accidents by type. This information calls attention to the causes of those accidents which are creating the greatest loss.

ADJOURNMENT



Dermatitis

WEDNESDAY AFTERNOON SESSION

October 4, 1933

The special session devoted to a discussion of dermatitis problems was called to order by C. W. Smith, Standard Oil Company (Indiana), Chicago, representing the Executive Committee of the National Safety Council, who welcomed the delegates. He then introduced Dr. Bert W. Caldwell, executive secretary, American Hospital Association, Chicago, who presided throughout the session. Dr. Caldwell promptly introduced the first speaker.

Oil Dermatitis

By DR. W. J. McCONNELL

Assistant Medical Director, Metropolitan Life Insurance Co., New York City

The speaker said in part: "Oil pimples" and "oil acne" are the names generally employed by workers as descriptive of the skin affections resulting from contact with oils and lubricating compounds which are used as lubricants and refrigerants in the cutting of metals, alloys, and in like processes. The skin eruption appears primarily as comedones situated in the orifices of the hair follicles. Encircling each comedone there appears a reddish, circumscribed macular eruption, with a tendency to slight elevation, varying in size from one to three millimeters in diameter. These macular eruptions, in turn, rapidly develop into papular lesions or the characteristic pimples with the circular bases and conical tops through which the cilia protrude.

The pimples appear usually on the backs of the hands, the forearms, and the anterior surfaces of the thighs. Among workers who have the habit of brushing the hair back with the hand, the forehead and face become additional sites of the pimples.

The chief complaint accompanying the skin eruptions is an irritation of the skin. Further injury to the skin may follow picking and scratching at the eruptions. On removal of the individual from contact with the oils, the eruptions usually retrogress and disappear, but may leave an inky black discoloration or a tattooing effect at the site of the eruptions. The discoloration presumably is caused by carbon suspended in the oil.

Some of the papular eruptions may become infected and develop into pustules and abscesses. This has led to the erroneous conclusion advanced by some observers

that the infection is the primary cause of the skin eruption. Irritant substances in the oils, suggested by other observers as the cause of the eruptions, are undoubtedly responsible in part for initiating the skin inflammation. The occurrence of the eruptions, however, will persist, I am convinced, so long as efforts are directed solely to the discovery of methods intended to inhibit the action of microorganisms and of irritant properties in the cutting liquids to the exclusion of measures designed to protect the skin surfaces from direct contact with the cutting liquids.

Analyses of many cutting liquids used in industrial operations, it is true, have demonstrated the presence of infectious microorganisms, but cultures made from the scrapings under the finger nails and on the surface of the skin likewise may demonstrate infectious microorganisms. That the primary cause of the skin eruption is not the result of infection is further evidenced by the fact that smears taken by different investigators aseptically from the eruptions have failed to demonstrate any microorganisms. It would seem logical, also, were the eruptions caused by microorganisms in the manner described, that more direct evidence of well-defined epidemics of skin infections, the number of cases approximating reasonably the number of exposures, would be found.

Many cutting liquids, perhaps the majority, apparently are not injurious to the normal skin as is evidenced by the absence of any skin lesions ascribable to the liquids among a number of workers using them. Cutting liquids even when penetrating into skin cuts and wounds do not always retard healing. I have examined individuals complaining of the primary skin eruptions whose arms also bore cuts and scratches into which the cutting liquid had penetrated, but who stated that the lubricant assisted in healing the wounds. The infections which are associated with the skin eruptions in many instances no doubt result from microorganisms derived from the skin surfaces which gain entrance through injury to the skin caused by scratching and picking at the eruptions. It is possible, also, that oils which have attained a high temperature may produce minute burns on the skin which favor the ingress of the microorganisms. In some few instances the infectious microorganisms may be conveyed to the skin by the reused cutting liquids, but the point I wish to emphasize is that these infections are secondary to or associated with the primary skin eruptions rather than the cause of the eruptions.

Neither does the theory that the skin eruptions result from the chemical or irritant action of certain cutting liquids adequately explain the formation of the lesions at the site of the hair follicles leaving the intrafollicular spaces uninjured. Analyses of certain lubricating oils and divers combinations of oils and compounds indicate the presence of irritating substances which in themselves may irritate and inflame the skin surfaces.

For the purpose of affording a distinctive product or of patentability many cutting liquids contain one or more special agents, such as nitro-derivatives of benzene, toluene, phenols, cresols, coloring agents and deodorants, each capable of producing chemical irritation of the skin. Phenols, when present, may in addition produce systemic poisoning from skin absorption. Another fact which may contribute to the chemical content of the oils and compounds is that the various metals used for making rods, bars, and other parts of machinery are pickled before they leave the rolling mills and such chemicals may easily be removed from the metals by the oils and compounds as they pass over them and in this way become carriers of the chemicals.

However, when such irritant properties are present in the oils the entire surfaces of the skin coming in contact with the oils become inflamed and the dermatitis

produced is characteristic of the agent causing it. The skin eruptions which are recognized as oil dermatitis or oil pimples appear when no irritant agents are found in the cutting liquids and, therefore, cannot be attributed solely to the chemical action of these liquids.

Among the many variable factors which may initiate or aggravate the skin eruptions the most constant factor as determined by the United States Public Health Service investigation was the dryness of the skin of those exhibiting the skin lesions. Those individuals with naturally oily skins did not seem to be troubled with the eruptions. The dryness of the skin may result from the desiccating power of the oils used or from a deficiency in the natural oiliness of the skin. The cutting liquids, which may be slightly irritating and contain impurities or foreign matter, such as dirt, are more easily absorbed by the pores of the skin in the absence of its natural oiliness and cause mechanical obstructions of the sebaceous ducts.

The skin in this respect might be compared to a blotter. Oil is readily absorbed by a dry blotter, whereas a blotter saturated with oil does not take up an excess. The variability in the natural oiliness of the skin of different individuals no doubt accounts for certain workmen developing the dermatosis sooner than others and accounts, also, for the absence of the dermatosis among other workmen operating the same machines and working under the same conditions.

Solutions, other than cutting liquids, may cause a similar skin eruption in susceptible individuals. Sugar solutions give rise to what is called "sugar itch" or "baker's itch." Ink may cause an eruption which is known as "ink acne." "Zinc pox" is the name applied when zinc dust is the causative agent; "rubber itch" and "cement itch" are other descriptive terms for similar skin eruptions.

On the theory that these substances entered into and obstructed the small openings of the skin and in this way caused the development of the skin pimples it appeared obvious that a clean oil rubbed into the pores of the skin would prevent the entrance of the solutions causing the dermatosis. It must be remembered, however, that oil rubbed into a skin already covered with extraneous matters tends only to force further into the orifices the obstructing material. Therefore, in order to obviate this difficulty it is important that the worker first clean the skin surfaces with warm water and soap before applying the clean oily mixture.

The following procedure has been found effective in preventing the dermatosis:

1. On entering the plant each workman is required to wash the hands and forearms thoroughly with warm water and soap. A mixture of swadost and liquid soap may be used to assist in cleaning the skin.
2. After drying the skin with an individual towel, he should apply either castor oil, lanolin, or lanolin and castor oil, and rub well into the skin.
3. At noon, before eating luncheon, the workman should wash his hands and forearms with warm water and soap.
4. On returning to work, he should repeat the morning schedule of washing and applying the oil preparation.
5. At the end of the workday, he should wash his hands and arms with warm water and soap, and dry them. If the skin is cut, scratched, or otherwise abraded, the usual first aid antiseptic treatment should be applied.
6. The lesions on the thighs can be best prevented by wearing aprons impenetrable to oils.

Cleanliness in the Prevention of Industrial Dermatoses

By W. R. REDDEN, M.D.

Director, First Aid, New York Chapter, American Red Cross

The speaker said in part: Many employees suffer from skin affections because of their contact with cutting oils, industrial dust, and other irritants. In fact, industrial dermatoses head the lists of industrial diseases wherever reported. Yet the real trouble may be dirt; that is, both the ordinary dirt that we recognize as "dirty" and the general kind that has been defined as merely "matter out of place."

What are some of the factors in the development of industrial dermatoses? Anything from hot water and mild soap, which are harmless and non-poisonous, to pitch, tar, and arsenic, which are definitely poisonous, may cause a skin irritation with resultant inflammation if these materials come in contact with the skin in sufficient quantity over a sufficient length of time. This might well be the case with workers in sugar, gardeners who handle hyacinth bulbs, or even housewives who fondle the beautiful blooms of the Japanese primrose. It is quite possible that certain persons who suffer from "rubber itch", "bakers' itch", etc., might fall under this group even though we know that at least the hexamethylene-tetramin used in the rubber industry is of itself toxic.

Season, temperature and humidity, working conditions, and kinds of skin play an important part. It has been observed that when workers in industries in which cutting oils or dusts of various kinds are found, become soaked with perspiration, there is an increase in dermatoses; and that dry-skinned persons and persons troubled with excessive oil are more susceptible than normally oily-skinned persons. Probably part of the answer in regard to heat and perspiration lies in the fact that more dirt is taken up by the perspiration; that the person in an attempt to keep the sweat out of eyes and off the hands, brushes his hands and arms across each other, across the forehead and the back of the neck, thus rubbing in the dirt. If the substance is toxic in itself, so much the worse. Moreover, if work clothes are filled with dust and dirt, then become perspiration soaked, oil soaked, etc., every movement of the body as well as the rubbing with the hands, grinds in the grime and irritating substances.

Apparently the oil on the skin is the first line of defense against irritants and other dermatoses producers. Hence, if the natural skin oil is frequently removed by gasoline, benzene, kerosene and other grease solvents, the skin becomes dry, harsh and cracked, and the first barrier to dermatoses is destroyed. The same holds true when pomice, harsh and abrasive cleaners, and stiff brushes are used.

The occupational dermatoses are not primarily caused by infection of the skin. When the skin becomes irritated, when bacteria from the skin are carried by dirt, grease, non-poisonous or poisonous substances in the openings about the hairs, the way is open for infection. When itching causes scratching with bacteria-laden finger nails, or rubbing with dirty hands, arms, or clothing, the skin is broken and germs find an open door to a fine incubator. When the skin is wiped with coarse burlap, waste or cloths which contain minute particles of dirt and metal, or when a skin covered with oil and dirt is rubbed with clean waste or clean cloths, the surface is broken and the greatest defense of the skin against infection is destroyed.

Obviously, for materials like acids and alkalis, including chromium, which destroy the skin oil and skin, there are two answers: provide closed equipment wherever

possible; provide workers with adequate protective covering. In other words, keep these skin destroyers off the skin.

Require a pre-employment physical examination for every applicant and a periodic examination of all employees when there is to be an exposure to a known toxic substance. Exclude those with skin disease. In the case of paraffin workers, there should be a daily skin examination.

Do a patch skin test on all who are to be exposed to toxic materials and also on all who develop a dermatosis during employment. The skin patch test is simple.

Wherever it is evident that a worker has a susceptible skin, whether this is due to a systematic condition, to a natural dryness of the skin, or to sensitization of the skin following repeated exposure, the person should be transferred to a non-exposure task.

In addition, it is important to keep as much of this toxic material as possible away from contact with the worker. This is done by use of a closed process as far as this is possible and by the use of protective material such as gloves, aprons, snu, fitting clothes tight at neck, wrists, waist and ankle.

It is just as important to remove these substances as rapidly and as effectively as possible from the skin. An illustration of how the American Cyanamid Company solved its problem will help. This company was pestered by cases of dermatitis. After careful study and experimentation, they found that the most satisfactory results were obtained as follows:

1. Workers change from street clothes into clean work clothes at the beginning of the day.
2. They bathe thoroughly every night before leaving the plant.
3. They make a complete change of work clothes from skin out after the wash-up.
4. In cases where men are unloading cars of the cyanamid, they are furnished with clean underwear and outer clothing.

In addition, they installed in locker rooms, soap dispensers in which was a solution as follows: glycerine, 960 grams; alcohol, 691 grams; salicylic acid, 340 grams. This solution was applied to face, neck, wrists and hands after bathing and seemed to keep the skin soft and pliable. The plant hospital records showed 225 cases of dermatitis treated during 1929. During the next year after the above system was put into effect, only 29 cases were treated, and these fell within the first five months.

Before you attempt to try out any one of the innumerable methods for the prevention of industrial dermatoses, give the simple methods of personal and environmental cleanliness, such as we shall outline later, a thorough trial under adequate supervision. Then add to these, the proper handling of oils for re-use.

For cutting oils and compounds, then, the primary preventive measure rests squarely upon supervised washing with any mild soap, a soft individual scrubbing brush, running hot water, and the use of a personal towel.

To this we add, wear leather aprons to prevent abdominal irritation and wear a simple, clean band about the forehead such as is used by tennis players to keep perspiration from going down into the eyes and to prevent contact of the arm for soiled hands to wipe away this perspiration. Such a procedure calls for plenty of protectors made of old, soft cloth.

Keep all work clothes clean and dry. The frequency of washing the clothing will depend upon the amount of contact with dirt, oil or perspiration. Some groups have found it pays to set up a laundry equipment to handle underclothes and outside work clothes and the towels of the employees.

Certain it is that work clothes should always be changed for street clothes, etc., and should be kept in locker rooms where they will thoroughly dry in air.

The re-used oil should be freed from metallic materials and should be sterilized. The workers should be taught never to use waste to wipe oils from the hands because waste contains bits of metal and dirt which may break the skin and open the way for infection. It has been found that a magnet will pick up plenty of such particles when the skin is wiped with waste.

The workers should be taught to rinse off the oil, etc., under running hot water with the use of mild soap rather than to use the cutting compounds for cleansing purposes. This holds true for the use of kerosene, gasoline, etc., as before mentioned.

Because dermatoses form such a large proportion of all occupational diseases and are often disabling, one should be familiar with at least the more important occupations that are exposed to skin irritants. Complete lists are almost impossible because almost any foreign substance can become an irritant if it is in continuous contact with the skin. But it is always possible to have in chart form a complete listing of all chemicals used in your plant. To this list should be added a complete chemical analysis of all new materials as they are introduced into old or new processes.

Against such a list, it is then possible to check up on the substances that are known irritants or that are known to cause dermatoses. Substitute a non-irritating substance for a known irritant wherever possible.

Give the worker every possible protection against contact with a known irritating substance. In addition to the use of protective clothing, the length of time of exposure each day should be reduced by a system of alternation of work.

Provide for cleaning down machines, walls, benches, and other surfaces. Make this cleaning frequent enough to keep the equipment and the air as free as possible from scatterable dust and to reduce to a minimum the contact of the worker with oils, dyes, and other substances used in the operation.

Make floors impermeable and keep them clean.

Paint walls so they will show up dirt and so they can be thoroughly cleaned and have them cleaned regularly.

Wherever possible, have machinery painted to show up oil and dirt, and keep it clean.

Put the workers in washable uniforms provided by the company and laundered by either the worker or the company. Even the American Rolling Mill Company tried this out with men handling sheet metal and found it paid.

Have adequate hand washing and other toilet facilities ready available in comfortable places and provide ample shower heads to take care of peak loads.

Either supply soap and towels, or provide a routine whereby each worker has his own. If a scrubbing brush is indicated, make it a part of required equipment but be sure they are not harsh.

Supervise hand washing, bathing, and the change from street clothing into work clothes and work clothes into street clothes.

Put all toilets, washrooms, and locker rooms in charge of a cleaner who does nothing else but keep equipment and rooms clean.

Give the workers sufficient time for the routine clean-up on company time; you will find it does not take long, once a system is established. You will find that the reduction in dermatoses with reduction in lost time and increase in efficiency will more than pay for the effort.

ADJOURNMENT



Dust Problem in Industry

FRIDAY MORNING SESSION

October 6, 1933

The special session devoted to a discussion of the dust problem in industry was called to order by J. R. Allan, assistant manager, Industrial Engineering and Construction Department, International Harvester Company, Chicago, who presided. He briefly outlined the purposes of the session and then presented the first speaker.

The Mechanical Control of Dust

By E. O. JONES

Consultant, National Founders Association, Chicago

The speaker said in part: During the last few years, much has been written about the pathological effects of dust. From this material there seems to be some lack of agreement among scientists as to the pathological effects of these types of dust, their dangerous dimensions, the length of time one must be exposed to their inhalation, the density of concentration which is dangerous, and the extent to which they are directly causative or contributory to disease.

It is unfortunate that in the twilight zone between ethics and non-ethics, there are certain members of the legal and medical profession who are willing to take advantage of these uncertainties and capitalize on them largely for their own benefit.

When the foundry industry was confronted with the accusation that it harbored a potential health hazard, its leaders immediately took steps to study the problem, with the object of eliciting all the facts and determining upon a course of procedure to eliminate the causation. This study has been under way in some localities for some time, but its procedure presents many difficult problems.

The mechanical control of dust is not our only problem, nor does the accomplishment of such control depend upon large expenditures of money. We know from experience that gradually human ingenuity will provide ways and means to this part of the problem.

But let us digress from the subject to consider the amount of dust we as individuals create. Take the molder, for instance, who goes to his bench at the start of his day's work. He reaches for his air hose, and starts the day by removing, with its force everything he can from his equipment. In close proximity to his bench,

or on the window sill in front of him, you will usually find a varied collection of relics. He will usually wet down his sand pile, but seldom his floor or gangway. When he is through with his shift he usually grabs the air hose and proceeds to take a compressed air bath.

And we have the foundry laborer: he has many menial tasks to perform. When he sweeps or uses a shovel he seems to be of the opinion that his efforts are judged by the atmosphere he creates. If he does sprinkle the floor it is usually done very sparingly.

Shake-out men and crane men seemingly give little attention to the results of their thoughtlessness. Grab buckets are usually lifted to the limit of their lift and then dumped. Many companies have furnished equipment, such as positive pressure helmets and respirators, to employees who work in extremely dusty atmospheres. But it is surprising to note the apparent lack of interest on the part of the employee for whose protection this equipment is furnished.

From these remarks some may say "Why shift the responsibility?" Not a bit. We have merely cited these few facts as an indication that possibly we can improve the supervision. If we make every man responsible for the cleanliness in the vicinity in which he works, and every foreman responsible for his department, and then in turn make the superintendent answer for the cleanliness of his shop, we will not have to worry about the increase in labor cost. After dust gets into the atmosphere, it is, of course, very difficult and expensive to remove. Keeping the foundry floor off the ceiling is a man-size job.

Ventilation is a problem everywhere. A diligent survey of our existing equipment may develop the fact that by small expenditures we can improve conditions. Inspect your dust-arresting equipment. See that the rapping device is in order, that the screens are in good condition, we suggest that they are rapped and the hoppers emptied regularly. Repair any leaks in pipes. See that the valves close properly. Chutes should be kept in good repair and when emptying arrestors, respirators should be worn by the men whose duty it is to perform this work. If refuse from the arrestors is not removed at once, keep it in containers or wet down until it is removed. Above all, watch your air velocities and make sure you are removing at the source as much of the dust as the equipment was originally designed to do. You pay for the current the motor consumes to operate your suction equipment, therefore get the proper return for that expenditure.

Do not store or allow sand to accumulate around your blasting equipment. Make sure you are receiving the proper air changes in your sandblast rooms. Inspect your masks to the amount of air purging through. The wearer is prone many times to just crack or partially open the valve, and when this is done he is not getting the full protection for which the helmet was designed. We suggest that the helmet be removed from the sandblast room and stored at the end of the day in a dust-tight cabinet, instructing the wearer to clean before re-using.

In your cleaning rooms where tumbling barrels are used, we deal again with air velocities. Piping should be diligently inspected and kept in good repair. Make sure traps are performing the service they were designed for. It might be well to keep floors in this department wet down. Remove the day's accumulation of refuse at the end of the day's run. When cyclones are used, make sure you are not exhausting at the level of windows which may be opened in other parts of your plant.

We will have to look for further co-operation from the foundry equipment manufacturers who serve our industry. Equipment will have to be sold to us net to

meet existing codes, but as dust-tight as human ingenuity can design them. After the equipment is installed, it will be the purchaser's responsibility to see that it is regularly inspected and maintained to perform the service for which it was originally designed.

And we refer again to the employee's responsibility. When he elects to work in a foundry, he should be willing to co-operate and wear the safety devices which are provided by his employer, and it will be the purchaser's responsibility to see that the equipment is well cared for and properly maintained.

Our industry is a basic one and we hope that it will long continue to be essential. For this reason we want to assure those who are sitting on the side lines that it is our determination and hope that, with the help of those in the medical profession who have given so generously of their time in scientific study, we can soon determine the actual extent of the hazard.

In the meantime, while many diverse opinions are being brought into agreement, it is imperative that we give more than passive assent to suggested measures of precaution or improvement. The accomplishment of worth while results depends upon the diligent and active co-operation of everyone concerned and the utilization of all known means of prevention and control. Only through united effort can we hope to accomplish an effective program which will give maximum of advantage to employers and employees alike, and to such an end we are confident the foundry industry will continue to dedicate its earnest and conscientious efforts.

How to Determine the Dust Content of the Atmosphere in Dusty Industries

By DR. E. G. MEITER

Director, Industrial Hygiene Laboratory, Employers Mutual Liability Insurance Co., Milwaukee, Wis.

The importance of atmospheric dust as an agent in the causation of respiratory disease has long been known. However, it is only within the last few years that this subject has achieved medical and legal importance in dusty industries. Because of the extension of compensation laws to include occupational diseases, and through an ever-increasing number of legal suits against industrial concerns by employees claiming disability due to dust inhalation, there is need for a severe attack on the problem of eliminating or otherwise combating the dust hazard. In order to intelligently control the dustiness of the air, the amount of dust present must be determined. With a given dust, two factors are usually considered: (1) the number of dust particles in a given quantity of air, which is usually expressed in millions of particles per cubic foot of air; (2) particle-size, usually expressed in a size frequency distribution curve, that is the percentage less than stated size is plotted against the size of particles.

Instruments Used for Determining Atmospheric Dusts

Many instruments have been devised for determining the dust concentration in air and it may be well to give a brief historical review of this subject. The South African investigators began using the sugar tube method for the sampling of atmospheric dust in 1911; the same method was used by the U. S. Bureau of Mines as early as 1914. By this method a measured volume of the dust air is passed through

a tube containing granulated sugar, which filters out the suspended dust. At the laboratory, the sugar is dissolved in water and the number of dust particles are determined by counting those in a small volume of the sugar solution under a microscope. This method of dust sampling had certain disadvantages, the chief of which was the fact that the purest commercial sugar contained a certain quantity of dust, which introduced considerable errors, especially in those samples containing a low dust concentration. To overcome the limitations of the sugar tube method various other devices were developed, one of which was the Palmer apparatus. This apparatus consisted essentially of a pear-shaped glass bulb, the lower end of which terminated in a U-tube or trap. Suction was applied to the glass bulb by means of an electric exhaust fan and the volume of air measured by means of a Petot tube. Dust-free distilled water was put into the U-tube. The air drawn through the water in the trap broke it up into a spray within the larger portion of the sampling bulb, which washed out and retained the dust. The dust so obtained was analyzed by the usual methods. The Palmer apparatus also had certain disadvantages, the chief of which was that its efficiency as a dust catcher was low. In the search for a more portable type of instrument, which at the same time would yield rapid results, the South African investigators introduced in 1916 a new instrument known as the Kotzé konimeter. The konimeter samples dust by impinging a small volume of air against the surface of a vaseline-coated glass plate, the vaseline serving to catch the dust particles. The dust retained on the glass plate was then counted under the microscope at a suitable magnification. The chief disadvantages of the konimeter are that in atmospheres containing a high concentration of dust, the spots are too dense to allow counting the individual particles and the method can, therefore, not be used in such cases, also many samples had to be taken to secure a correct average determination in places where the dust concentration was variable.

As a result of the different methods of dust determination being used by the different governmental bureaus and others, it was soon found that the various dust-sampling methods did not yield absolute results, consequently some confusion arose in interpreting the various dust studies. In order to arrive at some basis of comparison the U. S. Bureau of Mines conducted a laboratory study of dust-sampling instruments. The results of this study were published in Public Health Bulletin No. 144 entitled "Comparative Tests of Instruments for Determining Atmospheric Dusts." (1925) During the course of this study two of the investigators, Dr. L. Greenburg and G. W. Smith, devised a new apparatus called the impinger. In the comparative study the dust collecting efficiency of the impinger was found to be high, and in addition the method offered several advantages over previous methods. After several modifications to meet special requirements, this instrument was adopted by the Federal Public Health Service and Bureau of Mines as the standard technique for the sampling of dust in air. The instrument has been used in the study of a number of dust trades, and is the commonly accepted method in use today.

Size of Dust Particles Taken into the Lungs

It has been observed from a study of silicotic lungs that most of the dust particles that have penetrated into the air sacs are less than 10 microns in longest dimension (1 micron is 1/1000th of a millimeter, or 1/2500th of an inch). It is generally agreed, therefore, that we need not bother with particles larger than 10 microns in measuring the concentration of a dangerous dust.

So that you may visualize the size of these small particles consider a 280 mesh

screen in which the screen openings are 50 microns. In the absence of a beam of light, an atmosphere containing these tiny particles will appear clear to the naked eye, and therefore is extremely deceptive. Only a powerful microscope can make such particles directly visible.

It is necessary, therefore, to make a microscopical examination of the atmosphere to learn how badly polluted it may be. Larger particles such as are visible to the naked eye are essentially harmless in the causation of silicosis, as these are caught by the membranes provided by nature in the nasal and other respiratory passages and are eventually coughed up or eliminated before any damage is done.

When small dust particles are dispersed in air, they are carried about like smoke and settle out very slowly. How long such particles will remain suspended in quiet air can be roughly determined from Stoke's law. Assuming a round particle to be one micron in diameter, it can be calculated by means of this law that such a particle will fall only 20.3 feet in 24 hours. It can be seen, therefore, that any fine dust dispersed into the air is not only a momentary hazard but remains in the air for an indefinite period. This fact is often overlooked by workmen, as it is usually assumed that as soon as the dust cloud is no longer visible all dust has settled out.

The term "dusty working place" is only a relative one. Most air, both inside and outside of factories, contains some dust. It is, therefore, necessary to adopt a standard content for the dividing line between slightly dusty and dusty working places. The Wisconsin dust code prescribes a "tentative figure of 15 million countable dust particles under 10 microns in longest dimension with free silica content of 33 per cent in a cubic foot of air as determined by Public Health Service technique. Variations in free silica content will make proportional inverse changes in this standard." In accordance with this standard the permissible count for practically pure silica would be 5,250,000 particles.

How Dust Samples are Collected

As mentioned previously, the instrument used in collecting the dust samples is that known as the "Impinger." With this instrument the air to be sampled is drawn through a glass tube and impinged at a high velocity on a glass plate which is immersed beneath a suitable liquid contained in the collecting flask.

The impinger, therefore, combines the principle of collecting dust by impingement with a water-washing or bubbling method and so possesses the advantages of both principles. The dust is thus trapped and remains in the collecting liquid. Suction is applied to the impinger by means of a steam ejector operated by compressed air. Where compressed air is not available, a small electrically-operated vacuum pump may be used. The rate of air flow is measured either by means of a small vacuum gage or an orifice-type flow meter.

The entire apparatus is calibrated before use against a standard gas meter, so that a known volume of air may be sampled. The rate of sampling is approximately one cubic foot of air per minute. The dust-collecting device is placed in close proximity to the breathing level of the workmen involved while performing their respective duties, so that air samples representing actual working conditions may be obtained. After a sufficient volume of dust-laden air has been sampled, the collecting liquid is placed in a suitable container and removed to the laboratory for the necessary analysis.

When the dust sample reaches the laboratory, the entire sample is filtered into a clean graduated flask through a 280-mesh screen so that only particles smaller than 50 microns are permitted to pass, particles larger than 50 microns are not considered

injurious and are, therefore, removed from the sample. After proper dilution, the contents of the graduated flask are thoroughly shaken so that a uniform suspension is obtained, and two portions of about one cubic centimeter are removed with a pipette to just fill two Sedgwick-Rafter counting cells. The cells are allowed to stand at least 20 minutes and the dust particles are then counted by means of a microscope.

The microscope with an Abbe condenser is provided with an eyepiece micrometer, a 16-millimeter objective and a 7X eyepiece. The eyepiece micrometer has a large square engraved on it, and this square is divided into 100 squares, one of which is further divided into 25 smaller squares. The proper tube length of the microscope is determined by calibration with a stage micrometer, so that a side of the large square of the eyepiece covers 1 millimeter (1,000 microns).

The large square of the eyepiece micrometer, therefore, encloses the dust in an area of one square millimeter, and since the counting cell is one millimeter deep, all the dust suspended in one cubic millimeter of the sample is under the ruled field. All particles visually less than 10 microns in longest diameter in one quarter of the field are counted at five points on the cell, namely, near the four corners and the center.

Two cells of each dust sample are counted and the average of 10 counts is obtained. Control counts are subtracted from the average sample counts, giving finally, average net counts of the number of particles which are then calculated in terms of particles per cubic foot of air sampled.

Having determined the concentration of dust particles less than 10 microns in diameter in a given atmosphere, it is also necessary to obtain information regarding the mineral composition of the dust before any evaluation of the health hazard can be made.

In general it may be said that the harmfulness of a quartz containing dust is usually in direct proportion to its free-silica (SiO_2) content. It is, therefore, necessary to distinguish between "free silica", that is the silica that occurs as quartz, and "combined silica", or the silica that is combined with other elements in the various silicate minerals. It should be borne in mind, therefore, that the total silica reported in the customary chemical analysis is no measure of the amount of free silica.

The quartz content of fine dusts is usually determined by a combination of petrographic and chemical methods. Each dust presents individual problems and no individual technique applies to all dusts regardless of their composition. Those interested in this problem should consult Reprint No. 1560 of the Public Health Reports, February 24, 1933, entitled "The Quantitative Determination of Quartz (free silica) in Dusts" by Adolph Knopf, Professor of Physical Geology, Yale University, and Consultant, United States Public Health Service.

Discussion of Dust Problems

By DR. LEONARD GREENBURG

Yale University, New Haven, Conn.

The speaker said in part: On the technical side of this problem you have been presented with two excellent papers by Mr. Jones and Dr. Melter. There is little that I should add from this point of view. Perhaps the most valuable contribution that I can make is to present to you my own personal view of the broader administrative aspects of this problem gained as a result of many years of close contact. In order to do this, let us analyze the problem in its simplest terms.

We may begin by agreeing that pulmonary fibrosis results from the inhalation of certain dusts in known concentration over a sufficient period of time. This fact has been demonstrated repeatedly by means of industrial, laboratory and pathological studies. On this simple fact, I take it, there is complete agreement.

Such legitimate cases of disabling pulmonary fibrosis are held in many states to be the responsibility of the employer. Further, a perusal of the compensation laws makes it evident that there exists a decided trend in the direction of broadening the compensation acts throughout the Union for we find from time to time that additional states are being added to the list of those holding silicosis to be a compensable disease. We would certainly be blinding ourselves to the facts were we not to admit the existence of this trend in social legislation. It should be pointed out here that this is a very wholesome and desirable state of affairs. The insurance principle has justified its existence in spreading the burden of ill fortune over a long period of freedom from catastrophe and surely in the case of industrial accidents it has freed us from the deplorable state of affairs in existence prior to 1912. In the case of the occupational diseases we may hope for equally satisfactory results.

Nevertheless, compensation insurance is not the complete solution of the problem at hand.

The only adequate means of avoiding the burden of silicosis is by the prevention of this disease. All other methods do not touch the crux of the problem and they carry in their wake a vast amount of litigation, illness, and a large financial burden on industry. If what we have agreed upon to this point is true it is obvious that industry must prevent the dissemination of dust in the workroom air by such adequate engineering techniques as are available; or in certain cases where this is not possible industry must provide, and force the worker to use, such means of personal protection as will adequately safeguard him against the inhalation of dust. It is only by these means that we can guarantee a future free of disabling pulmonary disease due to dust inhalation.

In spite of the very best efforts of industry to solve this problem there will undoubtedly be a certain number of cases brought to the courts and presented as legitimate cases of silicosis. While some of these are true cases of silicosis others, I have been informed, are not, but are designed merely as a means of obtaining funds from industry. A consideration of such cases brings us logically to the second part of the present discussion. What is the ideal method of handling compensation cases with reference to occupational disease and more particularly silicosis?

If we examine the development of the compensation acts we find that a technique designed primarily to adjudicate cases of industrial accidents has by degrees been given jurisdiction over occupational diseases. In fact, in some states diseases are regarded as injuries so that they may be brought within the scope of the original compensation acts. But on close examination it becomes apparent that diseases are far more difficult to adjudicate than are the ordinary injuries arising in industry. They present many technical facets and often require a detailed knowledge of this particular branch of medicine with which the average commissioner is very often unfamiliar. As a result we find in practice that the Court is presented with highly technical evidence by experts for the plaintiff and for the defendant which is very difficult if not impossible to satisfactorily evaluate. Often the commissioner is caught between the conflicting views of such witnesses and is not provided with his own experts to aid him in arriving at the real scientific background of the problem at hand.

*Orig paper
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What we really need is a strengthening of the technical side of the compensation acts to keep pace with the increased factual understanding regarding the occupational diseases. This does not merely refer to the Courts themselves but should begin with the promulgation of accurately worded compensation acts which clearly define the diseases for which compensation is to be paid. Compensation commissioners should be assisted by boards of technical experts composed of engineers appointed by the deans of the various engineering schools and of physicians appointed by the deans of the recognized medical schools. The engineers selected should have a very complete knowledge of factory conditions and the field of ventilation, and the physicians should be experts in the field of industrial hygiene and occupational disease. It is only with the aid of such highly specialized boards, or their equivalents, that the compensation commissioners may be able to do complete justice to both sides in these highly technical cases. It is the belief of the speaker that employers and employees alike would benefit greatly from the establishment and use of such boards. In order to hasten the establishment of this system employers are justified in appealing to their legislatures with this end in view; certainly such a legitimate demand should receive the hearty support of all concerned.

Frequently one is asked, what should be done with those claims which are based on little or no real evidence of injury to the worker but which are merely reared by some very enterprising attorney? Such claims are, I have been told, becoming very common of late and constitute a real problem to industry. It is obvious that the compensation advisory boards suggested earlier will, as soon as they are formed, serve the future as a healthy bulwark against this type of baseless claim and I venture to predict that few such cases would be favorably acted upon by a board of real experts in this field. At the present time factory officials should employ the very best legal talent available and should reinforce such legal talent with technical and medical experts thoroughly versed in the field of silicosis. Many cases have been lost by a failure to bring to bear the requisite technical aid required to prove the non-existence of a hazard. Here is an excellent example of a case in which money may be saved in the end by increased expenditures.

We now arrive at the final steps in the control of this problem, the physical and X-ray examination of the worker. Every factory should have pre-employment and routine post-examinations. It seems obvious that the burden of the health of the worker should not be placed on the plant without the privilege of the pre-employment examination. How can industry be legitimately expected to hire a worker "in the blind" as to his or her physical condition and then a day later be expected to shoulder the burden of the worker's health? By repeated physical examinations it is possible to discern the faint early deviations from normal health if any take place. In this manner the employer would be forewarned very early if any workmen showed lung changes suggestive of early silicosis. The routine industrial health examination on a broad scale throughout the major portion of American industry would constitute a public health procedure of major significance. By its means a very large proportion of the population would be aided in the prevention of the degenerative diseases of middle life which today constitutes such a real menace.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Falls of Persons

THURSDAY AFTERNOON SESSION

October 5, 1933

The special session devoted to discussion of problems arising through falls of persons was called to order by W. S. Paine, manager, Engineering and Inspection Department, Aetna Life Insurance Company, Hartford, Connecticut, who presided. Chairman Paine welcomed the delegates and immediately introduced the first speaker.

Ladder Accidents and Their Prevention *Orig paper 112*

By F. L. HURLBUTT

Manager, Patent Scaffolding Co., Chicago, Illinois

The speaker said in part: In discussing ladder accidents, let us divide our subject into three divisions: (1) selection; (2) care or maintenance; and (3) proper use.

I can think of no piece of plant equipment in which there is the opportunity to buy either safety or accidents that there is in ladders. Basically, no ladder is better than the poorest piece of stock used in its construction. Only well seasoned, straight-grained woods should be used. For extension and string ladders, the rails should be of spruce, Douglas fir, Norway pine or long leaf yellow pine. Because the last named is somewhat heavier, it is not as desirable as the others. Rungs of oak, ash or hickory are by far the best, and here grain is all important. To assure straight grain, the best rungs are hand split in distinction to the ordinary machine turned rung.

The sectional size of side rails must vary with the length of the ladder, and likewise the diameter of the rungs must vary with the width of the ladder between the side rails. But in no case should the diameter of the rung be less than 1 1/4 inches, nor the tenon less than 3/4 inches. A genuine safety measure on extension ladders is the use of automatic locks, instead of the old fashioned gravity locks. All hardware should be of malleable iron or mild steel. No cast iron fittings should be permitted.

Much discussion has been indulged in over the question of whether rung tenons should extend fully to the side rails or only to within a quarter of an inch. My experience is that where the tenons do not go all the way through the rails, such ladders retain their rigidity better and do not get wobbly as soon as ladders which have the rails completely bored through. Also, moisture is less likely to get at the tenon of the rung and cause rot.

In all the field of ladders, there is no greater accident producer than the cheap step ladder. Any step ladder for industrial use should have side rails of a thickness of at least $\frac{3}{8}$ of an inch, and preferably one inch, by $3\frac{1}{4}$ inches. The steps or treads to give a good footing should be not less than $3\frac{3}{4}$ inches wide. Steps should be truss-rodged or braced to the side rails with angle braces. Frequently, it is necessary for a helper to assist a worker from the back of the ladder; for this reason the rung-back type of step ladder is preferable for plant use, as it is decidedly stronger than the flat type. The spreader is a fertile source of hand injuries. These can be entirely eliminated by the use of safety spreaders which have a shield over the joint to protect the hands.

The greatest contribution to safety in step ladders was the introduction a few years ago of the platform step ladder. With this ladder the worker stands on a solid platform, guarded on three sides by the side rails and the top member. If he has occasion to reach outward in his work, he can brace himself by pressure of his knees against the side rails and by the front of his legs against the top member. The gain in efficiency and safety is very great indeed.

Another type of ladder frequently used for maintenance work is the extension trestle. This ladder is of the "A" type, having a center section which slides up and down. In selecting extension trestles, the principal points to look for are adequate length guides, and strong locks for the sliding section, and a safety spreader.

But how can the average buyer check these points when he buys ladders? The surest way to get safe ladders is to insist that your vendor guarantee these ladders to conform to the National Ladder Code, which has been drawn up for your protection by the American Standards Association. This Code lays down the minimum specifications which tests and experience have proved must be built into ladders for them to be safe.

Care and Maintenance

We now come to the part that care and maintenance of ladders play in the accident prevention campaign. Undoubtedly, most structural failures occur as a result of misuse in handling and storing, rather than from the actual strains imposed by the workman. Ladders are dropped carelessly in handling, slid off the piles or trucks, often resulting in cracks in the front or back legs. Frequently ladders are stored horizontally with supporting points near the end, resulting in sagging, which may put a permanent set in the ladder, thereby lessening the strength of the rails. Ladders should always have several supporting points when piled horizontally to offset this possibility. Ladders should be stored in a place which is protected from the weather. Water and dampness will cause the wood to check and rot the rung tenons. The latter damage is difficult to detect.

To offset the effect of moisture, it is recommended that ladders for outdoor use be given first a coat of linseed oil, and then a coat of colorless shellac. Do not paint ladders, as it is then difficult to detect knots or checking.

A regular inspection of ladders is strongly recommended to prevent unsafe ladders from getting back into service. All workmen should be told to return to their foreman any damaged ladder. Instead of putting it back where they got it, for someone else to be injured on. If the damaged ladder is beyond repair, the foreman should immediately break it up so it cannot be used. If it is repaired, it should be conspicuously tagged, "Not to be used while this tag is on this ladder."

When there is doubt about the strength of a ladder, even after an inspection, a test should be made. Support the ladder horizontally at points about six inches from each end and apply a load of 200 pounds at the center. For varying length ladders, the permissible deflection decreases with the length of the ladder. Reference to the National Ladder Code will show the permissible deflections. If the ladder under test exceeds the permissible deflections, it should be discarded or cut down to a length at which it will conform to the Code. Frequently, an inspection shows a wobble or shake which can be eliminated by tightening up the tie rods.

Perhaps, I should refer to the third part of my discussion as "misuse" or "abuse" of ladders, for this is the cause of a great proportion of serious ladder accidents. Regardless of having good ladders, in spite of frequent inspections, if a ladder is not suited to a job, an accident may occur. Frequently, an extension ladder is little too short, so someone forgets that there must be a proper lap of the sections. If he gets by, he is lucky, for he has imposed a strain on the ladder for which it was never designed. Extension ladders up to 36 feet should have a minimum lap of 3 feet; ladders 40 to 44 feet require a lap of 4 feet; ladders of 46 to 50 feet long take 5 feet; and over 50 feet, 6 feet must be had.

Numerous accidents occur from placing ladders at incorrect angles against walls. If the ladder is placed so that it is too close to the wall at the bottom, there is a danger of over-balancing when the user ascends; while if it is too far from the wall at the bottom, there is altogether too much bending strain on the side rails. A good rule of thumb to prevent such accidents is to keep the horizontal distance from the wall to the ladder at the bottom one-fourth of the length of the ladder.

Slippery surfaces present a problem when ladders are to be used. Under such conditions, the proper type of safety ladder feet must be used. The ladder feet are of three general types: (a) those having an abrasive metal surface; (b) those with cork soles or rubber suction soles; and (c) those having spiked points. It is not possible to lay down any hard and fast rule as to what type of feet should be used. In general, on smooth surfaces the cork or rubber suction type is best. Yet again, on wet or oily concrete surfaces, the abrasive metal type will probably have to be selected. On wood or hard ground, the steel point is superior.

When ladders are used against shafting or pipes, if conditions permit, it is desirable to equip the ladders with hooks which will go over the shafting or pipes. In using long ladders out-of-doors against buildings where the ground conditions are not good, the safest thing to do is to lash the ladders at the top. There is always a tendency for a man using a long ladder to try to reach as far as he can either side of the ladder to avoid climbing down and moving it, and it is this reaching that makes lashing desirable.

Discussion: Two recommendations were brought out in the discussion: (1) Don't use Code specifications if they are not sufficient—base your ladder specifications on your own requirements. (2) If spikes on the ladder are sharp, the ladder will not slip on wooden floors.

The best safety lesson one safety engineer ever gave was to a group he found using a defective ladder. Obtaining a saw, he sawed the ladder into small pieces before their eyes, and then threw the pieces into the furnace as an illustration of what should be done with a defective ladder.

Orig. paper - St. 1.
W. 1287

Stair and Ramp Accidents and Their Prevention

By JAMES L. GERNON

Director, Division of Inspection, New York State Department of Labor, New York City

The speaker said in part: Considering all the injuries in homes, public places, and industrial establishments, falls hold second place in the list of causes of injuries, fatal and non-fatal. In New York State, in the year 1932, falls which occurred on stairs and steps resulted in 2,731 accidents, causing 25 deaths or permanent total disabilities, 421 permanent partial disabilities, 2,285 temporary disabilities, with 70,021 weeks of lost time, for which a total compensation of \$803,955 was paid out.

These figures indicate that falls on stairs and steps were 50 per cent of the total number of falls, 12 per cent of the weeks awarded, 10 per cent of the amount of compensation paid.

If we hope to make a real reduction in the number and severity of injuries on stairs, the first essential in safety education is to instruct all people in the art of using normally the muscular functions of the human body, so that they may stand and walk properly, and be able to use the normal movements of the body to protect themselves from falls. This is very necessary if we hope to reduce injuries from falls in homes, public places, and industrial establishments. To make headway we must learn the basic cause of the fall by securing better reports of injuries. To make better reports, those responsible for making the report must study the basic cause of the fall before they can apply preventive measures.

When we know the basic causes of falls, we can with ordinary intelligence adopt the proper measures to prevent them. What is it that causes falls? "Some violation of the laws of gravity." At this point we might ask, do the persons responsible for the construction or maintenance of stairs, or the persons using them, know that it is imposing fourteen times as much strain on the heart to walk up a stair than to walk on a level surface?

What causes this violation of the laws of gravity? Are the stairs improperly constructed, are they worn or broken, were they free of refuse, were they wet or slippery, were they improperly lighted, was the stair crowded at time of injury, was the person who fell pushed or jostled, was the injured person physically able to use his feet and leg muscles in order to properly ascend or descend a stairway? These causes of falls are but a few of many more reasons for falls on stairs, but they are of the type that are very seldom mentioned or admitted as the cause in the report of the injuries.

If all stairways were properly designed and constructed, there would be fewer injuries. In numerous instances, the stairways in homes, public places and industrial buildings have been improperly constructed because of the failure to allot sufficient space to construct a safe stairway of proper pitch and without winders. A large percentage of stairs are constructed with treads far too narrow for safety. If we could eliminate all the improperly constructed stairs and replace them with stairs of correct design, we would greatly reduce the injuries occurring on stairs. Some of the best architectural and engineering authorities hold that the riser of a stair should not be less than 6½ inches nor more than 7¾ inches.

The New York State Labor Law, Section 270, has established a standard for stairs, providing that all exit stairs in factory buildings constructed since 1913 "shall not be more than 12½ feet in height between successive landings. Treads shall

not be less than 10 inches wide, exclusive of nosing, and the riser shall not be more than 7¾ inches. No stairways with winders shall be permitted as a required exit. The treads shall be constructed and maintained so as to prevent persons from slipping thereon." These dimensions of treads and risers will provide a stairway about 37 degrees from horizontal. Every stair tread should have a nosing extending not less than ¾ inches beyond the face of the riser. This is an added factor of safety providing heel clearance when descending the stairs. Every stair should be provided with a balustrade or hand rails.

To reduce falls we will have to do more than provide safe stairs and walk surfaces. Much of the contributing causes of falls rest with those who travel on stairs. Some people do not, others cannot, walk properly. If all the people could walk correctly, or we could teach them to do so, we would reduce the number of falls on level surfaces from elevations, and on stairs. In making this statement, I am not excusing those who are responsible for failing to provide or properly maintain safe stairs or walking surfaces. Nearly half of our people reaching adult life fail to walk as nature intended.

To walk correctly on a level surface or on a stair or ramp, the feet should be spread about six inches apart, pointing straight, not fan spread. If they are fan spread, the danger of slipping, tripping or striking objects increases. When arches are weak or feet or legs ache, the feet are not properly placed to walk or stand correctly. It is important that the shoes must be long and wide enough to permit the foot to spread normally at the ball of the foot, and without causing pain in the feet or legs, in order that the ball of the foot can bear the weight of the body as one steps or walks.

After we have provided properly constructed stairs, including balustrades and hand rails, we must see that they are kept in good repair, clean and free from any kind of rubbish or material, and properly lighted. If more people had a wholesome respect for the hand rail of a stairway and used it when descending, many falls would be prevented. People must also have a normal ability to use their heads, legs and feet properly, in order to either ascend or descend a stairway safely. They must know how and be physically capable of traveling on stairs without being subject to the many injuries resulting from traveling on stairs.

From my experience and the examination of many reports of injuries, I am convinced that the inability of the feet and legs to properly function subject many people to injuries, and that this is the basic cause of a large percentage of falls on stairs, on level surfaces and from elevations. Have you noticed how easily a person whose legs and feet function properly may fall if he steps on a piece of paper lying on a dry cement or wood floor, or on a wet floor? If you have, you can understand how difficult it is for a person whose legs and feet fail to function properly to keep free of injury.

To travel up a stair properly, the foot is placed on the tread with the ball of the foot about two inches beyond the edge of the tread nosing, this permitting the toe of the shoe to clear the nosing of the tread above. A stair tread 9½ inches, including the nosing, will permit the average shoe worn by men to have about three inches clearance if the person steps properly. We should remember that as the dimension of the tread is reduced, the danger of falling increases. If the heel of the shoe is placed on the tread, the possibility of striking the nosing or face of riser increases when stepping to the tread above, and this danger increases as the dimension of the tread is reduced.

When descending the stair, the ball of the foot is placed on the front of the stair just back of the nosing. The proper placing of the foot provides the space for the heel of the shoe to clear the nosing or face of riser. Here again, if the dimension of the tread is reduced, the danger of the heel striking the nosing or face of the riser increases. As the ball of the foot is placed on the tread, the heel of the shoe is just off the tread, so it strikes the tread immediately after the weight of the body comes on the ball of the foot. When this is done properly, should the foot slip for any reason, the heel of the shoe will strike the tread and act as a brake and prevent falling; but if the heel or back of the shoe strikes the nosing or face of the riser, the person is drawn forward off balance and probably down the stairs.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Fire Prevention

THURSDAY AFTERNOON SESSION

October 5, 1933

The Fire Prevention Session convened in the Stevens Hotel with Chairman R. E. Vernor, manager, Fire Prevention Department, Western Actuarial Bureau, Chicago, presiding. After briefly welcoming the delegates, Chairman Vernor introduced the first speaker.

How to Have a Fire in Industry

By F. M. HIGGINS

Chief, Fire Prevention Bureau, Grand Rapids Fire Dept., Grand Rapids, Mich.

The speaker said in part: One thing we quickly discovered in Grand Rapids some years ago when we were investigating fires was that the same kind of people had the same kind of fires under the same kind of circumstances year after year. In other words, when one small storekeeper, or one industrial plant, or one home in the city had a fire, we were sure to find in a short time that two or three others, or perhaps half a dozen others, would have similar fires of almost the same kind.

It was plain, then, that most fires began from common causes. So we decided that we would try to explain to the people why fires were caused, and by so telling them the plain facts about fires we would be able to teach them how to avoid them. We went before the children in schools, talked to people in churches and seized every other opportunity to talk to groups throughout the city. We carried on this campaign throughout almost a year, with the result that last year the losses from fires in Grand Rapids were reduced nearly \$50,000.

But one of the strangest things about our investigation of fires was that it seemed a lot of people really wanted to have big fires. You know, there is an old axiom that if you do a thing you should try to do it well. I remember that when I was a small boy and heard a fire alarm in the neighborhood and ran out to see what it was all about, I was very much disappointed if the fire turned out to be a false alarm. But if the fire was a good big fire, and perhaps burned up two or three houses or half a block in my neighborhood, I thought that fire was a great success.

Something of the same idea must dwell in the minds of a lot of people in our big cities. When a fire occurs you will find them running to the telephone and thumbing through the telephone book hunting for the Fire Department number, and failing

to find this in their hurry they will ring up the police station, and all-in-all spend several valuable minutes through this delay. Of course, if they really wanted to put out that fire quickly, they would rush out of the house to the nearest fire alarm box on the corner and turn in an alarm which could be acted upon instantly in the distant fire house. In the meantime, of course, that fire will get a very good start and probably will be a fine success from the point of view of size.

I notice there is more competition on the streets today than there was when I was a boy and running to fires. If you, for example, are driving in the city and hear an alarm of fire, don't fail to turn your automobile and rush after the fire apparatus as fast as you can. If you can get in front of it, stay right out in the middle of the street and try to guess which corner the apparatus is going to turn. You might, of course, pull over to the side of the curb and wait until the engine goes by; but that would be a pity, for then you would have to follow the fire apparatus down to the fire. When you arrive at the fire, be sure to pull up close to the fire plug and leave your automobile parked exactly where the piece of fire apparatus would like to stand. If you can get in the way of the firemen who are carrying ladders toward a flaming building, don't fail to stand right there with your hands in your pockets and watch all that goes on.

Another thing I have noticed is the way in which most people take care of ashes from the furnace. If you carry cold ashes out of the basement, doubtless you will be very careful where you put them; but hot ashes are quite another thing—you can leave them lying about wherever the fancy strikes you. Just dump them up against a wooden box in the basement or store them close to the coal pile. The point I am trying to make is, that cold ashes couldn't start a fire if they wanted to, but hot ashes will make you a nice little blaze and may even burn down the house if you are only careful to put them where they will have a chance to spread a blaze.

I have noticed that most people like to hunt for a gas leak or a leak in the gasoline feed pipe of their automobile with an open match. Of course, a few people do use a spotlight, but there is no excitement about this. If you will light a match and go poking about the place where you smell gasoline, it isn't going to be any time at all until you have all the excitement you want.

Smoking in bed is another good way to have a fire. And I have known people who would go to the trouble to raise a window and toss a flaming match out to fall upon the face of some lady's hat, or perhaps to fall into an open baby carriage that passed just at the proper moment. Either of these is a good way to have a fire. You can have almost as much excitement as if you tried to use gasoline or coal oil to start a fire on a cold morning. There is nothing that quite compares with the element of surprise you will get out of starting a fire with a can of gasoline.

Up in Grand Rapids one winter we were having a lot of trouble with fires in the Italian district. More than a dozen little fires among these homes occurred in a few weeks. They were all about alike, due to an over-confidence in the ability of matches, cigarets and cigar stubs to go out of their own accord without assistance—like stepping on a cigaret butt or a match after throwing it aside. We decided it was a good plan to ask the good priest in that neighborhood to help us, and sure enough, after he had mentioned it a few times in his sermons the fires in that neighborhood ceased almost altogether.

But there was a certain Italian citizen in that neighborhood who decided he wanted a real good fire. Probably he had already been making a little home brew, but after a time he built a big still in the basement of his home. Now, you know, ordinary whiskey will burn under proper circumstances, but if you want to have a real good blaze just try setting some of this home brew afire. One day the still in that basement blew up, and not only burned down the house of our good Italian citizen, but three others were also burned alongside it.

In short, our experience with fires in Grand Rapids leads me to believe that the average citizen is still a good deal like the average small boy when it comes to having a fire in his neighborhood. That fire isn't going to be counted a success unless it turns out to be a good big fire with a lot of running about and clanging of fire engine bells and maybe a few people burned or suffocated and a lot of other excitement.

Handling and Storing of Flammable Liquids *orig paper*

By C. W. SMITH *F-597*

Director of Safety, Standard Oil Co. (Ind.), Chicago

The speaker said in part: You have read in newspapers and periodicals of the great explosive power of gasoline. But really gasoline does not explode. The fact that gasoline does not explode is a very great factor in the methods that are used in handling and storing this product. The vapors from gasoline, however, when mixed with the right percentage of air, are highly explosive, and it is this point that makes it possible to use it in internal combustion engines and for many other purposes.

During the last fifteen years our company has had a safety and fire prevention organization. The exclusive duty of this organization has been to study the best methods of accident and fire reduction and prevention. These methods are simple for it is not a complicated matter to handle these liquids in a safe manner and in such a way as to prevent fires.

Gasoline and other petroleum products which are classified as flammable liquids are usually carried to an average bulk storage plant in tank carload lots. They are spotted on a sidetrack near an unloading device. These unloading devices are usually so arranged that they unload from the top of the tank car through the dome. Before the unloading operation can take place the dome cover must be removed. The first hazard occurs at this point.

After the unloading pipe is inserted into the dome of the tank car the rest of the opening should then be completely covered. If it is not covered, vapors will constantly arise from the dome of the tank car and may be ignited by some nearby flame or spark. These covers are made in various forms, most of which are satisfactory. The Interstate Commerce Commission suggests wet burlap, but there are other covers which are even more satisfactory and which meet with the approval of the Interstate Commerce Commission.

At this point there is another hazard, and this is the possibility of a static electrical spark or the possibility of stray electrical currents.

The flow of the liquid through a metallic line can produce a certain amount of static charge. These possibilities of static sparks are carefully guarded against by the seller of petroleum products through the proper grounding of lines. Often stray

currents come in on the railroad tracks and onto the switch track on which the tank car is spotted for unloading. This may come from some other industry located upon the same switch track or upon the main line nearby. It may come from the leakage of an electrical line to the rails and from there to the tank car itself.

In all places where such leakage occurs or where measurements show that there is an appreciable amount of current where gasoline or other petroleum products are unloaded, the rails of such tracks should be bonded to the unloading device and then properly grounded. If this is not done, as the unloading pipe approaches the dome of the tank car, if there is an appreciable amount of current in the tank car, it will sometimes jump across from the tank car to the unloading pipe, producing an arc and a flash of gasoline vapors. A disastrous fire is liable to result.

This stray current, of course, can come from within the plant itself, provided the petroleum industry is using electrical currents and motors within its own plant. Some companies have recently taken the added precaution of placing in the pipe line between the plant and the unloading device a piece of pipe made of insulating material. This will keep any stray current, which may arise within the plant itself, from the unloading device.

These liquid petroleum products are pumped from the tank car through the lines to storage tanks. Therefore, the next hazard which exists is in the pump-house. It must be properly built and its workings must be properly set up. A large percentage of the pumps used at the present time for unloading gasoline are driven by electric motors. These motors, wherever possible, should be of non-sparking, polyphase type or explosion-proof.

It is impossible at all times to keep pump houses entirely free from gasoline vapors; but they should be well ventilated. They should have vents on at least two sides and these vents should be placed close to the floor because gasoline vapors are heavier than air and therefore settle to the bottom. The pump-house should contain no lights unless these are vaporproof, and any electrical wiring within the house should be in conduit and the conduit sealed. No electrical switches should be placed within the pump-house unless they are explosion-proof. It is an easy matter to have these switches on the outside of the pump-house.

These electrical rules and regulations should apply to all rooms which at any time contain even very low percentages of gasoline vapors. I must emphasize that it is the low percentage of gasoline vapors which are dangerous for it is only from about two to five per cent that produce an explosive atmosphere.

It is the large bulk storage of liquid that the public fears and that men handling fires in respective cities often view with alarm.

However, fire loss statistics will show that bulk plants, even considering those that are not up to standard, have so few fires that for the most part the danger is not great.

Storage tanks do not usually explode. Even most of those tank accidents of which you have read were not explosions in the true sense of the word. In most cases where so-called explosions have occurred excessive internal pressure has been built up by fire on the outside or surrounding the tank until the metal could not hold up and the tank ruptured. A true explosion from the ignition of vapors within the tank is very rare. Due to these facts, gasoline storage tanks will not and cannot explode if they are properly vented. It is possible to figure out the exact size of the opening necessary in order to vent a tank properly, and no matter what

the external heat may be, the internal pressure can be relieved if the automatic venting is correct.

Probably the next most important feature of a storage tank to make the plant entirely safe from fire is the installation of an emergency internal check valve. These internal check valves are so placed that they automatically cut off the flow of gasoline, through the discharge pipe, in case of fire or other emergencies. They are fastened open on the outside of the tank by a rope or a fusible link which, in case of fire, burns off and the internal valve automatically closes. They are so simple in arrangement that failure is almost impossible.

The next operation in a bulk storage plant carries the gasoline to the loading racks and from the loading racks to tank trucks. The same electrical hazards exist around loading racks that exist around the racks which unload the tank cars, and the same precautions must be taken. A tank truck passing rapidly along the highway with its tank properly insulated from the ground by the body of the truck and by the rubber tires on the wheels of the truck, can build up a static charge. Before any loading is done into the tank of the truck, it is therefore essential to take the precaution of grounding the truck's tank to the loading pipes. This is done by most companies by making a contact through a copper wire between the truck tanks and the pipe and this contact is maintained throughout the loading operation. Any lights on the loading rack should be vaporproof. If there are any switches around the loading rack they should be placed in a remote position or be explosion proof.

The only other place of possible hazard peculiar to the handling of flammable liquids in the average bulk plant is the warehouse. It should never be a place for storage tanks or for the loading of gasoline and similar products. The loading operation, in order to be free from fire hazards, should always be in a separate location. It is needless to say that warehouses should be kept free from refuse, such as oily rags, oily clothing, and free from the spillage of petroleum products. It should never be built upon a foundation which allows refuse to collect underneath the floor of the warehouse.

The proper handling of flammable liquids is undoubtedly just as important as their storage. The places where these flammable liquids are most largely handled are in the so-called gasoline service stations and, to some extent, in the garages and in certain stores throughout the country.

A gasoline service station is not a dangerous place. Very few fires occur around a gasoline service station and those fires which do occur are usually easily handled and usually do not involve any great amount of property. Most fires at service stations occur while the car is being serviced with gasoline and most of them occur from smoking, sometimes by the customer and, I fear, on the part of the attendant, or from small acts of carelessness while service is being rendered. There is very little danger unless actual fire is brought in contact with the gasoline vapors while servicing is going on.

There are a few simple rules, however, that should be followed to prevent fires at service stations. The underground service tank should be vented in such a manner that the vapors cannot get into the service station but will be quickly dispersed when the upper atmosphere is reached. Fill pipes in the underground storage tank should be so arranged that they will not be broken off by trucks or other cars.

Unloading gasoline in service stations should be handled through metallic lined

hose so that there is always contact between the truck tank and the underground storage tank so that no static spark can originate. The hose from the pump to the customer's tank on his automobile should be metallic lined for the same reason, and the nozzle of the hose should be of non-ferrous material so that it is impossible to strike a spark when the nozzle of the hose is inserted into the tank.

Highly flammable materials such as gasoline and alcohol should be kept out of service stations. They should be stored outside above or below ground. Above ground is satisfactory, the object in getting it out merely being so that fumes will not collect inside the service station. The wiring of electric pumps and the switches therein should be so enclosed that no electrical sparks can come in contact with the gasoline vapors.

At every service station and at every bulk plant, there should be some sort of smothering agent as a first aid fire equipment. You all must bear in mind that such equipment is merely first aid fire equipment and is meant only to handle small fires to keep them from getting out of bounds. It is not fair to believe that every plant, properly built and equipped according to satisfactory codes, should also be penalized to the extent of where it must keep on hand an almost unlimited supply of fire fighting material and apparatus.

The ignition of gasoline vapors produces a quick flash and it is usually true that the explosions which you read about are merely flashes. Products which are heavier than gasoline, such as kerosene, do not flash so easily. Their vapors are heavier and more easily and safely handled, especially in the home. Kerosene is not a satisfactory fuel with which to start a fire in a coal or a wood-burning stove, but the public has generally used it for that purpose; and in many localities it is still used in such stoves. Injury and even death frequently follow in the wake of its use. Kerosene is safe and satisfactory in every respect for a fuel and for illuminating purposes when handled in a proper manner, but the most common form of accidents in the use of petroleum products in the home comes from starting fires in ordinary stoves with this product.

The use of gasoline in the home has also been the source of many severe accidents and fatalities. Due to the low flash point of gasoline and the ease with which it vaporizes, it should never be used as a household cleaner. None has ever been used in my home for such purposes and none ever will be used with my sanction.

You all have read of severe accidents in the home from cleaning garments with gasoline. Some of these accidents have arisen when there was no flame present to ignite the vapors. In many instances the gasoline in the receptacle was ignited from a static spark when the garment was rubbed together during the cleaning process. This is especially liable to happen when the work is being done in a closed space such as a small kitchen, and especially liable to happen when silk garments are being cleaned.

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The Hazards of Defective Extension Cords and Fuses

By H. M. NAYLOR

District Mgr., The Kansas Power and Light Co., Topeka, Kan.

The speaker said in part: Practically all of the electric energy supplied in this country for lighting and the operation of small appliances is delivered to the consumer at a nominal pressure of 110 to 120 volts. Through long association with it we have all more or less exemplified the old proverb "Familiarity breeds con-

tempt." From this there has grown in the minds of many people the belief that "110 volts won't hurt you."

Nothing could be farther from the truth. The records of the National Safety Council can show you countless instances of death from contact with 110 volts. A few years ago, in a middle western city, a 15-year-old boy working with a 12-volt automobile battery received a shock which cost him his life. True, such instances are rare, but they serve to impress us with the really dangerous character of that great and useful servant of society and industry, as we have it in our homes.

There are few of us who have not, at some time, had a shock from some fixture wire, switch, or appliance. Some of us may even brag that "I don't mind 110 volts." For the greater part of us, the only reason we survived the experience is that we were standing on, or touching nothing but, some dry non-metallic substance not connected to the ground, such as the floor, a rug, or a chair, which was a sufficiently good insulator to protect us from a fatal shock.

The common extension cord is a frequent cause of accidents of this kind. Dragged about over rough concrete floors, thrown in a kinky heap when not in use, all tend to break open the insulation and expose the conductors, however good the cord may have been when new. With the conductors thus exposed, a person need only have the cord in his hand, and step onto a wet concrete floor, touch a water pipe or otherwise make good contact with the ground or some grounded object, to receive a shock that may be fatal.

With such tragic possibilities, extension cords, in the first place, should be of the best workmanship and materials obtainable; then, should be handled with care and properly disposed of when not in use; and finally, they should be regularly inspected for defects in the insulation. If defects are found, they may be repaired, or if the insulation is too badly worn, the cord should be destroyed.

Any workman is amply justified in refusing to use an old raty extension cord, and his employer should not be guilty of the crime of expecting him to do so.

No one, excepting a fire bug, would consider setting fire to his home. Yet many of us have put a penny back of the fuse, either as a temporary expedient, or to avoid the annoyance of repeated fuse burn-outs. Or we have substituted larger fuses than those originally installed.

Such practices are hazardous in the extreme. It should ever be remembered that the passage of an electric current through a conductor tends to heat the conductor. If the latter is large enough in proportion to the current flow, the heating may be imperceptible. With sufficient increase in current the conductor will become warm to the touch, further increase may make it hot, or even heat it to incandescence, in which event the conductor promptly oxidizes or burns in two. To this phenomena of heating we owe the toaster, percolator, range, water heater, and other appliances of that type.

Were we only concerned with the burning of the conductor, or wire, this paper would be somewhat pointless. But since the electric wires are, more often than not, in close proximity to combustible material in walls, ceilings, floors, etc., some protection must be provided against overheating them.

A fuse is the most common means of providing this protection. But even a fuse has its limitations. First, the wire composing the various circuits must be of proper size. Standard practice in this respect is established in the "National Electric Code." Next, each size wire has a very definite safe current carrying capacity. Fuses of

proper size will prevent exceeding that capacity. Fuse sizes are also established in the "National Electric Code."

Your electrical contractor, when he makes your installation, will know the sizes of the conductors, and will install the fuses accordingly. A careful record should be made of the size used in each circuit, and that size should never be exceeded.

Using larger fuses, or by passing the fuse with a coin, nail, piece of wire, or other means, has the same effect as tying down the safety valve on a boiler. You have removed your protection. You have no assurance that a wire will not burn in two and start a fire.

A blown fuse instead of being an annoyance, should be a warning. You have overloaded the circuit, or you have a fault in the circuit; either of which may have disastrous results.

Demonstration: Following the presentation of his paper, Mr. Naylor illustrated the points he had made by a demonstration which held the close attention of his audience. He had on the stage a miniature skeleton of a house, including the floor, walls, ceiling and roof.

He described how, during the evening, the household was gathered in one of the rooms about an electric lamp set on the table. The man was reading by this lamp. But the wife decided she wanted to do some ironing alongside. So the man rigged up a double socket which supplied current for the electric iron and still allowed him to read comfortably. Next, however, an electric heater, and various other electrical appliances were accommodated, by putting on other emergency sockets. When the current demanded by all these became too heavy and a fuse blew out in the basement, the man went down there and stuck a penny behind the fuse.

So all went merrily along for a little while until an overheated wire in the attic of the house set fire to some of the woodwork. The progress of the flames might be seen by his audience as the wire overheated, smoke began to roll out and then flames slowly spread under the roof and broke through.

It was, in short, a very striking illustration of the foolhardiness and ignorance of the average citizen in the use of electric current in his home.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Handling Materials

WEDNESDAY AFTERNOON SESSION

October 4, 1933

The special session devoted to a discussion of the problems incident to handling materials was called to order by David S. Beyer, Liberty Mutual Insurance Company, who welcomed the delegates in the name of the Executive Committee of the National Safety Council, and introduced Frank J. Lauehan, president, Fort Pitt Malleable Iron Company, Pittsburgh, Pa., who presided during the session. Chairman Lauehan briefly stated the objects of the session and then introduced the first speaker.

Industrial Truck and Tractor Accidents and Their Elimination

By G. E. SANFORD

General Electric Company, Schenectady, N. Y.

The speaker said in part: Industrial truck and tractor accidents, while comparatively few in number, are quite liable to be more serious than the ordinary run of machine shop accidents. Our experience over the past four years shows that lost-time accidents involving industrial trucks, trailers, and hand trucks were 3.5 per cent of the total, and nearly equally divided among the three groups.

Industrial truck accidents, however, were the most serious and included two fatalities. One of these occurred to a man during the second day of his employment. He was a professional chauffeur by occupation, and was engaged in carrying loaded boxes down a ramp, out through a door, and through the yard to another building. When he went on the job he was instructed that in going down the ramp he should turn his truck so that he would be behind the load, and he did so the first day when he was under fairly close supervision. The second morning, however, the supervisor was elsewhere and the man took his truck down with the load behind him. While he was on the ramp an automobile truck pulled up at the outside door. He ran into it and was killed almost instantly.

It was assumed that from his professional occupation he instinctively pushed down on the treadle which on the industrial truck operates in a reverse direction to the automobile truck, or in other words, the lifting of the treadle sets the brake. The truck was in good working order and subsequent tests showed that if properly operated it would have stopped on the ramp.

We have to some extent installed additional foot operated brakes which supplement the usual automatic brake; however, the construction of industrial trucks is such that there is no room on some of them to install such additional foot brakes.

A second fatality occurred at the intersection of a side alleyway and a main roadway. A truck operator at the end of his day's work was leaving the building by the alleyway and was taking his truck to the truck storage room, which involved traveling about 50 yards along the avenue. All truck drivers had had definite instructions to make a dead stop before entering the avenue, and large signs calling attention to this were conspicuously posted. However, it was raining hard at the time and instead of stopping he came out on the avenue at full speed, just in time to collide with an automobile which was passing.

The latter part of the year 1931, definite rules were issued in all plants that the speed of automobiles inside the works must not exceed 15 miles per hour, the only exceptions being fire apparatus, ambulance, or works physician on an emergency call. Employees who have permission to bring their cars inside the premises are told that violation of the traffic rules will suspend their right to enter. At one plant, the first reported offense by an employee results in a reprimand; the second offense a suspension of his pass for bringing his car into the works for a definite time, two weeks or more, depending on the nature of the violation; and a third offense results in an indefinite cancellation of his pass.

Drivers of trucks belonging to outside companies are stopped at the gate, and the driver is given a card calling attention to the fact that car speed inside the works must not be more than 15 miles per hour. This is done every time such trucks enter, even though a driver may be calling daily. He gets a new card each time unless, as is usually the custom, he has his old card with him. Any violation on the part of such driver is reported at once to the owner of the truck.

In addition to these cards, the plants are well posted with warning signs calling attention to the speed limit. During the year 1932, which was the first full year after this rule went into effect, we had just exactly one lost-time accident in which an automobile was involved.

Operators of ordinary industrial trucks are subject to other types of collision accidents. Men have backed too far and jammed themselves between the truck and a stationary object. In one such case, a man backed his foot rest under a steam pipe, resulting in a fractured leg. Accidents of this kind can be prevented by equipping trucks with heavy boiler plate guards suitably placed to the truck body. In some cases, however, where trucks have to be moved on elevators, the elevator platform is not sufficiently large to permit a truck with additional space required by this guard.

Trailer accidents are usually due to improper loading, tripping hazards over the tongue, and more or less infrequently the running of a truck wheel over a man's foot. Our tractor operators are instructed never to accept for moving any trailer which they do not consider to be properly loaded; any case in question to be reported either to their own foreman or to the nearest division safety inspector, and as a result, it is seldom that a tractor is loaded improperly, as those loading it are aware that the tractor operator will not move it.

The tripping hazard of the tongue can be eliminated by providing a heavy coil spring, which is sufficient to lift the tongue to vertical from a position slightly above the horizontal. A man when uncoupling lifts the trailer tongue slightly and the spring will do the rest.

Conveyors, Their Safe Installation, Use and Maintenance

By M. A. QUIRK

Assistant Manager, Industrial Relations Dept., United States Tire Co. Inc., Detroit

The speaker said in part: At the very beginning of their use, conveyors immediately proved themselves to be labor savers and more efficient than hand labor, also proving that while they were not non-hazardous, they did not cause an increase in non-fatal accidents as compared with hand labor methods. However, it can be said that conveyor or mechanical accidents are more severe than non-mechanical conveying methods because man is combating against the power driven mechanism when injured by a conveyor.

I will endeavor here to point out some of the hazards connected with installations I have seen.

On movable plate conveyors attached to trolley wheels that ride on tracks when conveying materials from one location to another, these wheels should be completely enclosed with substantial cast iron or sheet metal guards, so designed as to make it possible for millwrights to lubricate gears, bearings, and motors. Operators usually stand at the sides of such conveyors when loading and unloading. It is essential therefore that these guards should extend to the floor level so as to prevent the flange wheels riding on the tracks from running over the operator's feet. Where continuously moving conveyors are operated from one station to another or where they are controlled electrically from one central point, a trip rod should be installed in a vicinity where loaders or unloaders are located. These rods should be easily accessible so that they can be tripped and the conveyor immediately stopped in case of danger.

On some installations, due to the nature of the work, such as steam in a tire vulcanizing department, it is impossible for one operator to see another loading and unloading a vulcanizing press. Often due to the excessive amount of noise it is impossible for an operator to hear a cry or warning to stop the conveyor. In such instances an electrically controlled trip rod should be extended along the full length of the conveyor, so as to permit anyone to trip it, particularly the man who might be accidentally caught in the conveyor. Suitable signs should be erected in all departments where conveyors are operated to caution employees not to walk on or cross over moving conveyors. Bridges should be arranged at convenient locations, if possible.

Conveyor installations that necessitate travel from one floor to another should be equipped with bell or siren type warning signals or perhaps a simple telephone or tube communication system. Starting and stopping control stations should have suitable warning signs conveniently located nearby. All employees should be thoroughly instructed that no conveyor should be started after repair work has been done unless the foreman of the department, millwright or electricians have given permission to do so.

Belt conveyors are perhaps the most widely used type in handling coal and bulk material. Many hazards exist in connection with the operation of this type conveyor, particularly large pulleys at the end of travel of conveyor belt, and under no circumstances should any installation be approved unless suitable guards are provided to protect exposed pulleys. On belt incline conveyors delivering coal from cars to boilers it should be expected that suitable handrails be installed at locations where employees walk or work.

I believe a basic cause for the majority of accidents on delivery conveyors at power houses is improper lighting. Proper lighting within the delivery house (and all electric lights should have vapor-proof fittings) will insure greater safety and prevent many accidents. Coal crushers should be totally enclosed or suitable handrails installed to prevent employees falling into the crushers. Starting and stop buttons or switches should be conveniently located so that any employee can stop the conveyor in case of danger. Orders instructing and compelling employees not to ride belts should be rigidly enforced. Periodic inspection and removal of coal dust from conveyor house assures greater protection against dust explosions, which have caused a great many serious accidents in the past. Under no circumstances should repairs be made on pulleys or belts while motors are running. Before any repairs are made on this equipment all those concerned should be advised as to what is expected of them while repairs are being made.

Continuous chains which run over sprocket wheels at either end are widely known and greatly used in many plants. In many cases hooks are suspended or attached to chain lengths, and from these hooks materials are hung. The sprocket on both starting and return portion of chains should be effectively guarded.

Bucket conveyors and elevators are mostly used for hoisting and conveying materials. They are widely used in the handling of coal, cement and sand, and like all other conveyors present serious hazards. One of the most important factors to be considered with this type of conveyor is that no employee or operator should ever attempt to remove materials from buckets while the elevator is running. Attempts have been made to replace or repair buckets while the elevator was running, with the result that serious and in many cases fatal accidents have occurred. In this connection where the conveyors hoist materials and carry them over piled stock of bales, it is advisable to provide a permanent walkway alongside of the conveyor for the safety and convenience of repairmen and operators.

A most important problem is the proper maintenance of conveyors. Every millwright, oiler or mechanic who is responsible for maintenance work should know the hazards connected with his work and under no circumstances should be permitted to go onto the job unless he understands it thoroughly and will work according to instructions which both he and his immediate superiors know will insure his safety. The removal of guards has caused countless accidents to either the mechanic or to the operator who is ignorant of the fact that a guard had been removed from the machine.

I would like to suggest that wherever it is possible for a company to install centralized lubricating systems, they should do so. Centralized lubricating stations are being installed in a great many plants today.

In our efforts to eliminate conveyor accidents, we must consider that man is of first importance, and that more careful consideration must be given to the selection of new men, tireless supervision exercised to prevent violation of regulations, and discipline; thus the number of accidents resulting from carelessness, indifference, inattention and lack of judgment will be decreased immeasurably. Where a machine or conveyor is installed without proper protection, it is very probable that some operator will be seriously injured before guards are installed. If a new man is placed at work on a conveyor without proper instructions and supervision, there is every likelihood that he will be injured, not always on account of carelessness or indifference, but through his own ignorance. Ignorance is blind. Therefore, it seems to me that the person responsible for safety in any organization should work very closely with the foreman and the man, and at the same time keep up that permanent close contact with the engineering department.

ADJOURNMENT



Hoisting Chains

TUESDAY AFTERNOON SESSION

October 3, 1933

The session devoted to the discussion of problems in connection with hoisting chains was called to order by W. H. Cameron, managing director of the National Safety Council, who, in the name of the Council, welcomed the delegates and presented J. A. Voss, director, industrial relations, Republic Steel Corporation, Youngstown, Ohio, who presided over the session. Chairman Voss immediately introduced the first speaker.

The Causes of Chain Failures

By FRANK A. BOND

Vice-President, The McKay Company, Pittsburgh, Pa.

The speaker said in part: I feel that instead of myself, you safety engineers should be telling me what caused the chain failures in your factories or shops. It is true I can tell you of a brittle failure caused by cold-working of the metal surface, that is, by impacts received during the service—but what good is that going to do?

Again, I can recite a complaint from a customer stating that a chain having a tensile strength of approximately 30 tons, proof-tested to 15 tons, and with a safe load of 7½ tons, broke when lifting a load of ¼ ton. Now, as the customer is always right, what are we going to do about a statement or condition of this kind? We know it isn't true, and yet we hesitate to put up an argument with the customer. We may lose him, but most certainly the safety engineer in a case of this kind should be thoroughly acquainted with all the conditions surrounding this chain failure and handle it from a safety standpoint instead of from the purchasing department's standpoint of getting a new piece of chain for nothing.

I know that there are certain companies who have an excellent system of testing, inspecting and supervising the use of chains, and I can frankly tell you that we never get any complaint of chain failures where such a system is in vogue. My experience clearly indicates that the cause of chain failures can be summed up briefly in a few words; namely, abuse and lack of organized, intelligent supervision of the use and care of chains in service.

I, therefore, commend to you gentlemen that it is a matter of co-operation between you safety engineers, working in harmony with the National Safety Council, to work up and attempt to get adopted a standard system covering the use and care

of chains. As an indication of the good work the National Safety Council has already done, I again commend to your attention Safe Practices Pamphlet No. 98, "Use and Care of Hoisting Chains", and also the pamphlet on "The Effects of Annealing on Chains."

The purchase and application of the correct and proper size and grade of chain to each specific duty and, second, the proper co-operation between your safety organization and the shop foremen and workmen using chain, should result in the elimination of chain failures.

*See paper
in 342*

Inspection of Hoisting Chains

By A. C. BADGER

Metallurgical Engineer, The Youngstown Sheet and Tube Company, Youngstown, Ohio

The speaker said in part: In our mills we use chain slings to handle both hot and cold steel. The steel is in a variety of shapes, such as slabs, blooms, billets, packs of sheets, coils of wire, bundles of pipe, etc. A regular chain inspection system was inaugurated about eighteen years ago. During these years we have had very few accidents due to chain failures, none of them resulting in loss of life.

Chain manufacturers, of course, have excellent systems of inspection of chains before shipment.

Chain users should purchase to specifications which will adequately define the quality of chain desired. The use of standard specifications for iron and steel chain, A. S. T. M. A-56, is recommended.

In our mills we have a crew of chain inspectors, each man being responsible for the inspection of slings and attachments used in certain departments. They have authority to decide when any chain shall be removed from service for repair, heat treatment or replacement. In order that inspection may be uniform in all departments and inspection responsibility not be divided, we have found it best to have the inspectors report to the metallurgical department. This does not, of course, relieve a department foreman from the responsibility of having his men use the chains properly.

Our first inspection of chain is made upon its receipt by our stores department. Samples are cut from each size in each order and tested in the laboratory to determine that they meet the chemical and physical requirements of the A. S. T. M. A-56. If the chain meets these requirements, it is accepted and sent to the central stores location for which it was ordered, which is generally the blacksmith shop. Here the chain inspector gives it a very careful visual inspection before indicating final approval. The blacksmith shops make up slings of the length ordered by the using departments, the finished slings being inspected to assure proper workmanship on end rings or other attachments, etc.

We have found that a system of records, which will show the identity and history of each sling, is not difficult to keep, and is indispensable, considering the information and control of chain which it affords. Each sling is stamped on the most protected surfaces of the end link or hook, in two places, with a letter to indicate the department for which it was made and a serial number. The sling number is entered on a small file card, which provides space for recording (1) the name of the department, (2) order number under which the chain was purchased, (3) size and length of the

chain, (4) description of hooks or other attachments, (5) purpose for which the chain is used, (6) proof test load, (7) maximum safe working load, (8) weight, (9) date placed in service, (10) dates when repairs were made, with description, (11) dates when heat treated, (12) date when chain was discarded and (13) number of days of total service. This record serves as a systematic check on the inspectors and also permits us to judge which chain manufacturer is giving us the best chain.

After being placed in service, the slings are periodically inspected, the frequency of inspection being determined by the severity of the service under which they are being used. Chains carrying heavy loads of hot steel may be inspected every few hours, while chains carrying lighter loads will be inspected less frequently. In some locations the chains may be inspected only once a month.

Weekly reports are made by each inspector, showing the number of chains under his supervision, number inspected, number of new chains put in service, number and nature of repairs made, number of chains annealed and number of chains scrapped.

Inspectors, in their journeys through the plant, are instructed to watch the chains in service and to instruct the workmen in the proper use of chain slings. The workmen themselves, in a sense, become chain inspectors and are taught that chain must be kept free from kinks or twists, must not be dragged over hard material, must not be pulled out when caught under a load, or otherwise abused. They are cautioned to use slings of the - size and length for the work handled, to avoid overloading and sudden or jerky application of load when making a lift, and to see that loads are properly seated in the hooks or carriers. The inspectors also watch to see that chains are kept as clean as possible, since an oily or greasy chain not only is difficult to handle, but will collect dirt and grit which will cause undue chain wear.

At the proper inspection intervals, the chain inspector will lay the sling straight along the floor and carefully examine each link, using a hand glass, if necessary, to detect flaws. Slings which have become too dirty may be washed in caustic soda before inspection. If flaws are suspected which may not be readily visible, the surface of the link may be coated lightly with oil, which penetrates the flaws; the excess oil is wiped from the surface, which is then coated with whiting. After the whiting has dried, the oil will appear through it wherever there are surface flaws.

The inspector will look for (1) flaws, cracks, gouges or corrosion in the weld or body of the link; (2) cold work as evidenced by a pitted, battered, or polished appearance; (3) worn spots, measuring the diameter if necessary and (4) elongated links, measuring the length of the chain and matching it with its mate, if it be one of a pair. Questionable links may be up-ended on an anvil and the upper end hammered, which will produce cracks in excessively cold-worked links and open up defective welds.

As previously mentioned, the chain inspector decides what repairs are necessary. A car seal is placed on the end of the sling to indicate that it has been taken out of service and the inspector sees to it that the chain is delivered to the blacksmith shop for repair or heat treatment. No makeshift repairing, slicing or straightening in the department using the chain is permitted. Chains that are to be discarded are immediately cut up into short length and placed in the scrap bin, so that there may be no chance of a workman carelessly picking them up and using them. Chains which have been repaired are inspected to see that repairs have been properly made, before being reissued for service.

Good housekeeping is well worth while in storing chains. Each department is provided with a locker in which idle slings may be stored away from dirt and

weather as much as possible. This also minimizes the chance of one department picking up and possibly improperly using chains belonging to another department.

Some of our departments believe that they obtain better chain life by "giving the chain a rest", rather than working it constantly. Since each department has a certain number of spare chains, this is not a difficult program to follow. The idea may have some merit from the standpoint of fatigue phenomena.

Our system functions smoothly with an alert crew of inspectors and a working crew educated to the idea that good slings, properly used, are their safest tools. The system is one of the best safety measures a shop can adopt.

1004. R-1111 1134 The Repair, Annealing and Normalizing of Hoist Chains

By L. W. HOPKINS

Research Engineer, American Chain Company, Inc., Bridgeport, Conn.

The speaker said in part: Taking up the elements of chain repairing in order we have, first, the recognition of the chain defect or condition. The obvious defects include raised scars or defective welds, chain links which have been distorted or hammered out of shape or which have deep gouges, or which show evidence of excessive inter-link wear, chains which have been excessively stretched or elongated, rings which are distorted from the true circular shape, and hooks which have been distorted.

The less obvious defects which must be classified on a basis of judgment are: (a) inter-link wear to the extent that such wear should be measured for the purpose of retarding the chain; (b) evidence which indicates that distorted hooks or links have been straightened by workmen; (c) the stretching of chain to the point where it no longer works freely on pulley or sprocket wheels; (d) evidence that chains have been excessively cold work hardened by hammering, peening or impact, which would result in the formation of surface cracks and the concentration of impact stresses; which in turn often results in sudden failure.

All inspection of chains must be predicated on the fact that "a chain is as strong as its weakest link." The problem therefore is to find not only the weakest link but to recognize the condition of all links and attachments which reduce the gross strength of the chain.

The inertia of human nature often seems to be magnified in relation to the making of necessary chain repairs. Many accidents have happened after chain has been carefully inspected and found to be defective, but for some reason or other has been continued in service. Two very definite rules can therefore be established with respect to chain repairs: (a) remove all defective chain from service at once; (b) repair before using again.

Removal of chain from service is often delayed because no substitute chain can be found. Often this is a matter of careless operation and misplacement of necessary equipment. The proper method of keeping spare chains, especially slings, is to hang them on a chain board or rack at some convenient place in the room or department in which they are used. This is simple housekeeping and will in the long run result in saving much time and minimize accidents. The persistent cry for economy is unfortunately often the deciding factor in returning to service chain which has long outlived its usefulness.

The marking and tagging of defective links is desirable as it sets the responsibility for repairs upon the inspector who presumably has the knowledge and judgment

necessary for this important job. If the chains are returned to a chain repair specialist it is best to allow him full swing in making repairs. In this way the responsibility will be well defined.

The use of the proper replacement material is a factor of some importance. When repairs are made to a chain of crane or dredge chain quality and a link made of common bar iron or mild steel is inserted, that chain is no longer in fact a crane or dredge chain. The repaired link should have the same properties as adjacent links, both as to the elements of design and the physical properties of the material. A hook having elliptical, round, or square section cannot replace a hook of the same weight having a trapezoidal section and be expected to carry equal loads without dangerous deformation. A knowledge of chain materials is therefore essential.

The service of a skilled chainmaker is possibly the most important consideration in the repair of chains. The making of a scarfed end weld in a chain link is a work of art and not all blacksmiths are capable of making such repairs. It is easy to make a good-looking weld with the scarfs fully and properly hammered and which appears sufficiently strong, but nevertheless has a large percentage of its area in the center of the weld unworked and filled with scale and slag. Granting that the services of a skilled blacksmith can be obtained who fully realizes the importance of little things in the art of welding, he must still keep within reasonable dimensional tolerances. This is especially so when the chain operates on sprockets. In order to do this properly he must have equipment which is not ordinarily found in the average shop.

Advances in equipment for annealing consists of a furnace of sufficient heat capacity to thoroughly heat the charge in as short a time as possible. Pyrometer control is desirable and the thermocouple should be located as near to the work as possible.

Few industrial plants, large or small, have equipment for the proof testing of hoist chains. This is considered to be of prime importance in the manufacture of new chain and it would seem reasonable to expect the same vigilance in the handling of repaired chains. It is considered good practice to proof test steel chain to $\frac{1}{2}$ of the nominal breaking strength, and crane and dredge chain to $\frac{1}{3}$ of the nominal breaking strength. The safe working load is then set at $\frac{1}{4}$ of the proof load in the case of steel and $\frac{1}{10}$ of the proof load respectively in the case of iron.

In the case of slings the complete unit, including hooks, rings and all attachments, should be tested to the maximum safe working load for which the sling is designed.

The annealing and normalizing of chains has been the subject of debate over many years. The excellent research conducted by the National Safety Council and concluded with the final report in the 1930 Congress Transactions is the outstanding investigation reported in this country. The excellent and thorough work conducted by Dr. Gough entitled "Causes of Failure of Wrought Iron Chains", issued by the Department of Scientific Industrial Research of the National Physical Laboratory, England, must be mentioned.

As a result of all this work, one reason for the very occasional sudden failure of iron chains is now recognized as being tied up with the theory of a cold work hardened skin formation caused by the hammering and peening of link surfaces due to ordinary handling. This skin of hardened metal has increased in hardness and tensile strength and has been reduced in ductility by a proportionate amount. Its energy absorption capacity has likewise been reduced in proportion to these changes. In other words, it tends to be brittle under suddenly applied loads. Upon the application of a shock or impact stress this skin fractures, producing a fine crack which extends possibly only 3 or 4 thousandths of an inch to the soft ductile material di-

rectly underneath. Repeated overloading concentrates stress at the base of the crack and this gradually propagates itself deeper and deeper into the ductile material. The final application of a heavy load, particularly a shock or impact load, at the base of the crack (the point of reduced cross section) results in sudden and complete breakage. It is often stated, erroneously, that the material has, in some mysterious way, "crystallized."

The purpose of annealing is to restore the ductility of the work hardened surface, thus preventing the formation of the fine surface cracks which ultimately cause all the damage. It has been demonstrated that if the cracks are already present, but if they are superficial in nature, that annealing will tend to prevent any further propagation of the cracks. What, then, is proper annealing practice?

We must first distinguish between the two chain materials, namely, wrought iron and steel. Wrought iron has been called a fibrous material because the normal fracture of wrought iron is fibrous in appearance. The annealing treatment for iron is aimed at restoring the cold work hardened surface to its original condition and to relieve the internal stresses which may have been set up due to the distortion of links. Experience has proved that this can best be done by heating to a temperature of 1350 to 1375° F. for a time sufficient to thoroughly heat the chain. It is then removed from the furnace and allowed to cool freely in air. The rate of cooling is important.

The annealing of steel chain at this temperature is likely to result in some grain growth and it is therefore considered better practice to normalize chain made of this material. This is done by heating the chain above the upper critical point to 1600 to 1650° F., thoroughly soaking and removing from the furnace, allowing the chain to cool freely in air.

When in doubt as to whether chain is made of iron or steel, the chain may be annealed at either the high or low temperature, but there are considerations which must be taken into account. If the iron chain is heated to the high temperature of 1600-1650° F., excessive scaling takes place. The chain is likely to be too soft and stretch excessively when proof tested, leaving little elasticity in the chain for the absorption of shock loads in service. If steel chain is annealed at the low temperature, excessive grain growth is apt to take place. However, the one consideration, that of high scale losses and excessive softening in the case of the iron chain annealed at high temperatures, is a practical one which is easily demonstrated and common knowledge. The other consideration, that of the possibility of excessive grain growth in the case of steel chain annealed at low temperatures is largely academic and if the proper annealing cycle is carried out, that is, heating directly and quickly to the annealing temperature and removing the charge without excessive soaking in the furnace, no excessive grain growth is likely to occur. It is concluded that the practical procedure, in case of doubt as to whether chain is made of iron or steel, is to anneal the material at a temperature of 1350 to 1375° F., withdrawing from the furnace and allowing to cool freely in air as soon as this temperature has been reached and equalized throughout the chain mass. The furnace atmosphere should be reducing at all times to keep down scaling. It is not considered good practice to pack the chains in boxes as this increases the heating time. Chains annealed in car bottom furnaces should be removed immediately from the car upon withdrawal from the furnace.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Maintaining Interest in Safety

FRIDAY MORNING SESSION

October 6, 1933

The session devoted to Maintaining Interest in Safety was called to order by George H. Warfel, assistant to the executive vice-president, Union Pacific System, Omaha, Nebr., and also vice-president for Industrial Safety for the National Safety Council, who presided. After welcoming the delegates he introduced the first speaker.

The Value of Safety Contests

By DR. R. C. ENGEL

Director, Service Dept., The Corrigan, McKinney Steel Co., Cleveland

The speaker said in part: We have put safety across in our plant mainly through safety education, and it is through safety education that the rank and file of employees are instructed concerning the hazards and safe methods of their work. Our safety education campaign is carried on by means of weekly safety letters sent to all foremen and sub-foremen, who in turn convey the messages contained therein to the men under them. This safety letter also contains the standings of the various departments as to the number of days the department has gone without a lost-time accident; much interest is being manifested in these standings as no department is desirous of remaining at the bottom of the heap; and this is at all times a departmental safety contest.

The value of a safety contest is measured in the results obtained for safety generally, and not limited to the winning company, so that the losers should do better and the winner endeavor to maintain his standing. The attitude on the part of both winners and losers is bound to make for better safety everywhere.

The benefits derived through participation in safety contests are comprised in the safety education which employees received during the contest. Every red blooded American enjoys fair competition in any effort, and in every contest the feeling should be "let the best man win", but determine to be the winner next time. A safety contest is one way of ascertaining the weak spots in any safety program; it should be frank and honest in the diagnosis, be willing even to admit that the treatment was not successful. The most successful teacher, I have found, is the man who teaches his students how to avoid the errors he has made; and this should be so also in safety contests.

Safety contests depend upon each and every employee, and not upon the safety

man alone. In other words, a strong safety consciousness and job pride must be created in every man and be maintained throughout the employee group.

To show that safety contests are of value, witness the results in the Cleveland Safety Council's Greater Cleveland Contest of 1932, where 582 companies, employing 85,912 men per month, worked a total of 90,941,217 man-hours during a six months period and had 1,117 accidents. This was a reduction of 478 lost-time accidents, or 29 per cent over the contest of 1931, in which there were 370 competing companies, employing 81,756 men, and working a total of 91,086,816 man-hours.

We do not give awards in our departmental contests, which are continuous, but insist that every department act as a unit in the National Safety Contest, which puts fight into men interested in plant safety. Our departmental contests, however, bring forth great rivalry among the supervisors, and discussions at weekly safety meetings bring out a splendid co-operative spirit to eliminate accidents.

The real purpose of a safety contest, from our viewpoint, is to give us an idea as to what other plants are doing in accident prevention work; and it serves to point out, if our accident record is bad, that there is something radically wrong with our safety program. Therefore, a safety contest, such as sponsored by the National Safety Council, acts as a stimulus to the plant's safety organization. It spurs them on in their accident prevention work—because it is only human to be classed as the best in any respective field.

Discussion: A showing of hands indicated that very few companies have felt it necessary because of the depression to cut down the number of company safety meetings or the time given up to them in the plant. On the contrary, a very large percentage of the audience, indicated that safety meetings were being carried on as usual by their companies.

C. W. Flag, Illinois Steel Corporation, reported that his company is conducting safety contests on the basis of accident severity reports. He thinks, however, the better plan is to combine frequency and severity rates, as was done in their West Pennsylvania contest. The General Wrecking Company also uses the latter method. In 1930 the company started the plan of awards to all individuals in a department with a no-accident record. The awards are personal, such as an automatic pencil or a jackknife. This plan is in use in the company coal mines and steel mills.

The Standard Pipeline Company carries on a program which includes a preliminary inspection of the plant and the classification of departments in A, B, C, and D, grades, as to efficiency in good housekeeping. The company grades the contesting groups both for frequency and severity records and also on the basis of housekeeping results. A series of handicaps is established—small versus large plants, and hazardous versus non-hazardous departments. A trophy cup is awarded the plant with the most favorable accident record, and this cup may be kept permanently if won three times in succession.

Chairman Warfel stated that his company trained each man individually through a regularly published four page bulletin describing actual accidents in detail and suggesting method for their control. The accidents are written up in dramatic newspaper manner, promptly after each occurs, although omitting the name of the victim and the exact location. This bulletin serves the workers on 11,000 miles of railroad in ten states. Reports of the accident investigation do not spare the management when the supervisor or a machine is found to be at fault.

Investigation of Accidents *Very paper 1935*

By R. W. BLACK

Chief Safety Engineer, Standard Oil Co. (N. J.), Elizabeth, N. J.

The speaker said in part: To improve the safety record, it is important that each accident be carefully investigated to assure that our employees in the company may be protected against frequent accidents from the same cause. An investigation should start as soon as possible after the trouble has occurred. The shorter this time period, the more likely you will be to arrive promptly at the correct cause of the trouble. If too long a time has passed before the investigation is started, many things may take place to delay or influence the investigation, most of the things tending to interfere with the correct solution.

If the accident is not serious or unusual, the safety representative can very satisfactorily make the investigation. But in the case of serious trouble a committee should make the investigation, this committee to be composed of the following persons: works manager or superintendent, department head or foreman of operations involved in accident, and safety representative. In certain cases a larger group may be desirable, but ordinarily a small group is best.

Assuming that the accident is serious enough or unusual enough to require a committee investigation, a most thorough investigation should be made to obtain all the factors leading up to the trouble. Occasionally a most painstaking investigation fails to produce a reasonable explanation of the case.

It is sometimes desirable to reproduce the conditions that preceded an accident in an effort to find the true cause. In most cases, however, this is not necessary, as the investigation will show the various factors that contributed to the final trouble. Ordinarily an investigation will touch on the following points:

(a) A complete analysis of the job being done, including a survey of the equipment used and the method of preparing for the work.

(b) The experience of the foreman and of his operators is important. The experience of this group working together is often important.

Sometimes an individual is injured on a job that he has been doing for a long time, for a period of years, without any trouble. Cases of this type are perplexing as experience indicates that the operation has been carried on for a long time by many operators without trouble. The investigation plainly indicates that the operation is not as safe as you had thought or that the particular individual was largely responsible.

The following are a few cases illustrating various typical causes and the means adopted to prevent similar accidents.

To provide for the storage of new products it was necessary to add a tank at some of our wholesale plants from time to time. To take care of this we built a considerable number of tanks, 10 feet 4 inches in diameter and 26 feet high, that could be completed in the shop and shipped to the point of use, all ready to set up in the field. To take care of work of this type we employed regularly two or three foremen, each of whom had a handy man or two assigned to help him, the remainder of the gang being hired locally on each job. While erecting one of these tanks with the green crew, there was a misunderstanding of orders, and all of the group but one let go of the lever pole. This lever pole kicked up violently, striking one man a severe glancing blow.

The methods of doing this job were simple and had been in practice for many

years without accident. The foremen in charge of the work was away from the job at the time of the accident and there seemed to be a lack of understanding between him and his sub-foremen as to just what was to be done during his absence. More serious, so far as this case was concerned, was the misunderstanding between the sub-foreman and his gang.

A pipe-setter and his two helpers were assigned to a job of replacing a four-inch valve in a tank car unloading line. The valve was located under a low trestle and about five feet above the group. For some unknown reason, the pipe setter crawled onto the line and then stood up with his body between the axle and break beam of a flat car which was on the trestle. Soon after he got into this position the car was moved by a crane, crushing the man between the car truck and a cross member of the trestle.

The two helpers were away from the job obtaining tools and material so that they or no one else saw the injured man in position under the car truck. The car movement was flagged in the usual way. This accident has always been perplexing, as the injured man could do no work in the position where he placed himself. The job was done from the ground without scaffolding or any special equipment. This accident occurred soon after a series of safety meetings, which caused the safety failure to appear that much more conspicuous.

On two occasions we have had accidents occur to foremen which investigation showed were the direct result of a lack of care on their part in the performance of a relatively minor job. During the investigation of these accidents, the employees, who had been supervised by these foremen, commented on the seriousness with which the foremen had cautioned them concerning the performance of their regular work, and the workmen were reluctant to believe that the foreman himself would take the chance that it was apparent he had taken previous to the accident. As a result of one of these accidents, which occurred to a foreman in charge of electrical workers, a rather strict procedure was established for work on lines or equipment which were alive while in the immediate vicinity of "hot lines." This protection was extended also to painting work on power poles, some of which must obviously be done while the circuits are in use.

Foremen's Training in Accident Prevention

By C. M. ALLEN

Safety Supervisor, Safety and Training, American Rolling Mill Co.,
Middletown, Ohio

The speaker said in part: Believing in the principle that accident prevention is but one of the many inter-related functions of industrial management, the American Rolling Mills Company inaugurated a "Foremen-Managers" training program some four years ago, and combined its separate safety and training departments into one department of safety and training.

We fixed our minds on the job of preventing accidents, not injuries. Most of us are accustomed to referring to an injured worker as having suffered an accident. This is only partly true. The word "accident" is so many times confused with "injury" which is the result of an accident. How many times have you heard people exclaim, "that was a near-accident" when two cars collided and no one was injured. They were thinking of the injury, not the accident, for all the concrete evidence of

an accident was present. In the case cited, we might say that "fate" prevented injury to the occupants of the automobiles. But the safety worker is not interested in fate. His job is to prevent accidents, and to him only one phase should be apparent. That is, "the severity of an injury is uncontrollable." If you prevent your accidents, you do not have to worry about the injuries.

In past years we have talked a great deal about "safety education", but frankly, very little was ever done about it in a constructive way. Now every progressive safety man is approaching the problem from a calm and precise engineering viewpoint. Old practices are being torn apart and revised. Facts on all kinds of accidents are being collected, reviewed, and applied. The safety man has laid aside the shotgun and is really worthy of the title "safety engineer."

Back in 1911, we began to work in an organized way to combat injuries. We did everything we knew to do for safety and followed the advice and counsel of others engaged in similar work. Accidents were reduced and satisfactory progress was made. Our first training department was organized in 1918 under academic leadership. We modeled our efforts after those of the school room. We had lectures and loud oratory on debatable topics, such as psychology, leadership, morale, and the like. Attendance was entirely voluntary, and while many signed up in the early fall, there were comparatively few left at the end of the season. Many who needed the training most failed to enlist in the classes.

Training, like safety, during this period gave us an experience that prepared for what was to follow. As a result of our former experience with safety and training programs as individual functions, due to their ineffectiveness in the mill where our major problem existed, it was decided that both of these functions were necessary and had a definite place in the organization, provided they could be utilized more effectively for the prevention of accidents, reduction of costs and improvement of quality. An analysis of the two departments seemed to indicate that the safety department, from the standpoint of training men to prevent accidents, was more nearly approaching the ideal of what was actually needed along the line of training than the training department itself. Early in 1929, we decided to dispense with this isolated safety program and consider safety and the problem of production as one. The responsibility for all safety and training was delegated to the safety department. It was in the nature of an experiment.

In carrying out our new conception of what our training program should do, which was to improve the technique of every man in the organization on his present job, we realized our first responsibility was to our foremen group. When we analyzed their jobs we found their functions to be largely managerial, so we immediately inaugurated our foremen-managers training program.

This program was designed to give every foreman in our organization a proper and comprehensive view of his responsibilities. I believe most of you will agree with me that even a few years back the average foreman's conception of his job was that of handling either skilled or common labor, and that he gave comparatively little thought to the broader managerial functions of his job. In other words, he didn't consider that he was in business for himself and didn't appreciate that he was responsible for accident prevention, costs, quality, production and morale.

Our program was planned to cover a three year period. We are now starting on our fifth year of work. In 1929-30 the major subject of the course was "Conservation"; in 1930-31, "Prime Yield"; in 1931-32, "Prime Output per Hour." Each of these three courses was of six months duration. Each of the three programs was

broken down into six major factors and a full month was devoted to the study of each. The fourth week of every month was devoted to the study of costs on the particular subject. In the final analysis the cost sheet told just how effective the training had been. The 1932-33 course is now nearing completion. It is called "Management for Profit". It is set up for twelve months duration and deals entirely with cost control. The 1934 course will be ready to start November 1st. It will be of twelve months duration and will deal with cost control and the major problems that were covered in all the previous courses.

With the foreman well along in his managerial training, he is fairly well equipped to train his men in the technique of doing his job, and this work we call "Job Training." To use a simple expression, job training is merely teaching a man how to do a job in an efficient way. The plant safety directors conceived the idea of job training men when they discovered that costly accidents were repeatedly occurring on certain jobs in spite of the fact that the machines involved were well guarded, the men were provided with protective clothing, and they had been instructed in safety.

At one plant the compensation costs alone on one job that was not considered especially hazardous amounted to \$9,000, and the computed days lost were 17,000. A complete analysis was made of the job, and a careful study of the correct procedure to follow in the operation of the machine. After all detailed work was completed, all of the crews engaged in operating these machine were called together. There each accident was carefully analyzed, and through the use of large drawings the mistakes of the workmen who had been injured were pointed out. The men were then shown as a group by their foreman how to safely operate the machine, how to increase production, how to properly maintain the machine, and how to reduce rejections.

The results from this one training class exceeded expectations. The first class was held in August, 1929, and not one single serious accident occurred until January of this year, 1933. This one training class has more than justified all the time and effort that have been spent in job training men.

Before going into any training program for foremen and workmen, one thing must be considered before the program can be successfully launched. First, the management must be sold on the program; second, they must lend their support to the movement; and third, the program must be made as simple as possible and the school room idea must be completely discarded.

Not everyone can teach, but it is essential that every foreman in an industry, if he is to be a successful foreman, know something about teaching men how to do their jobs. His technique of teaching may be crude, but as long as he can impress the workmen that his instructions are sound, he is worthy of the name "foreman."

I have dealt with many types of foremen and have seen many who were highly educated fail in teaching a workman how to follow a simple routine. Again, I have seen the hard-boiled foreman, who thought it was impossible for him to get up before a group of men and explain the details of a job to them, do so in such a way that there was not the least bit of misunderstanding on their part concerning the job.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



Practical Medical Program for Industry

THURSDAY AFTERNOON SESSION

October 5, 1933

The special session devoted to discussion of a practical medical program for industry was called to order by Dr. W. A. Sawyer, medical director, Eastman Kodak Company, Rochester, N. Y., who presided as chairman. Dr. Sawyer welcomed the delegates, briefly outlined the purposes of the meeting, and introduced the first speaker.

Health Education

By J. H. HOLZBOG

Manager, Industrial Relations, Chain Belt Company, Milwaukee

The speaker said in part: In establishing a program of industrial health, there are two groups to whom the program must really be sold, the management and the employees. Recently I sent out a letter to about twenty firms requesting information regarding their health programs, and from this survey it is very evident that the majority of employers are not as yet sufficiently sold on the idea of industrial health that they have made any real investment in a well defined health program.

I do not mean to indicate that employers are wholly indifferent to industrial health as one of their problems. Far from that, for we find a very great many of our larger employers who have established complete medical programs and are doing a real job. However, these large plants are in the minority and there are vast numbers of small employers with anywhere from 10 to 1,000 employees who have either no medical program at all or one which is very limited.

There seems to be three reasons for the lack of more progress: (1) lack of detailed information with regard to organizing such a program; (2) lack of definite knowledge of its economic value; and (3) the lack of some promotional agency to push the thing into action.

It is quite evident therefore, that in the majority of cases our health education must begin with the management. Many of our employers are still under the impression that a worker's health is his own personal problem and that the employer need not concern himself about it. Most of these employers do not fully realize how important a worker's health is to the organization until one of their key workers is

suddenly incapacitated and they find themselves in a bad situation. Even then, I dare say that many of them would complacently lay the misfortune at the door of Providence.

You know, this responsibility thing is a very peculiar one, especially when it applies to ourselves. How many individuals will readily accept the responsibility for their own health? Most medical men will agree that one should have a physical examination at least once a year. Yet even in a group composed almost entirely of doctors, nurses, and people who are vitally interested in health work, (such as this meeting) how many of you can honestly say that you have a physical check-up regularly once a year?

When accident prevention work came into its own, it was the cost of accidents that made employers realize that the accident prevention problem demanded attention and it was then that they started to work on it with real concentration. The compensation laws and similar legislation in our various states were largely responsible for placing the responsibility for an injury on the employer. Now, I do not want to advocate that we need legislation to make us realize that the health problem belongs to industry, but it does seem that unless these problems actually cost us money in visible dollars and cents we are very apt to disregard them and consider them as more or less unimportant.

In Wisconsin, for example, we have had this fact brought home very forcibly through the medium of a new code on dusts, fumes, vapors and gases, and the recognition of silicosis as an occupational disease. I am most familiar with the part of the code dealing with dusts. Since the code has been in effect, about one year, I venture to say that there is scarcely a foundry in the state that has not had at least one silicosis case and some of them have had ten or twenty. When we consider that these cases cost anywhere from \$5,000 to \$20,000 each, there is little wonder that management becomes vitally interested. The occupational disease problem is therefore one factor which is now and will continue to be one of the prime factors in bringing industrial health to the attention of employers.

A few of our larger institutions have attempted to determine the costs of sickness to industry and it is now possible to obtain considerable authoritative information on this subject. Several years ago in our own plant when there was not so much absence due to lack of work, we maintained a chart for a period of some months contrasting the time lost due to injury with the time lost due to sickness. We found that the curve plotted on non-occupational lost time stayed consistently above the curve plotted for occupational lost time, and I would say that the difference was approximately three to one. In other words, if we lose money when a man is off duty due to injury, the intangible costs amount to just three times as much when the man is off due to sickness, according to the figures obtained from this study. According to the National Chamber of Commerce, there is an average loss of nine days per worker per year due to illness.

As a consequence, it would seem to me that health education should start with the management. They must be sold on the idea that a health program is an economic investment just as they have pretty well generally conceded that safety work is a good investment. It is absolutely essential, too, that any plan or program of this nature must have the whole-hearted support of the management in order to succeed.

But to get down to the subject of health education for the workers, which is the important point here, let us first consider just what it is we wish to teach these workers. Do we want to attempt to teach them all about the various diseases, their

prevention and cure, etc.? That is not our object. We are not trying to teach them to be medical experts but simply to teach them the best way to live. If we do a good job of this, we will not have to worry so much about diseases and their cures. From my observations, it would seem to me that this problem of proper living is more and more becoming recognized as our biggest health problem.

As to the means of educating our workers on how to take care of themselves, there are undoubtedly a great many ways of doing this. It seems to me that the logical place to begin education of any sort is with the newcomer. Experience has proved that in any program we attempt to get across in our various organizations, it is much easier to get new employees to accept the new ideas than to get old employees to change their ways. The new man will regard rules, regulations, system and other methods in use as standard procedures and in his attempt to become acclimated and to make a good impression in his new surroundings, he is not inclined to question the order of doing things.

The initial physical examination has proved of particular value in introducing the new employee to the company and its human relation policies. To secure the fullest value of this opportunity, the physician must impress the individual with the sincerity of his interest in him as an individual. Whatever impressions are made upon the new employee at this time determine his attitude and reactions to a great extent in later contacts with his foreman and fellow workmen. This is also true of the new employee and the hospital personnel. Here he makes up his mind, perhaps subconsciously, whether he will come to the hospital should be met with a minor injury or feel the need for advice, or whether this is a place to be religiously avoided in the future. Workmen are quick to recognize genuine interest and are eager to place confidence in those they appraise as sincere.

Many people have a great fear of examinations, a fear that perhaps they will find out that they are afflicted with some dreaded disease, or a fear that they will be disqualified for a job because of it. They should be made to realize that these examinations are to their own advantage, as they are conducted in order to fit the individual to his job commensurate with his physical characteristics, and not to discriminate against him. It is absolutely essential to gain the new man's confidence and encourage him to come to the medical department at any time for counsel and advice.

Of course, if we have only the preliminary examination and do not follow it up with periodic re-examinations, the first impression may gradually wear off. Periodic check-ups give us an opportunity to remind these employees of advice given previously and to see that they are really following suggestions made. Also, it is much more likely that the man will act on the suggestions from the doctor if he knows that in six months or a year he will face that same doctor again.

Where we do not have doctor's services available, almost all of the smaller plants at least have a nurse or someone else who is trained in first aid work. In such cases it is possible to carry on our health education through these people. We must be careful, however, that these people do not attempt to in any way fill the place of a regular physician, they can, however, be of invaluable service in offering advice and health on the ordinary health questions, where a physician's advice is not necessary. Visiting nurses are also used, and provide an excellent contact.

Further efforts along the lines of health education through personal contact can very well be made through our safety committees. This can be done whether or not we have a physician in the plant. In the case where we do have a full-time physician, the safety committee can be used to help popularize the medical department and en-

courage the use of its facilities to the fullest extent. In the case where no regular medical department is maintained, they can then be taught to disseminate health propaganda of a general nature and to encourage their fellow workers to check up on their own health from time to time.

Another way of educating our workers along health lines is through the medium of conferences and lectures. Conferences, of course, are only feasible with small groups such as safety and sanitation committees, or small groups of workmen. Lectures and short health programs, however, can be carried on in larger groups and can be made to serve a real purpose.

In Milwaukee the Association of Commerce has for about ten years organized and managed a yearly school of first aid and health. This school has for its object primary instructions in three subjects. There are usually five bi-weekly meetings which are held in a large auditorium in the center of the city and during the last few years the enrollment has averaged between 2,000 and 3,000 people. Members of the school are recruited from the rank of the various industries around the city. The instruction given is of a very general nature but I believe that some very real results have been obtained through this school.

Other methods of health education, more or less of an impersonal nature, include such mediums as plant publications, rule booklets, and bulletin boards. The National Safety Council has also published a small health booklet which is a very fine piece of work.

There is one other place of health education which is somewhat indirect but very important, nevertheless, and that is the sanitation and ventilation phase. All the advice and counsel we can give will bear very little weight unless we back it up with a place to work that is clean, well ventilated, and generally conducive to good health.

Discussion: Dr. C. O. Sappington, Chicago, suggested that you can do more in teaching children than adults. In a study of children and adolescence, made some years ago in San Francisco, he found that 90 per cent of the children enter industry from the public schools. Health education in these schools, therefore, is the real foundation for effective work, for these children enter industry with the same defects observed in them as in the public schools. Here is a fine opportunity for some foundation to establish a health program in the schools and follow through into industry.

The Eastman Kodak Company, Rochester, N. Y., has a nutrition adviser who carries on a health program through bulletins, personal consultations and other available mediums of contact with employees. One good effect of this program has been to decrease the indiscriminate use of cathartics.

The Placement of Workers from a Physical Standpoint

By DR. A. G. CRANCH

Medical Director, National Carbon Company, Cleveland

The speaker said in part: Chiefly I shall try to discuss physical characteristics as they may affect proper placement—points that the alert safety man should note, and often to his credit does note, even better than a doctor. Both employment man and doctor, to accomplish the best in placement, should know the physical requirements of the various jobs. Then a really satisfactory placement should be possible.

The large man may not be fat but usually is tall. The tall man often is not large, only tall and thin. So when we say "this job calls for a six-footer", what do we

really mean? A man six foot three and one-half inches appeared for a chipper's job, one often meaning car loading with heavy packages which must be piled one on another, requiring heavy and repeated lifting. Our tall applicant weighed but 137 pounds. To have put him on such work would have meant to court a chronic back case. We put him on a parcels post job free from heavy lifting. The other job could best be filled by a man heavy and well muscled in proportion to his height, preferably over 150 pounds, neither fat nor thin.

Consider the fat man. His fat may be well distributed, and may cover good muscles. If so he is apt to be broad in the shoulders and long in the chest, and fit for heavy work. But beware of the fat man with narrow shoulders and with a bulbous abdomen. Such a man usually has very poor posture, and his abdomen usually encroaches upon his chest. His wind is short and he is very prone, like the long thin string bean, to lame back.

And so I would remind you that all men are not what they seem. A big man may only appear so. He may really be quite under weight, have light bones, loose joints, a short chest, and long back, or he may be heavy with poorly distributed fat. On the other hand, the small man may be only a little shorter than the average but deep chested, well muscled, close knit, and an excellent example of the human machine.

To view the problem in a slightly different way, let us consider some of the different types of work in the light of their physical requirements.

Heavy Work requires strength rather than speed. For instance, agriculture, lumbering, mining and quarrying, road-building, iron and steel industries, slaughtering and meat handling, freight handling, etc. For such work we would look for the stocky type, middle height or better. Not fat but well developed and muscular. Broad shoulders, deep chest, long trunk, at least 150 pounds, preferably over. Never tall or thin, or long in the legs as compared with the body.

Heavy work—requiring some speed as well as strength. For example, railroad and shipping, building and construction, helpers for many skilled trades, heavy machine operators, truckers and movers. These men may often be of medium build, well muscled but supple, and if well proportioned, men under 150 pounds are often very satisfactory.

Medium and light work—requirements are varied, as in average factory work, such as machine operations, assembling of products, stores handlers, delivery men. For such work many of the more extreme physical types may be used without disadvantage. The fat man, the thin man, the short or very tall, may often be employed without handicaps or hazard. Here mental characteristics often are of as much or more importance as physical.

Skilled labor—In the placement of skilled labor, mental traits assume more importance than with common labor. In these are right, physical adaptability is greater. Some trades as foundrymen, blacksmiths, boiler makers, masons, structural ironworkers, millwrights, plumbers, tanners, etc., require men of good physique and the more extreme types are at a decided disadvantage. But natural selection has largely done its work before the skilled worker applies for a position. The thin stoop-shouldered man may succeed as a printer, but he would not be likely to fit in as a foundryman or boilermaker. The fat man with ample weight may become a successful baker, but hardly will he be a structural ironworker. Many times dexterity is more essential than strength, and granting this is present, physical types may vary

much, as noted in such trades as electricians, tool-makers, machinists, painters, clothing makers and many others.

The clerical worker—Those in clerical and supervisory work, of course, are selected almost entirely for mental achievements, and physical characteristics of the natural or fixed type claim but a small part. With these workers, however, acquired characteristics in the nature of defects are often very important, both to themselves and to their employers. Close watch should be kept for such defects, especially such as may be progressive.

Granting that the employment man and the doctor have fully co-operated, and the man free from defects but with marked natural physical qualities has been properly placed, let me add a word of caution. Transfers within an organization are often made without fully considering the physical adaptability of the man for his new work. Such things should be considered just as fully in making a transfer as in hiring a new man. Because a man has proved well fitted for one job, it does not follow that he could do as well in any job.

I must also touch on a few points relative to the acquired physical characteristics, the "defects" often found. These, too, have a bearing on placement, are often such that the employment man would not detect them, and sometimes even a doctor's examination does not find them before hire.

Of course, there are some defects which would disqualify for any employment until corrected. These are really not so numerous. Usually only such things as communicable disease, and the more advanced stages of certain other diseases, as of the heart and kidneys, diabetes, arthritis, etc. The other commonly listed causes for rejection are usually relative, and depend upon the degree of impairment present, and the opportunity to supply suitable work. Of course, considerable hazard is involved in employing those with some types of defects, especially conditions almost certain to be progressive. With the interpretation so often put upon "aggravation of a pre-existing condition" in applying compensation laws, any employer in self defense must exercise caution, and frequently will not employ a man with some conditions, who might work at selected occupations for some years before their defects would reach a stage which would constitute a real hazard in themselves or their fellow workers.

Two points should be emphasized in reference to the placement of defectives. First, the examining physician must have a real knowledge of the job requirements; and second, he must consider the defects from a point of view of man, job, and employer, rather than just a medical or life insurance problem. And he must not be misled by some of the reports made on certain kinds of defects. Some concentrating on certain subjects leave us fearful by turn that a large number of our applicants are suffering from, let us say, tuberculosis, heart disease, syphilis, defective vision, or what not.

Such conditions are sources of concern. They do occur, and those concentrating on their study are doing a great service to the public and to physicians. But sometimes I am inclined to feel that after a study of a certain series of cases, they sometimes generalize too freely. In some communities, for instance, I know that syphilis is very frequently found. In others it is not. Comparison of presumably equally reliable figures seems to me at least to show that it cannot be evenly distributed. So also with defective eyesight. Some surveys lead some observers to deduce that 90 per cent of adults have defective vision and need glasses. But other surveys of large numbers of industrial workers fail to find even half this number, and also many

a case of truly "defective vision" is still amply able to perform his usual work satisfactorily and without symptoms.

And so defects are often "relative" and with intelligent placement, many defectives can be employed with safety, and without handicap or lack of efficiency.

Discussion: Expert opinions agree that no examination at all is better than a mere superficial inspection, and an examination is of little use without efficient follow-up. A man with incipient hernia (where the ring bulges are present but there is no break) should not be employed unless he wears a truss. His case should be recognized as a hernia and he should be employed where he would not be likely to suffer strain.

Practical First-Aid and Its Application to Accident Prevention

By HART E. FISHER, M.D., F.A.C.S.

Chief Surgeon, Chicago Rapid Transit Co.

*Original
F. 519*

The speaker said in part: At the inception of our medical policy, we decided to adopt a definite plan of employee health conservation. By this we believed we should be able to prevent not only the accident itself, but reduce the complications of injury if the accident did occur by being assured of the physical condition of our employees. It was essential, therefore, that we have definite knowledge of the state of physical fitness of all new employees entering our service in every capacity. We instituted a pre-employment examination under a definite standard of job requirements and followed this up with a careful medical examination to fit these standards.

With a stop thus put to taking defective employees into our service, from a safety standpoint, it was next necessary that we have a complete inventory of all those old employees who were already in our service to determine their physical fitness for the work they were engaged in. As a pioneer in this preventive phase of medicine and following it yearly with the same group of employees, through the intervening years we are now able to see the great value accruing to us from this part of our accident prevention effort.

Our well equipped medical department was able to give the employees assistance in arriving at a diagnosis of their condition and were able to extend a laboratory service in all branches of medicine to them and their private physicians without cost to the employee. The actual treatment was left to the physician, except in the case of those who on account of their financial condition were not able to employ outside medical aid. We reserved the right to keep under observation all employees under treatment by their own physicians, in order to be acquainted with their progress toward recovery and to place them in work where they would not be a hazard to themselves or those entrusted to their care.

A step further up the ladder of accident prevention through health conservation of the employee was to instruct each one in health facts pertaining to his body. We also, as a matter of course, saw the very urgent need of training him in the fundamentals of first aid. This school of first aid was established and under a strict standard of instruction by physicians the classes were instructed what to do until the doctor was available. It was not our intention to make doctors out of these laymen, but to equip them to be efficient and available when accidents occurred.

Accidents will happen despite all we do to prevent them, but when they do occur our attention can be directed toward bringing the patient back to recovery in the shortest possible time. Many of the complications that result from trivial injuries are due solely to neglect or delay in competent first aid treatment. In cases of electrification alone, the cost and effort put forth in first aid work have been invaluable in reducing fatalities. Here the first few minutes are of the utmost importance if the patient is to live. No physician is ever instantly available in this class of case and it is therefore essential that the layman be efficiently trained in life-saving measures.

Most of the criticism in industry directed at the layman's first aid as detrimental to the patient, where bunglesome first aid services may have been rendered, is due entirely to laxness of training and observation of the employee. Some companies use layman first aid executives without any medical authority responsible for what is taught to the employee, and others parcel this work out to associations making a business of teaching first aid who may not be acquainted with the needs of industry. If this work is not made a daily routine by the surgeon in industry and a daily observation had of the layman training, then disaster will creep in.

There is much more in industrial medicine and surgery than simply taking care of injuries that arise, and my acquaintance with industry has revealed the fact that most industrial surgeons are interested more in traumatic surgery with its spectacular surgical procedures than they are in the preventive phase of the subject. Keeping industrial employees physically and mentally fit for their daily occupations is as much a part of the industry as it is to produce a given commodity.

(Note: Dr. Fisher's address was followed by a practical demonstration of first aid and resuscitation methods, presented by the Chicago Rapid Transit Company's First Aid Team. This demonstration was a repetition of nearly 100 methods of resuscitation originally given during the 1931 Annual Safety Congress, in Chicago, and published complete in the volume of Transactions on pages 97 to 120 inclusive.)

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Industrial Nursing Section

TUESDAY AFTERNOON SESSION

October 3, 1933

The joint session of the Industrial Health and Industrial Nursing Sections, devoted to a consideration of problems of industrial nursing, was called to order by Mrs. Fern C. Deleplaine, R. N., Stevens Hotel, Chicago, who presided. Mrs. Deleplaine welcomed the delegates, briefly outlined the purpose of the session, and introduced the first speaker.

Safety in Nursing

Orig. paper 193

By W. S. ASH, M.D.

Director of Medical Service, United States Tire Company, Detroit

The speaker said in part: Practically every quality which makes a nurse a good nurse makes her a person to be reckoned with in the safety picture. In a certain house organ of a large industrial concern, I ran across the qualities upon which the field representatives were rated. Here are just a few of them: appearance, personality, tact, industry, initiative, dependability, co-operation, habits, health, judgment, vision, planning, training, supervising, etc. In fact practically all of the twenty-five qualities also apply to the nurse.

Perhaps the foremost essential is that the nurse be temperamentally fitted for her work. She must feel that she is in a work which permits her to give the best that is in her, something into which she can put whole-hearted enthusiasm. She must not be a clock watcher and a pay day anticipator. She must be slow to anger, almost assuming at times the hotel slogan, "that the guest is always right." She must not close her ears to constructive criticism, but she must let the ordinary "moothings" go right over her head. Always remember that you are doing a worth while job, impossible of being actually measured in dollars and cents, regardless of all the figures the statisticians can assemble. The time has long gone by in industry when the nurse was a person to be tolerated rather than welcomed. And the relationship of the nurse to safety is equally apparent in the small as well as the large establishment.

In larger plants where there is a doctor in direct charge of the medical work, his worth to the company is measured largely by the scale of your services. Good nursing, good medical service; poor nursing, poor medical service. If only for selfish reasons, the nurse should do her best. Poor work on her part may wreck the service and if

the service is wrecked she will most certainly find herself among the wreckage. On the contrary, if she puts forth her best effort she has the satisfaction of feeling that her work is well done, a satisfaction not to be overlooked even in this material age when we also expect financial returns commensurate with our work.

I know of no work where Self is so important and yet, paradoxical as it may seem, where Self should be so much relegated to the background. The value of the service you render is based largely on you as an individual, your personality largely determines your work, and yet the moment that Self bobs up ahead of service you are off on the wrong foot. You must sell yourself to both management and employees. Management must be convinced of your ability to do the work assigned to you, but the employee is often the final judge and a hard task master at times. He isn't so easily fooled as we sometimes think he is; he has a way of knowing whether sincerity prompts our actions.

The nurse who sees only the immediate treatment of injury and sickness as her entire field is falling far short of her opportunities. These are only part of a large field before her. The "why" and the "wherefore" of the conditions which bring patients to her are of prime importance. Why do men get hurt? Why do some get hurt oftener than others in the same work? What brings some girls to the office frequently and others are never seen? Back of every patient's visit is a cause. Seeking out this cause is just as much your duty as it is the safety engineer's, perhaps more so.

Some months ago we had a girl employee brought to our office with the history of having fainted at her machine. In a few days the same thing occurred again. It was an unusual happening, the girl being an excellent worker and general employee. To make a long story short, we checked with the foreman and after some sleuthing around we found that the girl was actually starving herself. She had an unemployed husband and two children and had recently taken in a sister with her two children. In order that the others might have sufficient nourishment, she had been pretending she was "not feeling good" and was actually eating less than enough to keep body and soul together.

Let me implore you not to neglect the things which may seem trivial to you, but which loom up important to the employee who comes to you for help. A sympathetic hearing to the troubled man or woman may prevent accidents later; I am sure it does. Putting a troubled mind at ease is often worth more than physical remedies.

We grant the importance of professional skill in this great work, and it is certainly an ideal combination when we find it going hand in hand with the other qualifications which I am rambling about. However, many a wonderfully skilled worker has been a complete failure at her work, and more than one mediocre nurse has been a great success, because she had that indefinable something which makes employees turn to her instinctively when injury or sickness is upon them.

There has to be something inside of you as a starter. Don't forget that you are dealing with a human being the same as yourself, all of us made in the same image, but through no fault of ours occupying different niches in the game of life. I don't want a nurse without backbone, who hasn't the courage of her convictions, but I will not have one who is coldly calculating, without the least semblance of humanitarian instincts. I don't want a stormy petrel of bluster and independence, but one who is amenable to discipline, one who can maintain her poise in the face of discouraging odds.

If possible, familiarize yourself with shop operations. Find out what a boring mill

is, know a mold or band-saw when you see one, know something of chemical processes if chemicals are involved. Nothing helps so much as to have first hand knowledge of what your patient is talking about when he describes his accident. You can better visualize his problems and it helps him to have confidence in you.

I think the alert nurse should not hesitate to enter into safety committee discussions. She has first hand information about safety ideas and she should have a chance to uncork them at times. If we want to know something about how our product is made we ask the production man; if we want to know how the mechanical end is kept up we ask the maintenance man. Why, then, should we not ask the nurse about the relations of health, injury and safety?

We sometimes seem between the devil and the deep blue sea in trying to see eye to eye with both employer and employee, and yet when we come to analyze the situation we find that there is no wide variation between the two. An amicable relationship with the foreman is a point not to be lost sight of. The foreman thinks first of production, and we think first of health and safety. But it is easy to reconcile the two viewpoints and co-operation is easier than it may seem at first.

Tying Up the Nursing Program to Personnel Relations

By EVALINE F. LOGAN

Industrial Nurse, Wisconsin Steel Co., Chicago

The speaker said in part: The personnel department of any large firm is the first department that ordinarily comes in contact with the new employee, for the employment department is usually a part of, or is connected with the personnel department. The duties of this personnel department do not end with the employment of labor, but follow labor through its employment, look after its welfare, its health, its safety, and in general keep in touch with it through the course of employment. Naturally, therefore, the duties of the industrial nurse tie up with and form part of the work of the personnel department.

Among the generally recognized duties of the personnel department is employment and the keeping of employees in such a condition of efficiency and health, both physical and moral, as will be of advantage, not alone to the employer but also to the employee. The question of health, moral and physical, is a matter of never-ceasing concern and the maintenance of that degree of health, contentment and morale which keeps the worker properly and contentedly at his task is a matter of vital interest, not only to the personnel department but to every department of the plant. Loss of time and efficiency due to accidents, avoidable or otherwise, or to poor health, mental or physical, means a loss to all.

In these various activities, the nurse acts hand in hand with the personnel department. In many cases of long continued disability crises of many kinds develop. Many employees own their homes which are usually bought on the installment plan, and where accident or prolonged illness threatens the loss of a home because of failure to pay these installments, the personnel department is informed by the nurse of the circumstances. If it feels justified in acting, the titleholder or holder of the mortgage is called on, and request is made for an extension of time on payment of principal, arrangements being made requiring the employee to pay interest only, over such a period as will permit the employee to get back on his feet financially. Sometimes,

too, loans are made to employees to assist him in meeting obligations such as rent, gas and electric light bills, or clothing.

Many other facts also present themselves in the course of visits to the families of disabled employees, factors that every industrial nurse is familiar with. Owing to her close relations with the family, many of these problems are presented to the nurse for valuation. She is asked for advice or assistance in connection with insurance, wills, truant boys and girls, and so on. Sometimes a member of the family requires medical services which the family is not financially in a position to procure. The nurse is frequently able to secure medical services from some source for the ailing member of the family. Where a death occurs in the family of an employee and no provision has been made for insurance, the nurse is frequently able to get the assistance of a "Good Fellows' Club" or similar organization.

At first glance it would seem that these should be things outside the scope of the nurse's interest or the interest of the personnel department, except in an academic way, but experience has proved that human nature will not confine itself within academic lines. It is only natural that in the endeavor to prevent shattered family morale from retarding a patient's recovery, or later, when he has returned to his employment, from acting as a mental curb on his efficiency as a worker, some of these problems should be brought by the nurse to the attention of the personnel department for any action that can be reasonably taken.

At all times the effort of the nurse and personnel department is to build up self reliance, self respect and initiative on the part of the employees and their families. While charity is at times necessary, it is never the keynote of service rendered. The idea underlying any such service is that of assistance in emergency only.

When it comes to monetary assistance there is a limit to what can be done, and there is a limit, too, to the time and consideration that may be given to individuals or families, no matter how worthy the cause; and the industrial nurse must be practical enough to determine just what recommendations should or should not be presented to the personnel department.

During the period of depression industrial nurses have had to extend their services more widely along the lines of social service. The personal knowledge gained by them in their home contact with the employees and their families has often pointed the way to the character of relief to be offered, and at times, too, it has prevented unnecessary relief being given.

Many employees were necessarily laid off as business declined. It then became the duty of the personnel department to keep track as well as it could of the majority of these men, and particularly of the older and more desirable employees, so that they might be recalled to service as needed. Many of these men soon exhausted their savings and some companies put in plans whereby certain weekly loans were made to the men to tide them over the emergency. The amounts of the loans varied with the conditions and needs of the families. Personal investigations of the various cases became necessary, so that family budgets might be worked out, and it has been part of the duties of the industrial nurse to make these investigations and report on them to the personnel department and recommend proper family budgets.

Cases are sometimes uncovered where the illness of the wife or other member of the family has necessitated so much home work, nursing, etc., on the part of the employee, that his usefulness as a worker has become definitely impaired. Many employees, confronted with trouble of this sort make no complaints, feeling that the matter is of no concern to the company and, strictly speaking, it is not. On the other

hand, everything that affects the capacity or morale of an employee is the employer's concern in so far as it tends to impair his usefulness as a worker.

The nurse's personal contact with the families of these workers makes it frequently possible for her to unearth the hidden sore spots, and take the necessary steps to correct them. In worthy cases she can secure the assistance of the personnel department, of affiliated organizations, the organized charities, clinics, physicians, and from other sources known to her.

Among some of the industries, the industrial nurse is also charged with the duty of imparting information to employees with reference to their safety and the safety of their fellow employees during employment. Part of the information she can give is derived from her own experience, particularly with accident cases, but largely the information comes from the National Safety Council or other like sources, where information is compiled from experience to point the way to prevention of accidents. Among many industries, the duty of imparting safety first knowledge, as it is sometimes called, with the object of minimizing accident and disease, is taken care of directly by the personnel or similar departments. Regardless of how this valuable information may be passed on, both the nurse and the personnel department have an important and interlocking duty to perform in the endeavor to prevent accidents, as well as to alleviate the results of accidents when they do occur.

Discussion: In the vast majority of industrial plants, there is no industrial nurse; only the larger industries support a full-time nurse. For the more than 40,000,000 workers in the country there are only a few thousand industrial nurses; and this is true in spite of the fact that there is ten times as much lost time caused by sickness as results from accidents.

Because of the great economic phase of the industrial nursing problem, the economic questions involved, such as family troubles, etc., demand that the nurse should be trained in social service work. The industrial nurse should have the vision of the public health nurse, and special schools are necessary for this technical type of most necessary training. New York University is offering a post graduate course for nurses of this nature.

The Nursing Associations should analyze this problem and take it up; they should outline the needs apparent and plan to present the problem to available universities.

Rehabilitation of the Injured Worker *orig paper W39*

By DR. J. F. COX

Medical Director, Illinois Bell Telephone Co., Chicago

The speaker said in part: When the worker is injured, what can we do for him? The treatment may be classified into: (1) immediate; (2) rehabilitative or corrective. The more efficient the former is, the less necessary will the latter become.

In treating wounds, visualize what may be involved, make careful tests and examinations to rule out severance of tendon and nerves. X-Ray if any possibility of fractures. When repairing use all aseptic precautions. Treat soft parts first and when danger of infection is remote or past, treat for all conditions present. Drains and warm boric or Dakins dressings often prevent infections.

Infections produce many hideous deformities in industry. Early warm boric dressings eliminate many of these. Know where and under what conditions to incise.

Incise freely away from contact surfaces—mere punctures do not suffice. Drain if necessary and remove when it has done its duty, so that normal process of repair may begin. This will not occur if drains are left in until they become foreign bodies. Dress in position to give least possibility of contracture. When contractures are inevitable, dress in the most usable position. There is always a best position. In this work under the strictest aseptic conditions, use glove for mutual protection of patient and operator.

Fractures require constant supervision during the entire healing period. Use all devices at your disposal to make a diagnosis, especially X-rays, with frequent check-ups or fluoroscopic examinations. This will eliminate chances of malformations of parts from going on to solid bone formations, only to be discovered when the casts are removed. Do not use circular casts except when necessary, and relieve pressure by splitting where possible, and watch carefully for constriction or signs of pressure. Start gentle passive motion and massage early. Many cases of fracture are almost ready for work when casts are removed.

I have mentioned immediate treatment rather specifically because of the fact that many cases would not come for rehabilitation to any great degree had the case been handled properly at time of injury.

Assuming the worker has had his fair share of treatment, he now shows some residual effect of injury; scars, in other words. He now becomes a candidate for rehabilitation.

This may be simple: merely hydrotherapy heat treatment, passive motion, massage, the return to modified work with frequent inspections until regular work is resumed and physical therapy measures are discontinued. Many firms do this. They find suitable work for them, work they can do and enjoy. Rehabilitation does not concern these types. It is for the worker who has been left stranded, unable to do his regular work because of injury or is untrained to do anything else. Some firms return to employment at this time their injured employee, finding for him a soft job which offers no incentive or chance for advancement. Another returns to his same job, which he soon finds out he cannot do. This latter is demoted in rank and pay and he is dissatisfied.

Now we have two employees in unsuitable positions—one who is dissatisfied because he has no chance for advancement, the other because he has suffered from a demotion and reduction in salary. They become malingerers, create unrest among their fellow employees, settlements are made and they are finally discharged.

What is rehabilitation? Rehabilitation is a large human engineering undertaking devised for the purpose of conserving man power.

In 1920 the Federal Industrial Rehabilitation Law was enacted. This act provided for the vocational rehabilitation of persons disabled from any cause and their return to suitable, gainful employment. One million dollars is appropriated annually and is apportioned to states which have accepted the plan and submitted a plan for carrying on this work. Whether this should be administered as a part of the educational system or as a separate department, matters little. Arguments pro and con can be advanced for both.

The fact that a person is a part of our citizenry qualifies him for a right to gainful occupation—his handicapping injury qualifies him to vocational rehabilitation.

Compensation laws are inadequate, as no provisions are made for rehabilitation by which the handicapped man may again resume gainful occupation. Compensation laws should be closely associated with rehabilitation. To make it a success Federal,

state, especially the Industrial Commissions, civic, social and fraternal organizations, churches, industrial and insurance firms, should support it. It costs the state about \$1 per day to support an unemployed disabled person. This, together with his dependents, makes the cost enormous. Why should not this handicapped person be given a chance to become independent and self supporting, encouraged to do so?

Almost all the states (44) have plans and aid from the Federal funds. The Industrial Commissions work together with the Vocational Rehabilitation Board, and cases are referred by them for correction and training.

First, the injured is appraised as to his age, education, previous training and occupation. His possibilities are evaluated. Many times surgical procedures will render him able to resume his previous work. At other times there is no possibility of this and he must be re-educated or re-trained to a more suitable position.

It would be folly to expect to fit an artificial arm for one who had been a watch-maker or an artificial leg to a brakeman and expect them to resume their original occupations. However, there is always some position the handicapped person can fill provided he is properly trained and he has not lost his morale.

Very often employment agencies are averse to employing the handicapped in many cases because an injury to a corresponding member may make them responsible for a complete total disability. This in many states is taken into consideration by Industrial Commissions. Some years ago the Western Electric Company employed about 600 persons with physical handicaps and compared their work with a like number who were normal. Their injuries were no more frequent.

In the United States there are approximately 300,000 injured in industry alone. Of these, 50,000 are partially permanently disabled. Of these, 5,000 or 10 per cent are taken care of yearly by rehabilitation and vocational training.

In Illinois vocational rehabilitation is administered by the State Board for Vocational Education at Springfield. Agents of the division of Vocational Rehabilitation are prepared to advise and counsel disabled civilians in the selection of new work. The service also includes assistance and advice leading to physical restoration. The state is prepared, through joint Federal and state funds, to pay for vocational training and instructional supplies when vocational training is offered as a part of the rehabilitation program. The service includes also assistance in securing employment and supervision in it until the requirements of the new work have been satisfactorily met.

All persons are eligible, either male or female, of employable age, who are, through accident or disease, unable to engage in self supporting work; or persons who, being thus handicapped through accident or disease, may be expected to engage in gainful employment; or persons suffering vocational handicaps who are American citizens and who are residents of the state of Illinois.

To obtain the service, men or women incapacitated for gainful employment and who desire the service of rehabilitation should report to the Board for Vocational Education, Division of Rehabilitation, on application blanks which are furnished upon request.

Illinois stations are located at Springfield, Chicago, LaGrange, Rockford, Peoria, Salem, Bloomington, Moline, Metropolis, and Princeton.

ADJOURNMENT

*TWENTY-SECOND ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL*



Safety Equipment

TUESDAY AFTERNOON SESSION

October 3, 1933

The special session devoted to a discussion of safety equipment was called to order by R. T. Solensten, Elliott Service Company, New York City, general chairman of the Accident Prevention Equipment Manufacturers' Section. Mr. Solensten welcomed the delegates in the name of the Executive Committee of the National Safety Council, and then introduced Albert S. Regula, executive secretary, Industrial Relations Counselors, Inc., New York City, who presided. After outlining the purposes of the session, Chairman Regula introduced the first speaker.

Safety Devices in the Modern Safety Program

By C. B. AUEL

Manager, Employees' Service Department, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

The speaker said in part. Once we thought that mechanical guards were the solution to the entire problem of accident prevention. But now we know, after years of effort and experience bought at a tremendous price, that mechanical guards are but a small part of that solution, while other preventives, some most odd in kind, already play or are commencing to play, an important part. Among these are: minimum labor turnover, good health, contentment, neatness, cleanliness, English language, good lighting, wearing apparel, education, X-ray apparatus, air conditioning apparatus, and photoelectric cells.

Let us advance, however, a step further and no longer look upon guards as preventives against injuries simply as negative devices, but rather let us look upon them as something even more valuable—namely, as positive devices, aids to safety and also to production or lessened costs and as devices to permit more nearly normal functioning of the worker, even if at times they aid in these other respects only indirectly.

Who is there that will deny that light, besides enabling work to be seen better and done better, hazards observed and therefore avoided, also adds cheer to a place; that neatness and cleanliness, involving the removal of dirt and obstructions, produce a feeling of comfort among the workers; that safe working conditions relieve or avoid mental strain; that good health is a distinct asset to every worker? These are intangible effects, as far as our present means of measurement go, but of real value.

nevertheless, in accident prevention work, for they add to the ease, contentment, well being, and, therefore, to the more normal performance of the workers, tending to raise the morale of the entire establishment.

With reference to mechanical guards, in the design of tools and equipment and in the development of processes, endeavor should be made to avoid the necessity of the operators having to use guards at all or to take precautions against accidents, thus making whatever it may be absolutely foolproof, for there can then be no possibility of accidents in the event of human failure.

Failing this, the next best type of guard is one that does not permit the operator to enter the danger zone with any part of his body.

And the next best is the type of guard that prevents the machine from functioning until the danger zone is cleared of obstruction; that is, a guard that must be in the fully closed position before the machine it is guarding can operate—a gate guard on a punch press is of this type. And another is the type that pulls or shoves the hand or arm away as the machine operates.

Finally we come to the type of guard where some degree of co-operation is required on the part of the operator if accident is to be avoided.

When purchasing machine tools or equipment, it is well to include in the specifications a clause to the effect that other things being equal, preference will be given to the best guarded designs; or better yet, include exact specifications for guarding and thus avoid misunderstandings. But if, upon arrival, the tools or equipment are found not to conform to the requirements of good guarding, there should be no hesitation in insisting upon the supplier making such changes as may be necessary or else doing the work one's self and charging the cost back to him.

While concerns do much of their own guarding because of the special features connected with it, commercial guards should wherever possible be purchased. Commercial guards are built to fill the needs arising from many sources, so that in purchasing them, one purchases experience beyond one's own limited sphere—again one of those intangible items, not to be measured, but often worth its weight in gold; and it is not only fair but common sense, therefore, to patronize the guard manufacturer who is rendering service of the highest value—the saving of life, limb and utilization, and avoiding besides accidents the giving of a bad name to a plant.

To maintain safety equipment and standards at their proper effectiveness, a special system of inspection must be installed to include them, aside from any general system of departmental inspection or patrol. After a considerable study by our own company, no better way has yet been devised for looking after certain of our equipment and standards than our so called safety calendar, a sheet which is divided into as many spaces as seem necessary to record our inspection periods; elevators daily, hand trucks and portable ladders quarterly, medical examinations semi-annually, etc. However, these inspections do not cover all requirements and at intervals we, therefore, inspect departments to see if goggles, helmets, gloves, armlets, etc., are being sterilized and repaired before being re-issued. We also ascertain if gauges and thermometers continue to be checked; if the air flow is right at spray booths and sand blasts; and if any unlooked for hazards have developed or if unsafe practices are being indulged in by the workers.

X-ray, blood and urine examinations might also be included among modern safety devices, for they serve as warning signals if used in examining operators at intervals in dusty occupations or where fumes occur. Without a careful looking ahead of this kind, safety devices and standards, like anything else, will deteriorate and retrograde

and be found unreliable or wanting in time of emergency and receive, perhaps, blame to which they are by no means entitled.

Protective Clothing

By LT.-COMMANDER W. P. BIGGS

Navy Department Safety Engineer, Washington, D. C.

The speaker said in part: Safe clothing covers a very wide range and is one of the most important factors in the industrial worker's equipment. A distinction should be made, however, between "safe" clothing and "protective" clothing. In general, it may be said that everything the worker wears at his employment should be safe, but in most trades, to meet the unusual hazards of the job, special clothing should be provided that has unusual protective features.

Some industrial organizations have prepared general safety orders or rules for their employees covering the subject of safe clothing. For example:

1. Supervisory forces must see that no types of clothing are worn that will create a hazard in any job.
2. Employees working around moving machinery are prohibited from wearing hanging neckties, long flowing coats, dusters, or aprons, long belts projecting from the buckles, rings, watch chains, loaves, or torn clothing. All clothing should fit snugly to avoid the danger of becoming entangled in moving machinery.
3. Employees handling material by hand and railroad men are prohibited from wearing rings. Rings often catch on projecting bars, stakes or car sides when trainmen are getting on or off the cars.
4. All employees are prohibited from wearing oily or grease-soaked clothing; such clothing should be washed entirely clean regularly to remove all grease and oil and avoid the danger of fire.
5. All employees are prohibited from wearing shoes with ragged or flapping soles that might become a slipping or stumbling hazard. Safety shoes are recommended.
6. Garments must be reasonably comfortable in any temperature in which they are worn.
7. Garments must fit at least fairly well and not interfere with the worker's movements.
8. They must afford adequate protection against the hazards for which they were designed.
9. They must be durable, and they should not be too expensive.

During a good many years both the employers of industrial workers and manufacturers of safety equipment have expended much time and effort in devising suitable and adequate protective clothing to meet the multiple hazards of the job. A very high degree of cooperation between these interests has been maintained. In some cases special studies have been carried on to determine the degree of protection necessary, the best means to this end, and to establish standards of particular value to which new safety equipment might conform. In some of these studies the Navy Department of the United States government has participated. One of the outstanding studies, to which manufacturers, the Bureau of Standards, the Public Health Service and the Navy all contributed, resulted in the standardization of protective goggles with lenses 50 mm in diameter.

Thus, scientific study and the accumulated experience of years have resulted in the

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production of adequate protective clothing of many types in every field of industry. The Safe Practices Pamphlet of the National Safety Council, No. 16, entitled "Protective Clothing," very adequately covers the requirements of the employee in industry.

If you desire protective clothing, it is only necessary to determine your needs and then purchase to meet them. I can assure you that you will not only find the manufacturer willing, but anxious, to assist in developing the type of material suitable for your requirements. Manufacturers are always glad to learn your experience and develop equipment accordingly.

Some General Considerations for the Selection of Respiratory Protection Devices

By W. P. YANT

Supervising Engineer, Pittsburgh Experiment Station, U. S. Bureau of Mines, Pittsburgh, Pa.

The satisfactory solution of respiratory protection problems requires considerations beyond the mere securing of a device which will protect the wearer from the contaminating agents. In fact the first consideration and decision to make is whether or not a hazard exists, and assuming a hazard is found, the second consideration is whether or not the situation should be taken care of by personal protection or a general removal of the hazards, or removal of the workman. The prevention of exposure may be accomplished by preventing contamination or removing the contaminant at the point of production, by removing the workman or changing his position, by general ventilation and dilution of the air contaminant to a non-harmful amount, and by providing personal or individual protection through the use of protective devices. Exposure of persons can be prevented by one or a combination of these procedures, their desirability of use usually decreasing in the order of mention; that is, prevention of contamination should be given first consideration and individual protection by means of such devices as gas masks and respirators the last consideration. There are, however, many exceptions to this general statement, as situations where protection is for accidental occurrence of gases and emergency use in situations where the hazard may be increased by the difficulty or uncertainty of maintaining a respirable atmosphere, and where the nature of the process make it difficult if not impossible to maintain a harmless atmosphere, or where it is a matter of the most economical means for providing adequate protection.

General Requirements for Selecting Equipment

The selection of safe and efficient devices for giving protection against irrespirable atmospheres requires:

- (a) A recognition of a dangerous situation and an understanding of the kind and source of all hazards, both existing and potential;
- (b) The selection of the most suitable type of devices for the situation at hand;

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- (c) The procurement of a device of good quality and which will give satisfactory performance.

It is not possible to discuss here the items and factors which enter into these broad requirements further than to convey a recognition and an understanding of their significance and to indicate a general basis for analyzing and dealing with respiratory protection problems. In addition to selection, there are also many other items of importance to safety and efficiency in the use of this kind of equipment, as care, maintenance, and proper usage. Most of these are fundamentally embodied in training, an understanding of the hazards presented by the atmosphere, the operating principle of the apparatus, its scope and limitations of use, safe procedures for entry and explorations of dangerous situations, and rescue and resuscitation methods. The latter are important to saving of lives by means of protective equipment and to taking care of the wearer of the equipment in event of accident.

Recognition and Understanding of Hazards

The recognition of a dangerous situation and a full understanding of the hazards involved is fundamental to a decision of whether or not personal protection is needed and if so, the quality and quantity of protection that is required. Failure to recognize a hazard, or if recognized, to consider it of not enough consequence to provide protection, is the cause of infinitely more injury to health than improper selection and use of equipment. There is usually little or no doubt attending the recognition of a situation that will cause acute poisoning, because it is almost certain that it must be recognized in advance of injury or it will be recognized promptly by a definite recognizable injury. However, with situations which cause chronic poisoning, or what is usually termed an industrial disease, after many daily and even years of exposure to small and often unrecognized amounts of gases, vapors, or dusts, there is a much greater possibility that the danger will escape attention. The reasons for this are embodied in a general lack of understanding of the hazards attending the occupation and the absence of manifestations of a dangerous atmosphere by physical appearance, sense affection, and/or signs of injury recognizable by the layman or even medical men, particularly in advance of serious harm. In many instances recognition is first made by a casual observation of an unusually high incidence of some common affection or disease occurring in a group of workmen, which as individual cases were not connected with industrial exposure.

Aside from the humanitarian viewpoint and the economic loss to employee and employer through sickness from occupational diseases, they are becoming and, in many instances, have become of utmost importance to industry through costs of compensation. In some instances they may readily threaten the existence of the industry unless the harmful exposure of workmen is eliminated and/or established as non-existent. The importance of this arises not only through the occurrence of actual injury and bona fide claims but through malingering and racketeering, the opportunity for which is much greater with occupational diseases than accidental injuries, owing to the many indefinite items and factors. Potential or actual contact of some kind and to some degree with substances which are harmful to health exists in most industries, and if enough effort is made it is usually possible to name some contact that could potentially influence the illness of a workman, either by direct cause or aggravation. This will serve as a basis for either a bona fide or a false compensation claim. Securing the necessary facts for proving or disproving the claim is often difficult if not

impossible, and the decision in many cases rests on the veracity, opinions, and guesses of expert witnesses, on the strategy and eloquence of the legal talent, and on the sympathy of the referees and jury.

This discussion of occupational disease which might appear to be irrelevant to the subject of this paper, is given for the purpose of pointing out one of the most important reasons for industry to be cognizant of its hazards and to prevent exposure of workmen. There are many instances where the savings in compensation costs will eventually, if not at present, greatly exceed the cost of protection. Also, establishing the fact, in advance of claims, that a harmful exposure does not exist or that adequate protection is provided and used will discourage false claims, improve the regard of both employee and employer for occupational disease compensation, and remove important difficulties in its administration.

Recognition and Evaluation of Hazards

An endeavor to adequately describe all dangerous situations would be endless and incomplete because new ones are being created daily. In general, recognition and evaluation of a hazardous situation requires (a) an understanding of all of the harmful substances, conditions and/or procedures that may be present or possibly created; (b) a consideration of the possibility and extent of exposure; and (c) the toxicity or harmful properties under the possible conditions of exposure. A good rule for unknown situations and one which will help to avoid a good many of those which are found through the occurrence of accidents or ill health, is to consider them harmful until proven safe. The experience of others can very often be a fallible basis for evaluating the safety of contact with a substance because a good experience depends not only on the substance and the general process, but also on the exact details of their use. In many instances these details are most important because there are few situations which can not be made safe if enough effort is made.

General Types of Equipment for Respiratory Protection

The many requests received by the Bureau of Mines for information regarding devices for respiratory protection indicates a good deal of confusion and lack of understanding of the available designs, the operating principles, uses, and limitations. The scope of this paper permits only a very brief mention of these subjects. For a more detailed discussion the reader is referred to previous reports and publications which deal more fully with the subject. Without attempt to give a complete bibliography, a few of these references are appended to this paper.

The apparatus in common use in this country for protection against harmful industrial atmospheres may be divided into five general though not always distinct types:

1. Self-contained oxygen-breathing apparatus.
2. Hose masks.
3. Compressed air respirators, helmets and hoods.
4. Canister gas masks, including direct-connected and replaceable cartridge type.
5. Dust, mist, and smoke respirators of the filter type.

In addition to these common types there are specialized types among which are: the "lung", which was devised primarily for use in escaping from submarines; aeronautical equipment for providing oxygen at high altitudes; emergency oxygen-helmets or hoods for brief exposures during fire-fighting and rescue work; and the diving

dress, in either the self-contained or hose line supplied types. These specialized types will not be included in the present discussion.

Self-Contained Oxygen-Breathing Apparatus

The usual design of self-contained oxygen breathing apparatus used in America embodies the following principles and essential parts: Pure oxygen from a comparatively small storage cylinder of the gas at high pressures (1,800 to 2,000 pounds) is released through a pressure-reducing valve to a flexible breathing or low-pressure storage bag and then through a breathing tube, a check valve and mouthpiece to the wearer. The exhaled air which contains the residual oxygen and the carbon dioxide from the lungs is returned through the mouthpiece, another check valve and breathing tube, through a purifying unit which removes the carbon dioxide, to the breathing bag. The wearer thus breathes oxygen in a closed circuit, the loss of oxygen from the circuit due to consumption by the body being replaced automatically from a high-pressure storage cylinder so that the volume of respirable atmosphere in the circuit remains relatively constant. The wearer's source of oxygen is entirely independent of his surrounding atmosphere; in fact, the apparatus provides an ample supply of oxygen and functions properly under water. It is not, however, recommended for use at depths in excess of an equivalent of 15 pounds (approximately 30 feet) owing to the possibility of "oxygen poisoning." The apparatus has many parts and requires considerable attention by a trained person in order to keep it in a safe condition. A thorough course of instruction combined with training in its use by competent instructors is also essential requirement for safe use. However, with good maintenance and adequate instruction and training, the apparatus will furnish protection to the lungs against all deficiencies of oxygen and all gases and concentrations that the skin can endure. It is widely used in emergencies and for conducting work in atmospheres where there is danger of oxygen deficiency. It is the only type of apparatus that provides this degree of protection and at the same time permits freedom of travel of the wearer to considerable distances from fresh air.

Hose Masks

The hose mask is essentially a full-mask facepiece connected to a line of hose, by means of which air from an uncontaminated place is conveyed to a person in a contaminated zone. With the exception of devices that employ a comparatively short length of hose, 25 feet or less, the supply of air is augmented by means of a rotary blowers at the intake end of the hose. A hose length of 150 feet is the maximum length approved by the Bureau of Mines.

As a hose mask supplies the wearer with fresh air, it will obviously protect the lungs against all deficiencies of oxygen and against any gases and concentrations thereof. It provides a degree of protection equal to the self-contained oxygen breathing apparatus but has the disadvantage of restricting the wearer's movements to a distance equal to the length of the hose line from fresh air. When such restriction is permitted, the hose mask is preferable to the oxygen-breathing apparatus. It is lighter in weight (except where the wearer makes a vertical climb), subject to less mechanical and performance difficulties in use, requires much less maintenance and inspection, less instruction for safe usage, and is lower in initial and maintenance and operating cost than the self-contained oxygen-breathing apparatus.

Compressed-Air Respirators, Helmets, and Hoods

Compressed-air respirators, helmets, and hoods are similar in general principle to hose masks in that they are designed to supply fresh air to the wearer, but differ in details of the design. The facepiece may be a half-mask, a full-mask facepiece such as is usually used with canister gas masks, or a helmet or hood that fits entirely over the head and neck. Air is supplied through a (usually small diameter) hose leading from a supply of compressed air. This supply may be from the same source used in the process conducted by the wearer, as in sand-blasting or spray coating, but an independent source is usually preferable. In either case, precaution must be taken to insure an adequate quantity of respirable air free from harmful contamination.

These compressed-air devices have a wide application for providing protection where, owing to localized contamination, protection is required continually or frequently enough to justify providing an air supply, and where the workmen's activities are confined to a limited radius. When equipped with a half-mask facepiece the device can supplant the use of dust respirators or even canister gas masks for protection against atmospheres non-irritating to the eyes. Where protection against eye irritation is needed a full-mask facepiece or goggles may be provided, or if there is need of protection for the remainder of the head and neck (as from sand in sand-blasting operations), a helmet or hood completely enclosing the head can be used. When properly designed, maintained, and used within the scope of designed purpose, equipment of this kind gives good protection and is well adapted to many dust and gas problems where the wearer's duties permit the leash-like hose line. These devices, however, are not designed for emergency uses in highly injurious gas or vapor atmospheres and would in many instances be unsafe for this usage.

The importance of a supply of clean pure air of normal composition can not be over-emphasized in the design and use of this type of equipment. Precaution is particularly necessary when the possible contaminants of the air supply are without odor or taste, as lead, arsenic, or silica dust; or gases, as carbon monoxide. Instances have been found repeatedly where the air supplied through the respirator was seriously contaminated and in some cases to a higher degree than the air surrounding the workman, owing to the intake to the supply being located near general ventilation exhausts or at places where there was general contamination. With dusts it appears that a slow accumulation of the contaminating agent occurs in the air receivers or lines and later owing to a variety of possible influences it is suddenly borne by the air and results in a marked degree of contamination. In other instances it has been found that the air was contaminated by exhaust gas from the leaky manifold of the gasoline engine used to drive the compressor. The writer has personally experienced contamination by the stack gases from a locomotive engine that happened to stop at a point on a siding close to the compressor intake. Another source of contamination which has caused considerable trouble is overheating of the compressor cylinders with cracking and burning of lubricating oil and the formation of carbon monoxide along with other objectionable if not harmful decomposition products and a depletion of the oxygen content of the air. Also if the air is stored in receivers or lines for extended periods before being supplied to the respirators, a depletion may occur through oxidation (rusting) of the metal. The writer has observed the oxygen of air contained in iron vessels to drop from the normal of 20.93 per cent to less than 7.0 per cent in three days, and there are records of fatal accidents to persons who have entered tanks and steam boilers after they had been standing empty but closed tightly for extended periods.

The general precautions and remedial measures are apparent from the source and type of trouble. It is pointed out that placing a filter consisting of an oil trap, a dust remover, soda lime and activated charcoal between the air source and the facepiece of the respirator will remove most of the contaminants but it will not remove carbon monoxide. In fact a filter of this type would tend to remove odors and consequently the sense-perceptive warning properties of a dangerous situation. This is mentioned not from the viewpoint of discouraging the use of purification units, but to indicate that these units do not completely remove the dangers from all possible air contamination. They must be used with full knowledge of their efficiency and limitations and with general precautions against compressor intake contaminations and improper compressor operation.

Canister Gas Masks

A canister gas mask, which is the device usually termed a "gas mask", consists of a canister filled with granular form chemicals, usually connected directly through a flexible breathing tube to a full-mask facepiece, though other modifications as direct connected canisters, a mouthpiece or half-mask facepiece may be satisfactory or even desirable for some purposes. The air is inhaled through the canister and exhaled through a one-way valve at the facepiece or mouthpiece to the surrounding atmosphere. The canister contains chemicals or materials which remove or otherwise render harmless the deleterious constituents. This type of mask is merely an air-purifying device. It does not contain or generate oxygen and accordingly its use is restricted to atmospheres in which the oxygen content is high enough to support life. As there is no known chemical or material suitable for gas mask use which will remove all kinds of deleterious gases and vapors, the gases or vapors against which a particular canister will give protection depends entirely on the content of the canister. Canisters may be designed for one specific gas or class of gases, or for a combination of gases or classes of gases, but usually will not give protection against any gas or classes of gases not included in the designed purpose. Also, the canisters may or may not contain filters for giving protection against smokes, mists and dusts.

The classes of gases, members thereof, and designated types and color marking of canisters for these gases have been standardized. All the important manufacturers of gas masks in the United States follow these standards. (Details of the standards are given in references 15, 17, 19 and 20.)

In general the life of a canister against a particular gas or class of gases is a function of the amount of the particular absorbent in the canister. This might suggest that by making the canister large enough it would be possible to provide protection against practically any concentration of gas or vapor. This, however, has limitations. For several reasons the Bureau of Mines has not approved canister-type masks for use in concentrations of gas in excess of two per cent with the exception of ammonia, for which approval is granted for three per cent. It is believed that higher concentrations are beyond the intended purpose, the comfort and the safety of this type of equipment. In situations where higher concentrations exist (usually confined spaces) there is very frequently danger from a deficiency of oxygen. Concentrations of even two per cent of gases, as chlorine, phosgene, sulphur dioxide, and three per cent ammonia are very discomforting and produce slight to moderate irritation and often severe blistering of the thin skin areas if the person perspires. The reactions in the canister with this range of concentrations of all gases, and particularly with carbon monoxide, cause marked heating, and the air passing through becomes hot and uncomfortable

to breathe. It may be mentioned in this connection that it is actually possible to melt the solder from the canister and, in the case of an activated charcoal filter, set the charcoal on fire by passing into the canister concentrations of gases not greatly in excess of two to three per cent and at high rates of flow. This speaks for the efficiency of the absorbents but at the same time indicates the necessity of limiting the designed field of use. It is realized that in practical emergency situations persons cannot wait until the concentrations of gas or vapor in the air has been determined in order to ascertain if it exceed the limitations of the protective device. However, persons with experience in dealing with the particular situations can roughly judge the degree of contamination and danger. Also if the wearer of the mask is experienced, alert, and proceeds into gas cautiously, he can detect inabilities of the device to give protections in time to escape. An important exception to this, is an atmosphere markedly deficient in oxygen and which gives very little and often no warning. Important reasons for designating gas-concentration limits for canister gas masks are to establish the degree of protection afforded by these devices and to furnish a guide for the selection of equipment for meeting respiratory protection problems.

With the exception of a special type, small emergency mask for escaping from suddenly occurring carbon-monoxide-containing atmospheres, particularly for aiding miners to escape following fires or an explosion, all of the canister gas masks which have been approved by the Bureau of Mines (see list of approved appliances, reference 20), consist of a facepiece connected by a flexible breathing tube to a canister which is carried either on the chest or back, by means of a suitable harness. The Bureau of Mines schedule of requirements for canister gas masks is intended to provide a mask that will give protection against atmospheres ranging from those which will be harmful after a single exposure of a few hours or less to atmospheres which are intolerable and can not be borne for even a single breath, and the quantity of the most efficient present-day absorbent necessary to meet these requirements is, with few exceptions, beyond that which can be incorporated in a canister of small enough size for a satisfactory direct-connected design.

However, this does not indicate that other designs and particularly the direct-connected canister type, or the replaceable cartridge type mask are without a place among devices for giving respiratory protection in industry, if they are well constructed and used within the limitations of the protection they will afford. These devices provide protection against atmospheres which workmen may breathe without protection but which will either produce a chronic type of affection or poisoning after repeated exposures of several hours daily. Their field of use lies in situations such as spray-coating and bench work with solvents, where adequate general ventilation is provided but where there is need for individual protection against localized contamination. The major advantage of this cartridge-type mask as compared with a mask having a full facepiece, breathing tube, and canister is better vision, convenience, and comfort. These convenience and comfort factors are very important to the adoption and use of protective devices for situations where, owing to the lack of discomforting nature of the atmosphere and absence of immediate physiological effect, the workmen will endure the atmosphere without protection even though there is danger of chronic poisoning after prolonged daily exposure. The cost item is sometimes given as a basis for using the cartridge-type mask. This, however, is not believed to be a sound, economic reason because for a given expenditure it should be possible to procure more protection in the form of one large canister than in several small ones. An important fact to remember is that these cartridge-type masks are not designed for

emergency use or protection against high concentrations of gases or vapors. They would be definitely unsafe for these usages.

Dust and Mist Respirators

Dust and mist respirators are designed to give protection against harmful air-borne particulate matter or suspensions. These contaminants may be solid particles, liquids condensed on solid particles, or liquid particles alone. Also these particles may be accompanied by other harmful gases or vapors or by the vapor of the toxic liquid condensate or particle.

As the absorbents used for removing gases and vapors are practically ineffective for removing particulate matter from air, it is necessary to employ mechanical or physical trapping and filtering. The usual form of a respirator for protection from dust, smokes, or mists alone in a half-mask facepiece directly connected to a filter in the form of a cloth or felt bag, a disc or cylinder can containing a paper cloth, or felt disc. The design, however, may range from this half-mask direct-connected filter design to one having a facepiece, breathing tube and filter worn on the chest, back, or head in the form of a cap. If combined protection against particulate matter (dust, smoke, and mists) and gases and vapors is required, the filter element must contain in addition to the filter, a suitable absorbent of the kind used in canister gas masks for the same gases and vapors. Such gases or vapors may be formed with the particulate matter or may result from volatilization to liquid particles trapped by the filter with subsequent contamination of the inspired air if a suitable vapor absorbent is not provided.

There is obviously no real distinction between a dust and mist respirator equipped with absorbents for gases and vapors, and a canister gas mask equipped with filters for dusts and mists, excepting in the degree of protection afforded against the three physical forms of matter.

Selection of Type of Apparatus

The ideal selection of a device embodies the optimum combination of adequate respiratory protection with maximum durability and simplicity in design, construction and operation, and a minimum of encumbrance, discomfort to the wearer, knowledge and experience for safe usage, maintenance, and cost. Although none of the several available types described can be considered as fulfilling all of these requirements for all situations, there are few if any situations for which one of the types in some available form will not provide adequate protection and fulfill the remaining requirements to an acceptable degree.

A good selection requires (1) a complete understanding of the nature of the hazards that attend the situation for which protection is required, and (2) a complete understanding of the principles of protection, the general design, scope of use, limitations, advantages and disadvantages of either the available types of apparatus or possible modifications. It may be pointed out that devices for giving respiratory protection are continuously becoming more specialized and there is an increasing demand for respiratory protection service to meet particular conditions.

Adequate respiratory protection against the most hazardous condition for which the device may be used is the first requisite of a satisfactory type and one that must be entirely satisfied regardless of all other considerations and factors. Whether or not "adequate protection" should be considered synonymous with "maximum protection"

in making the best selection, depends on the particular situation and the importance of the other factors, many of which also have an influence on safety.

Encumbrance and discomfort to the wearer incur fatigue, cause distraction and, in general, handicap the wearer's ability to take care of himself, thus increasing the possibility of accident, not only from the hazardous atmosphere but from other sources. They impede the performance of work and thereby tend to prolong the hazardous operation and possibly delay the saving of life and property. It is emphasized that the importance of comfort, particularly in the use of respirators, cannot be over estimated.

Simplicity in design, construction and operation in general minimize the chances for mechanical failure and reduce the maintenance required for keeping the equipment in a safe usable condition. These factors are also conducive to ease in acquiring the complete understanding of the working principles, assembly of parts, scope of safe usage and limitations, which are essential to good maintenance and safe usage. This understanding is the most neglected item in the present day use of equipment for respiratory protection, and is responsible for most of the accidents that have occurred.

Selection of Quality and Quantity of Protection

A good type selection does not insure satisfactory protection unless the specimen or brand finally obtained will fulfill at least the minimum essential and expected requirements of the type. As might be expected, all types are available in a variety of capacities and in qualities ranging from good to poor and even dangerous.

It was with a view to establishing a list of commercial devices which would meet the minimum requirements for safety, durability, and efficiency, or, in other words, the requirements for good quality and quantity of protection, that the Bureau of Mines inaugurated its system of approving devices. (See references 16 to 20 inclusive for publications which describe this Bureau's approval system.)

Briefly, the approval system provides a means whereby a manufacturer can submit his equipment to the Bureau of Mines for tests of its conformance to the Bureau's requirements. If a device possesses these requirements the manufacturer receives a certificate of approval of the Bureau of Mines which he can display as evidence that his device has met the requirements. Also the approved devices are marked in a manner which clearly distinguishes them as approved devices and indicates the limitations and the purpose for which they are approved. Consumers can use this as a guide in selecting devices of known tested quality. The Bureau of Mines also periodically issues for public use a list of the devices (see reference 20) which have met the Bureau's requirements together with the manufacturer's name. The types of devices which are approved by the Bureau at present are self-contained oxygen breathing apparatus, hose masks, and the regular design of canister gas masks. Work which is designed to lead to a schedule of requirements for dust respirators is in progress at the present time and is near completion.

It is opportune to mention that an American Standards Association committee under the chairmanship of Dr. M. G. Lloyd of the Bureau of Standards is at work on the preparation of a national safety code in which specifications for all types of masks and respirators will be given. Such a code is urgently needed. It will not only have a salutary effect in raising the general quality of devices, but will provide consumers with a guide to obtaining good equipment of all types in much the same manner as the Bureau of Mines system has accomplished these benefits for a part of the types through its approval system. It is hoped that when such a national code becomes

available, the consumers of equipment will demand devices which meet the established material and performance specifications. It is only through such demand that the full benefits of the code will be derived.

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Quality Requirements in Eye Protectors

By W. P. ELSTUN
Operating and Engineering Department, American Telephone and Telegraph Co., New York City

The speaker said in part: When eye protectors or goggles are referred to, I immediately think of the Bureau of Standards and the Safety Code on Head and Eye Protection. The very purpose in establishing this code, and in its subsequent revisions, was to help in insuring quality requirements in eye protectors. In this code

the work processes or operations are divided into nine groups, ranging all the way from processes involving protection against relatively large flying objects traveling at a rapid velocity to protection against wind and very fine dust particles. They also include processes requiring protection against excessive brightness, against other injurious radiant energy, and against acids and spattering molten metal.

I cannot take the time to describe and explain all these nine groups, but they may be found in the code with which many of you are doubtless already familiar. I simply mention them to illustrate the point that before deciding upon a particular type of goggle or protector for the eyes or respiratory organs, the type of work and the protection required must be thoroughly known.

As I see it, the safety requirements for goggles for use in protecting the eyes against flying objects might be summarized along these lines:

1. The goggles must be reasonably comfortable. Under this broad general requirement I include fit, optical comfort, lightness of weight and good ventilation. These are all features tending to increase the comfort of the wearer. This requirement as to comfort is placed as the first safety requirement because without it the goggles will not be worn when needed.

2. The lenses and supporting cups must be sufficiently strong and so designed that injuries to the eye will not result when flying objects strike the lens. We cannot always insure against cracking or breakage of the lens under all conditions of impact, but we must be reasonably sure that even though breakage occurs particles of the lens or flying objects will not enter the eye and impair the sight. To accomplish this, high grade commercial goggles are built so that when the lens is broken, shattering will rarely occur, and if it should happen the particles which leave the supporting cup will tend to be thrown outward rather than inward toward the eye.

3. The goggles must have a reasonable service life, not only as an economical measure but to insure against rapid deterioration of parts which might not promptly be detected in the field and yet which would impair the serviceability of the goggles.

4. In general, the goggle should be so designed that it can be readily inspected in order to detect a defect produced by use or misuse. Important hidden parts that cannot be washed are certainly undesirable in any tool or device upon which the workmen's safety directly depends.

5. If the same pair of goggles is to be worn by more than one employee, the goggles should be capable of withstanding sterilization.

In selecting for any industrial organization a particular make or series of makes of goggles, there are but three methods available for judging the relative merits of the makes under consideration. These are: (1) technical investigation and study; (2) laboratory tests; and (3) field trials.

The technical investigation discloses design features relating to all five of the fundamentals, namely, comfort, strength, service life, ease of inspection, and possibilities of sterilization. For example, the quality of the lens, the amount of ventilation provided, the adjustability of the distance between eye cups, the shape of the eye cup are all features controlling comfort which may be judged from a careful inspection. Likewise, the materials and quality of workmanship employed in manufacture have a bearing on strength, service life, ease of inspection and possibilities of sterilization, and these likewise may be judged from a careful inspection.

The laboratory tests will give definite data on strength and ability to withstand sterilization so that facts rather than judgment may be utilized in determining the

relative merits of the different makes tested in so far as these two requirements are concerned.

The field trials confirm judgment with regard to comfort, service life and ease of inspection. This confirmation is often quite valuable because, irrespective of how carefully the technical investigation is made, some phase of the field operations may be over or under-emphasized or neglected entirely and the original opinion formed on the basis of the first technical investigation may have to be modified in the light of developments produced through the field trial.

I am inclined to feel, therefore, that no one of these methods, namely, technical investigations, laboratory tests, or field trials should be used alone in deciding how satisfactorily a particular make of goggles meets the five safety requirements and the needs of the organization. In my opinion a combination of all three methods should be used.

The Relation of Safety Equipment to Experience Rating

By H. F. RICHARDSON

Secretary-Treasurer, National Council on Compensation Insurance,
New York City

The speaker said in part: Safety equipment is actually related to experience rating only in so far as it helps to reduce accident frequency and severity and thereby to reduce the cost of workmen's compensation insurance to the individual risk.

Experience rating is really a comparison of the past actual loss experience of the individual risk over a given period of time with the corresponding expected loss experience for such a risk, and on the basis of such comparison the manual rate is increased or decreased according to whether the risk's individual past experience is better or worse than the average. The "expected loss" experience is what is anticipated will be the cost of such awards for compensation and medical service as predicated upon the past performance of all other similar risks in the industry.

For example, past experience may indicate statistically that a machine shop of a certain type and size is expected to cause accidents amounting in loss cost to \$10,000 a year. The experience of this particular machine shop, however, may have caused an annual average of loss cost of only \$5,000. If, for the moment, we overlook the feature of size of the risk, a detail which has a considerable influence upon the rating, we can say that this risk is just twice as good a risk as the average of the industry and might expect a rate of just half as much as the average of a group of similar risks. If it produced \$15,000 of loss cost it might expect a rate just half as much higher than the average rate for the industry.

This supposition naturally contemplates that the future attitude of the risk toward accident prevention and the installation and use of safety equipment will be the same as in the past. If laxity develops in this connection, undoubtedly the future of loss experience will grow steadily worse, while if constant improvement is the goal the loss experience will improve and the cost of compensation will be less.

The size of the risk has an important bearing upon the experience rating of the risk. In insurance parlance we say that the "credibility" of the risk is a major factor in its experience rating. It is obvious that with all other things being equal the past record of a large risk is a more reliable guide to its future performance than is the experience of the small risk, because the law of averages has more

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opportunity to work in a larger risk. Then, too, the experience of a risk in a hazardous trade is a more reliable guide to the risk's future performance than the experience of a risk of similar size in a non-hazardous trade for the same reason; the hazardous trade producing more accidents and, therefore, is a better chance of getting an indicative average. In experience rating, it is primarily the cost of the accidents rather than their number so that severity within limits also has a major effect upon our consideration of the risk's experience. All other conditions being equal, for example, we would actually not rely as much on the experience of the risk if it all resulted from one serious case as we would if it reflected a lot of less serious cases more frequently occurring. The first instance probably would never occur again for years, because of the workings of chance; while the second would probably approximately repeat year after year. As a result of this condition in experience rating, accidents are treated under two distinct groups; the low-frequency high-cost cases such as the deaths and permanent total disability cases, and the high-frequency low-cost cases which cover all other compensation cases and also medical costs.

One other feature of experience rating is of very decided importance. This is the application of the principle of "weighting" the experience of the risk in determining a future premium rate. The principle of the "weighted experience" provides that the same degree of importance shall not be attached uniformly to the experience developed in all years of the risk's operation but that each year shall be arbitrarily graded so as to give the most weight or credence to the latest experience. As a matter of fact, the weights assigned to the five years of experience are represented by the factors .40, .60, .80, 1.00, and 1.00, beginning with the earliest year's experience. In other words, the experience of the two latest years is accepted at its face value, while but 60 per cent, 60 per cent, and 40 per cent of the experience of the third latest year, fourth latest year and earliest year respectively are retained for rating purposes. The reason for this feature of experience rating is again to restrict the influence of conditions which are not considered reflective of the risk's loss cost prospects for the immediate future.

Suppose we have a risk where five years ago it was under the management of persons not interested in any way in accident prevention or in the use of safety equipment. During that year probably there would have occurred numerous accidents as a result of such attitude on the part of the assured. Suppose that during the last two years, however, new blood had been brought into the firm which had been thoroughly sold on accident prevention and extensive safety programs had been inaugurated and all evidence indicated a continuation of this practice. It does not seem logical that the shortcomings of the risk in the earlier years of the risk's history should unduly influence the future rate of the risk. While unquestionably the risk's earlier experience should be reflected in the rating, its effect on the future rate for the risk should be modified in the light of the more modern conditions. The weighted experience principle which we follow does just exactly this. In other words, it makes the assured pay in full for the most recent conditions in his plant and it does not drag out unduly the penalty for some particular condition which may or may not be reflected in the present conditions of the risk.

ADJOURNMENT.



Safety Organization and Program

WEDNESDAY AFTERNOON SESSION

October 4, 1933

The special session devoted to problems in connection with Safety Organization and Program was called to order by J. E. Culliney, Bethlehem Steel Co., Bethlehem, Pa. He welcomed the delegates in the name of the Executive Committee of the National Safety Council, and then introduced George Opp, safety engineer, The Detroit Edison Company, Detroit, who presided during the session. Chairman Opp outlined the discussion in view and introduced the first speaker.

Mechanical Safeguarding and Engineering Revision

By L. W. LOHREY

Manager of Personnel, Deleo Products Corporation, Dayton, Ohio

The speaker said in part: Many speakers have presented statistics so often to prove that most accidents are due to causes other than the lack of mechanical guarding, that many have reached the conclusion that the job is done, in so far as this very important phase of safety is concerned. In fact, they have sold this point so well that many of the safety engineers of the country have lost their jobs within the past few years. Management everywhere evidently believed them and since it was necessary to reduce overhead expense, their services were dispensed with, as their departure would not be missed. I can't say that I sympathize with these chaps; in most instances it was good riddance. They were the fellows who told management every time a worker got hurt that the machine was properly guarded and that the accident was due to the carelessness or the cussedness of the worker. They did not, however, tell management that with additional engineering the machine could be guarded, and with little additional expense, so that regardless of the carelessness of the worker, it would be impossible for him to be hurt.

No—mechanical safeguarding and engineering is not completed—it is practically in its infancy. The sooner we recognize this fact the greater will be the improvement in this field of safety.

Let us consider for a moment the report of the Division of Safety and Hygiene of the Industrial Commission of Ohio, and then determine whether or not mechanical safeguarding has reached the point of perfection that many would have us believe. In 1932, 131,519 total claims were filed with the Commission. Of this number—

45,123 were due to cuts and lacerations; 25,723 crushes and bruises; 19,710 sprains

and strains; 11,528 puncture wounds, 8,663 fractures; 8,295 burns and scalds; 713 dislocations; and 220 concussions.

The number of direct amputations of some member or members of the body, by machinery or other hazards, was 422. Of this number seven were arms; five were hands; four were legs; one was a foot; five were toes; and four hundred fingers or parts of fingers.

You will note that the parts most susceptible to injury were fingers. Of all the claims filed with the Commission most of them were due to injury to the fingers—a total of 33,676. I do not want to tire you with figures, but as long as the state of Ohio continues to send out such reports no one can convince me that mechanical safeguarding is doing all that it should do to reduce hazards.

I would not have you believe that I do not recognize the importance and value of proper supervision and training of the worker to control hazards. This form of accident prevention has a very definite place in the control of safety—but it does not, and should not take the place of a mechanical device when needed.

A study of accidents in many of our larger plants will generally show that very few of them are due to unguarded machines. This, in my opinion, is not true of the many smaller plants which for various reasons do not purchase modern machinery and equipment as do the larger plants.

I will cite a few instances of accidents due to the lack of proper mechanical guarding or engineering.

Case No. 1. An operator working on a dial feed punch press lost the tip of his thumb when the press did not eject the material properly. Instead of taking a stick or stopping the machine he used his thumb to force out the part, with the result that he lost the tip of it. After this accident occurred a guard was placed over this particular part which made it impossible for anyone to put his thumb in this particular position.

Case No. 2. The operator of an automatic punch press received a severe injury to his finger when he placed his hand on the guard used to prevent the tie rod from falling in case it should break.

Case No. 3. An employee lost a thumb on a hydraulic press which operated at a very slow rate of speed.

Case No. 4. An operator of a punch press lost a tip of his finger when he was equipped with a positive guard.

These cases show the need for better engineering. In the age of speed we cannot trust to anything but the best in safety. There are too many factors which cause the human being to fail.

Again—why should we assume that we have reached the goal from the standpoint of engineering? Why do we maintain our large engineering forces for the improvement and development of our products? If it is desirable and profitable from that standpoint—why is it not equally as important to continue our engineering development in safety?

Who would want an automobile that was designed twenty years ago in preference to the splendid model of today? Likewise, the models of safety of today must progress if we are to reduce accidents to a minimum.

Mechanical safeguarding and engineering play an important part in the control of occupational diseases. A noted labor leader, a few years ago, made the statement that no man should do the work that a machine can do. Likewise, may I say, that no man or woman should be permitted to perform an operation which involves an

occupational disease that a machine can perform. I have in mind a particular operation which required the use of wood alcohol. Under the old method this operation would have been performed in a very crude manner. Under the present conditions a modern machine costing five thousand dollars was installed to take care of this particular operation. The only reason that this machine was installed was the consideration of the operator's health.

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By W. J. PEACOCK

Head, Department of Personnel, Northern Paper Mills, Green Bay, Wis.

The speaker said in part: Most of us in the safety game go through the stage of guarding our plants, and then of having foremen and occasionally executives expect accidents to cease, as though machine guards might exert an influence on stumblers, trippers and those who neglect their goggles. It was only after we had analyzed our accident statistics and dug out the causes that we discovered a major category of human causes which no amount of machine guarding could prevent.

Today we know that education is the most concern of any industrial safety expert, indeed plant education is so vital that we must find ways of putting a thrill into it.

First of all, a thrill for ourselves.

It is worth while to visualize the environment in which our modern safety program is being produced. An engineering section, accustomed to weighing facts for their accuracy, acts as sponsor for our codes and safe practices pamphlets. Psychologists inspire us to accurate thinking regarding the mental attitudes of workmen. Medical science gives us warning and procedure regarding industrial diseases, infections, and every-day health requirements. Psychiatrists are helping us to locate and to retrain the "accident-prone" employee. Sociologists are writing textbooks on the organization of our plants for safety as well as production. And checking up on our entire set-up, we have expert statistics emanating from the American Engineering Society.

I narrate these facts to bolster any who may be losing courage in these trying days. It will not be long before safety education will be accepted as on a par with other industrial interests founded upon scientific research.

It is not to pilory the men in question, but to express my surprise that their kind still exists, that I mention two headline speakers on one 1933 regional safety program. The first speaker created a laugh where a laugh was out of place by stating that the only printed matter he could find in preparation for the topic of "Public and Home Safety" was a book on funerals. The matter was serious, because he is a regent of State Normal schools and lives at his state capitol, where access to at least three libraries of unusual size is available. The other speaker, a plant superintendent and a college graduate, stated that he was formerly a plant safety man and that he had been trying to unlearn the nonsense of his earlier years in which plant safety depended upon "the carnival method", "sob-stuff appeals", and the contest inducement. There were in the audience many friends of the speakers who could have loaned them scientific material on their subjects which would have made either humor or tirades appear what they were in fact, a waste of time that ought to have been used constructively.

Every delegate to this Safety Congress owes it to himself to visit the headquarters

library of the National Safety Council in order that he may have his vision expanded to the proportion of the literature available, and certainly any firm would applaud the judgment of those who will buy some outstanding safety book and add it to their expense account.

The first thing to mention, therefore, in connection with safety education is the privilege the safety man has of entering into a heritage of scientific literature, textbooks, if you please, upon which to revise and quicken your program of plant instruction. One ought to go farther and urge that every safety man consider himself a collaborator in this work of putting safety education upon a scientific foundation.

It used to be emphasized that industrial safety as a program must be carried to the individual workman. Contests are valuable in that they arouse an entire plant and make groups "safety-conscious", but when we are told that one-third of our employees experience over two-thirds of our accidents, in fact, that certain men are hurt again and again, we begin to realize that education, which is directed to the individual mind, is most wise and essential.

Wide publicity has been given to the story of the Cleveland Railway Company experience, in which a division with the highest accident record was taken and transformed in a single year to the safest division on the system by a "clinic" method, dealing with employees as individual cases. Among 167 motormen 50 were found involved in half of the total accidents of the division. One man was on the books 32 times in a year. There were seven cases of "faulty attitude"; six cases of failure to see potential hazards; six of faulty judgment of speed and distances; five cases of impulsiveness; four of irresponsibility; four cases of lack of attention; and so on.

Very essential in our safety thinking these days is the discovery that not only safety experts but industry, the schools, churches, in fact the Government itself are being weighed for their constructive contributions to human welfare in these NRA days. Today in American thinking there is emerging a philosophy of action as big as life itself.

Plant safety goes far beyond the "don't-get-hurt" stage. It is concerned with job-making and job-saving. It aims to inspire the sort of manhood efficiency which willingly adopts the ideas of speed, cooperation with others, better health, prevention of waste. In short, the safety man has a sweet job of turning out bigger men, partners in activities which are vital to the welfare of society.

Supervision

By GEORGE H. MILLER

Assistant Manager, Safety & Fire Protection, E. I. du Pont de Nemours & Co.,
Wilmington, Del.

The speaker said in part: Supervision means the act of overseeing or superintending. Consequently, it would seem that the subject should include the acts of all those whose positions in the industrial establishments give them such responsibilities for safety. The modern industrial accident prevention program makes safety an operating responsibility and holds each member of the operating organization, from the manager down to the foreman, accountable for his share of safety supervision according to his relative responsibility in the "line" operating organization.

We generally concede that it is at the point of direct supervision that such of our accident prevention work fails. But we must not forget that higher supervision fails

first in that it does not provide effective direct supervision. In any case, we believe our present problem is largely stated by the question, "how can direct supervision be improved?"

It is evident to everyone who has made a close study of accident records that more and more of those accidents formerly charged to the carelessness or negligence of the workers are now being classified as lack of supervision; and the old alibi, "risk of employment", is fast falling into disuse. Supervision is now being held responsible for those untoward happenings which occur within its jurisdiction. But how many of us realize fully or act fully upon the realization that at the time we give direct supervision to certain responsibilities, we must at the same time train that supervision in their fulfillment. We have no more right to expect a foreman to prevent accidents among his men merely because we have told him that he is responsible for them, than the foreman has to expect the job to be done safely merely because he has told his men that it should be done that way.

There has been a tendency in the past to allow foremen to grow up in the organization more or less on their own; and the selection of foremen has many times been largely based upon length of service. Consequently, in many cases the foremen have not been selected with due consideration to the fundamental requirements of foremanship. One of our suggestions for improving direct supervision is to select foremen with greater care and to train them in foremanship. It was not a difficult task for the higher officers, the area supervisors, or the department heads, recognizing their responsibility for the caliber of foremen in their departments, to set about some definite need for improving the quality of foremanship. Many of the schools throughout the country are now providing excellent courses for training foremen; and we believe that plant executives have not always taken full advantage of these facilities.

Sometimes the safety committee meetings grow monotonous because they are devoted to the consideration of a few minor mechanical hazards. These meetings may be used very appropriately for the development of foremanship in accident prevention. The National Safety Council publishes a set of twelve pamphlets known as "Safety in Foremanship." These pamphlets can be used as a guide for a study of this subject in the safety meetings. Undoubtedly, the results will not only be an improvement in safety foremanship but also an improvement for foremanship for other operating responsibilities.

It is impossible for anyone to accept the full measure of his responsibility for a certain task unless that responsibility is definitely given to him. For this reason, we believe that plant safety organizations should parallel the plant operating organizations and be complete down to the last man. We have observed that many times the position of the foreman in safety work has been usurped by arranging the safety organization in such a way that the foremen are not given their logical places. Some safety organizations, even though they are arranged logically and according to the operating organization at the time, are not carried through to the workers. Our experience in the chemical industry has indicated that it is perfectly feasible to require each foreman to have a safety committee so that he can pass the safety which he received in the meetings he attends down to his men and so that he will recognize beyond any doubt that the safety of those who work under his supervision is squarely up to him.

Our next suggestion is that the higher officers require that each foreman under them make a periodical safety inspection of his area and report to his respective

superior on specially prepared forms, not only his suggestions for safety improvements, but also those faults which the foreman has found and corrected.

This is another way of indicating to the foreman the scope of his responsibility and another way of giving it to him very definitely. It is our belief that any attempt on the part of outsiders to usurp the inspection duties of the foreman lessens the foreman's respect for his responsibilities. We do not mean that other inspections should not be made by higher officers and perhaps by the plant safety engineer, but we do plead the case of the foreman and ask that he be allowed to accept fully the responsibility which he has been given.

The safety programs employed by most industrial plants provide for departmental inspections, but these are usually made by departmental inspection committees; and we wonder sometimes if the department heads or area supervisors do not leave the problems of safety inspections entirely up to this inspection committee without taking very active parts themselves.

Our next suggestion is that each departmental superintendent, or whatever he may be called in that particular organization, make a periodical safety inspection of his department with the safety inspection as his primary object. Furthermore, we suggest that he equip himself with a flashlight. This is not said facetiously. We have amazed many departmental superintendents by showing them what dark corners and out-of-the-way places contain. If the higher officers are to know how well the foremen are following through with their inspections, it is necessary for the higher officers to occasionally make inspections themselves, not through inspection committees, but personally.

From our experience in analyzing injuries, we have come to the opinion that foremen do not always know the hazards of the work of those they supervise as well as they should. Each foreman should not only know the hazards connected with the work of his men but he should know the precautions which should be taken to prevent accidents. He should know all the safety rules which govern the tasks of his employees; and he should be in a position to properly impress these on his workmen. He should know what safety devices such as gas masks, goggles, respirators, and special clothing his workmen need for their protection; and he should determine as often as is necessary that the workmen have these, that they are in good condition, and that they are being used. We have found it entirely practicable to have the foremen report occasionally to their superiors on these subjects.

Recently we used, with very good results, a special form containing a few simple questions. Each foreman was required to make out one of these forms for each of his employees and give it to his superior. One question required that the foreman list the hazards to which the particular employee might be subjected in his work and the precautions the employee should take. Another question required that the foreman list the protective devices which the employee should have and required that he say whether they were in good condition and if they were being used. There was also one question on this form which was designed to give the superior the foreman's opinion as to whether or not the particular employee was a safe worker.

The superior of the foreman reviewed these reports and from them determined what additional instructions in these subjects the foreman should be given. He was able to determine those employees whose attitude toward safety should be improved. Furthermore, one may easily realize what happened to the foreman himself. He frequently found that he did not know all that he should know about his workers

and their requirements for safety and promptly accomplished considerable self corrections.

We believe that discipline has a place in our plant safety programs just as it has in our plant operating programs; in fact, the same place. If a foreman fails to discharge his responsibility for safety, he should be suitably reprimanded. Furthermore, many accidents would be prevented if the individual workers were properly reprimanded for practices which they know to be unsafe. The scheme of foremanship breaks down unless some means is provided for upholding the sincerity of rules and regulations.

An investigation of a recent major injury revealed that an employee had committed a certain unsafe practice at least 300 times within a year and that on several of these occasions the practice had been committed in the presence of one of his superiors. A former safe method of doing the particular job had been entirely abandoned, apparently without much consideration having been given to whether the substituted practice was as nearly safe as the previous one. In another case, an employee removed his screen guard from a feed hopper so that he could poke some large pieces of material into a mill by hand. The result was that he lost a portion of his hand.

The idea that an employee would be allowed to continue an unsafe practice under the very eyes of his foreman, or that a workman would remove a guard from a hopper and pay a portion of his hand as the price of his disobedience, would seem preposterous if we did not know that these practices do occur and perhaps more times than we realize. Supervision should be ever alert to the practices of the employees, and above all should be sincere and serious in its application; for after all proper supervision is not that which falters to countenance unsafe practices.

There should be no employee at the plant who does not appreciate the sincerity of the management's interest in accident prevention. Sometime ago we heard the president of a company tell a meeting of supervisors and foremen in no uncertain terms just what the management expected of him in so far as safety was concerned. Those supervisors and foremen went away from that meeting with a far greater appreciation of the importance of safety in their daily operations. Consequently, we suggest that the plant manager or his assistant take the opportunity to call all the supervisors and foremen together occasionally and tell them what is expected of them and that the job of safety is theirs.

All that has been said heretofore has concerned methods of improving direct supervision. Before we could get very far with any of these plans or programs, we must fix in our minds a certain starting point. In our efforts toward safety, as in our efforts toward good housekeeping, low costs, and everything else that involves some relationship with men, we will waste a lot of effort and fall far short of the desired results unless we start with the principle that we must first get the sincere cooperation of those who are to do the work.

We can talk about instruction of supervisors, instruction of foremen, and even instruction of workmen, but unless those instructions are carried out, we will accomplish nothing. It is impossible to have a supervisor watching every foreman and a foreman watching every man, every minute of every hour of every working day. Hence, unless we have first established whole-hearted cooperation and the will to accomplish our purpose throughout the organization, we will never accomplish the best that is possible in accident prevention work. Our last suggestion, therefore, which by order of importance should perhaps have been first, is that we start out

on the basis of securing the cooperation of all in carrying out a program which they have been made to realize is intended to minimize and if possible eliminate the waste of human life caused by accidents.

ADJOURNMENT

*TWENTY-SECOND ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL*



Safe Use of Chemicals in Industry

*orig paper
N 217-2 chemical*

TUESDAY AFTERNOON SESSION

October 3, 1933

The special session devoted to the safe use of chemicals in industry opened with Chairman H. S. Smith, Union Carbide and Carbon Corporation, New York City, presiding. Chairman Smith made a brief statement of the reasons for this consideration of chemical hazards and then introduced the first speaker.

Safety in Chemical Laboratories

By DR. HOWARD ADLER

Chief Chemist, Victor Chemical Works, Chicago Heights, Ill.

The speaker said in part: Most laboratories are designed and equipped today to make them safe places in which to work. Fume hoods to remove injurious vapors, various types of fire extinguishers to prevent the spread of flames, are common equipment in a day when we think as highly of laboratories as we do of factory machinery. The equipment for safety in laboratories is every bit as important as the guard on the machine out in the plant. These safeguards help appreciably in reducing the probability of accidents. It is obvious, however, that just as guarded machinery alone is not sufficient to insure a good safety record, so a thoughtfully equipped laboratory is not all that is required to prevent laboratory accidents.

The unique position of chemical laboratories results from the large number of potentially hazardous materials being handled constantly, but even here there is considerable variation depending upon the type of work being done in a particular industry.

Let us consider, then, a research laboratory using acids such as phosphoric, oxalic, formic, sulfuric, and to a lesser extent nitric and hydrochloric; alkalis such as caustic soda and potash and ammonia; yellow phosphorous, flammable liquids such as methanol, ether, benzene, etc.; toxic gases, such as carbon monoxide and chlorine; and many chemical reagents.

Practically all laboratory accidents fall into three classes:

1. Those which are due to improper manipulation of simple chemical equipment.
2. Those due to improper mechanical handling of chemicals.
3. Those which are caused by unexpected chemical reactions.

The mishandling of glass equipment probably causes most of the accidents of the first class. Of these accidents, perhaps the most prominent are those which result from improper attempt to put pieces of glass tubing through rubber stoppers. This

accident used to occur at frequent intervals in school laboratories, and appears most often among the accidents experienced by assistants in our laboratory. Usually the glass tubing is forced through the stopper, pressure being applied at a distance quite removed from the stopper itself. The glass tubing breaks and often inflicts severe cuts on the experimenter. Proper instruction would eliminate this accident.

The best way to reduce the number of accidents of this class is to make sure that the people in the laboratory are properly instructed in the manipulation of chemical equipment and in the use of safeguards such as goggles, shields, etc. In the case of the assistants about the laboratory, it requires proper instruction in the tasks they are asked to perform by the chemist for whom they are working. It is possible, if this instruction is properly carried out, to reduce the number of accidents caused by carrying out simple chemical operations in the wrong way.

During a study of our accident experience we noticed that a large proportion of the accidents occurring in our laboratories during the past six years happened to assistants. This pointed to the fact that they were being asked to do things for which they had not been suitably trained. We have decided to change our procedure in this respect and to have each chemist to whom an assistant is assigned certify that he has been instructed properly in certain fundamentals. These would include the methods of using chemical equipment, the use of fire extinguishers, precautions in handling of acids and dangerous chemicals, and the use of goggles, rubber gloves, etc.

The second class of accidents, those due to mishandling of chemicals, would include those accidents due to the spilling of acids causing burns of various kinds, the spilling of flammable liquids, particularly in the neighborhood of flames, and other similar types of accidents. To reduce accidents of this type materially in any laboratory, it is necessary for the members of that laboratory to recognize the necessity for care in handling dangerous chemicals and acids. Of the various acids we use, formic acid is particularly corrosive to the skin, producing blisters during the burning process. Chemists know or do learn of this property and treat the chemical with the proper respect, which leads to safe use. The same is true of the other corrosive reagents. The handling of the most dangerous chemical, even yellow phosphorous, can be made relatively safe.

It is necessary to know what can and what cannot be done with safety. All chemists by the time they reach the industrial laboratory know something of the properties of phosphorous, of the ease with which it catches fire, and of the severity of phosphorous burns. In general, this causes them to handle this particular substance quite gingerly.

There is always one danger in handling a chemical of this type. To what extent does continual handling cause the respect for the chemical to disappear? It is difficult for us sometimes to realize that we cannot afford to let down. We must not let familiarity breed lack of respect. I am sure all of us will find times when we have taken unnecessary chances in handling dangerous chemicals. It is usually in cases where we have been dealing with these dangerous substances for some time and have come to feel that we have completely mastered them.

The nature of the work of research laboratories presents an additional source of accidents to which I have already referred, namely, the unexpected reaction. Practically all chemists engaged in research recognize the potential violence of some chemical reactions. They do not always expect the reaction which occurs, however, and are unprepared. A violent reaction, when one is prepared for it, does not

usually result in an accident. It expected, the quantities used are small and mechanical safeguards are used to protect the worker. Some experiences of our laboratory might serve to illustrate the occurrence of these unexpected reactions.

A man in our laboratory had carried out a reaction between some corrosive organic chemicals including phenol about twenty times, varying conditions of temperature, concentration, and so forth, to determine the best yield of the product. The next time he happened to use one of the reactants in a more finely divided condition. The reaction became unexpectedly violent, the flask boiled over, some of the corrosive liquid being spattered in the chemist's eye. Prompt attention prevented any serious consequences. But why didn't he wear his goggles? He had worn them during most of the twenty-one experiments. The reaction appeared perfectly under control, so he discarded the goggles.

This type of things presents a real problem in some research laboratories, especially where the chemists are mature and somewhat set in their ways. It is not as easy to put across to them the absolute necessity for wearing goggles and continuing to wear them, as in the plant. With the laborer, we insist upon goggles being worn in all precarious operations. In the laboratory, dealing with more highly trained men, we assume that they are sufficiently intelligent to realize the necessity for working safely. It should be simpler in the laboratory to enforce safety rules. Actually it appears to be more difficult.

Another instance occurred only recently where a new reaction was being tried out. The action of air and of oxygen on a flammable liquid in the presence of phosphorous was being studied. The work was carried out under a hood on a small scale. The reaction was of the type which required a considerable time and did not need watching, as it was at room temperature, and the flow of air and oxygen into the flasks was easily regulated. The precaution was taken of having a bucket of water under the flasks to quench the phosphorous in case they broke. The precaution, however, was inadequate. After three hours, at a time when no one was near, there was a sharp detonation and a fire, which did not prove serious. Had the chemist been near he might have been seriously injured, however, because the explosion was so severe as to leave nothing of the flasks but splinters of glass. We should not require a warning of this kind to make us realize the necessity of using a shatter-proof screen between the reaction flask and the worker.

There appears to be in some cases the attitude that the use of goggles and similar protective equipment is overdone. This seems to be particularly true of chemists who have been out of school for some time, and the only reason which can be given for this point of view is that they have been approached with the idea of working safely too late in life. There isn't any doubt that the earlier we start considering safety in connection with the problems which confront us, the better will be the accident records which we have to present. The work which is being done in the schools now to create some interest in safety even by the young child should do much to improve future conditions in chemical laboratories. The place where the most satisfactory approach to the question of safety in chemical work can be made is in the colleges where the chemists are trained. I do not know the present scope of safety instruction, or to what extent young chemists are being taught to consider the properties of the substances with which they are dealing in carrying out their experimental work. Ten or twelve years ago there was a great deal to be desired in the safety teaching in school laboratories. The accident caused by glass being improperly pushed through stoppers occurred quite frequently. In many cases in

elementary chemical laboratories the tendency of the student used to be to work with his laboratory manual right beside him, and his method of carrying out an experiment would be to read one or two lines in the manual, and then proceed with the part of the experiment outlined, without reading through to the end of the instructions. This type of procedure may easily prove fatal.

The laboratory of a chemical plant is in a unique position with reference to safety in the plant as a whole. The people working in the plant are generally not technically trained men. They are handling chemicals of varying degrees of harmfulness, and are required to handle them in a safe way. The chemist in the laboratory is technically trained and because of this training is supposed to have more intimate knowledge of the properties of the chemicals he is using than the people who are working with them in the plant. On this account, a laboratory with a poor accident record is not very good for the general attitude toward safety in the plant. The people working in the plant soon feel that if the chemists in the laboratory who are supposed to know the chemicals they are using cannot work without having accidents, then surely accidents which occur in working with these same chemicals in the plant are unavoidable. Hence people in the laboratory should feel an additional responsibility toward the plant and strive to carry out their work in the safest way.

In conclusion, I might advance the following points: 1. Accidents occur in the most safely equipped laboratories. 2. Minor accidents can be greatly reduced in number by insuring proper understanding of the work to be done. 3. Serious accidents can be avoided by utilizing safeguards provided in the laboratory, to anticipate unexpectedly violent reactions. 4. A good accident record in a chemical research laboratory can be attained only by conscious effort toward safe manipulation. This requires sufficient knowledge of the properties of the chemicals being used and recognition of the hazards involved.

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Safe Handling of Acids and Caustics (Small Quantities)

By C. E. RALSTON

Safety Director, Pittsburgh Plate Glass Company, Pittsburgh, Pa.

The speaker said in part: The recognized hazards of handling acids and caustics are bodily injuries, especially to the eyes; property damage, including destruction of clothing, and in many cases, fire. Undoubtedly, most of the trouble we all have experienced in connection with this problem has been due to a lack of knowledge on the part of the worker as to the hazards involved. Entirely too much has been taken for granted as to the knowledge of the worker, which is a serious oversight on the part of those in responsible managerial positions. When care has been taken to inform the workers of the hazards of their work and the proper emphasis has been placed on the use of protective equipment, personal injuries are rare.

When instructions are given they should be in the clearest terms and the worker should not be left on his own until he gives evidence of a clear understanding. Such instructions should be given in the work areas where all equipment, materials and conditions can be visualized. We should not assume that the worker knows, but should be certain of his knowledge as the hazards are so serious.

Too much cannot be said as to the personal habits of the worker with respect to cleanliness in handling acids and caustics. I have observed many workers whose personal condition would lead one to believe that they were total strangers to soap and water. This condition is a sure forerunner for infection in case of even the

slightest injury. Every effort should be made to have the workers use shower bath facilities so generally provided, and also wear clean clothing each day. A liberal use of water is a very important factor in the prevention of serious results from most of the recognized hazards. This applies to the protective equipment used as well as to the body.

We are all agreed that the best and safest way to handle the carboy is with the two-wheel truck, with adjustable arms which pick up the carboy container by slipping under the cleats of the container. The use of this truck keeps the operator some distance from the carboy and the bottom board strength is tested before he attempts to move the carboy by hand. When the carboy has been delivered to the place where it is to be used, we are confronted with the necessity of providing the proper inclinators, pitchers, syphons or other equipment as may be necessary to fully protect the worker from so-called accidental breakage of containers or spills of material.

Glass shields as a part of the inclinator equipment are an excellent aid in protecting from splashes. Other devices, such as rubber tubing over the neck of the carboy, will prove an aid in this work. Where possible, the acid should be removed from the carboy by the use of pumps or syphons.

When the containers are empty they should be thoroughly flushed out with water. This is a general requirement but one quite frequently neglected and many injuries result from the handling of supposedly empty acid containers.

Real constructive thought should be given to a proper and intelligent use of labels on all acids. In addition to proper labeling of individual acid containers, there should be proper warning signs around the areas where the acids are stored and used. These signs should warn those not engaged in the handling of the acids with the dangers of the area.

Acids which are naturally unfriendly to each other should be kept separate at all times, just as the work areas where acids are used should be isolated as much as possible from other areas.

Adequate lighting and ventilation are very necessary when acids are handled. No open lights should be permitted and all light bulbs enclosed in vaporproof globes. Effective exhaust systems should be installed as so many of the acid fumes are poisonous and present a serious hazard when inhaled by the workers.

Frequent inspections of equipment and work areas are very important as the need for good housekeeping cannot be stressed too much. Poor housekeeping tends to encourage indifference and carelessness which always lead to trouble. Floors should be kept free from slipping and tripping hazards at all times.

Proper clothing and body protection is extremely important. As has been mentioned before, the clothing should be changed daily. Rubber gloves and aprons should be worn and in many cases rubber boots or wooden clogs will be required. Close fitting acid-proof goggles are very necessary in most cases while in others the large lens spectacles may furnish ample protection. Efficient respirators should be provided for use where toxic fumes are involved. Some work will require the wearing of hoods or helmets which completely cover the head and shoulders. Where the work requires the wearing of hats, these should be of the wide brim type in order to furnish as much protection as possible to the face and neck.

Operating rules are very essential and should be conspicuously posted in the work areas as well as given to each individual worker. On checking over available ma-

terial of this nature, I was very favorably impressed with the clearness and conciseness of the rules of the General Electric Company.

(The remainder of the paper was devoted to a highly technical outline of first aid treatments for chemical burns as established in the Columbia Chemical plant at Barberton, Ohio, the speaker carefully pointing out that all practices and treatments employed there are the result of experience and are directed by medical supervisors of the plant).

Safe Handling of Acids (Large Quantities)

By C. E. SEVRENS

Merrimac Chemical Company, Everett, Mass.

The speaker said in part: There are three common causes of injury in handling acids:

- (1) Burns by coming in direct contact with strong acids.
- (2) Breathing oxides of nitrogen formed by the decomposition of nitric acid.
- (3) Explosions and fires from the generation of hydrogen gas caused by the action of weak acids on metals.

Burns by acid may be prevented by keeping the acids inside tanks or other equipment where it belongs.

Venting poisonous fumes to the atmosphere and the wearing of masks in emergencies will prevent accidents caused by breathing them.

Never permit an open flame to be used where there is a possibility of an explosive gas being present.

Consumers of acids in large quantities have installed the necessary equipment for storage and handling in bulk. Careful consideration should be given as to the location and design of the storage, as well as the safety of its operation. Tanks, pipe lines, valves, pumps, etc., should be built of material that will withstand not only the pressure but corrosion due to the acid used. It is advisable to have pipe lines and valves overhead, as leaks are more apparent and they are more easily inspected.

Repair work on acid lines must be treated as a hazardous occupation. When necessary to make repairs the supply should be cut off and valves locked or have warning signs on them. These should be placed and removed only by the men working on the line. A warning sign should be placed below the point at which work is being done and then allow the line to drain through the leak. It is a good plan to use a shield through which a chisel can be used when opening flange connections. Bolts on the bottom half should be loosened first, allowing the acid to drain out. Cast iron fittings should have a bag wrapped around them before breaking with a hammer. Pipe lines have been known to have acid in pockets or accumulations caused by obstructions in the line, which have, due to accumulated pressure in that area, blown out without warning when the line was broken and have caused serious burns. Valves should not be packed while pressure is on the line. Workmen should not be allowed to break or work on acid lines without having on goggles, rubber gloves or other necessary protective clothing, and a safety pail filled with clean water.

Many accidents have resulted from exposure to fumes and explosions of gases or vapors contained in tanks supposedly empty. It is advisable to have storage tanks equipped with a bottom outlet to aid the cleaning process. When it becomes nec-

essary to wash out a tank it should be done under the direct supervision of a foreman who shall be present during the whole operation. After opening the bottom outlet, the cleaning of tanks should be done from the outside by means of a hose fitted with a special nozzle so that it can be introduced into the dome of a tank car or opening in any other type tank, and a good flow of water should be played in all directions. If the sediment is not dislodged by the force of the water, it may be accomplished with a hoe fitted with a blade which conforms to the shape of the tank, having a flexible handle of sufficient length to reach the end of the tank.

If repairs are to be made after the washing, the bottom outlet should be closed and the tank filled with water, adding soda ash until the water shows alkaline when the tank is full. The tank should remain filled for at least twelve hours before allowing anyone to enter. Should it be necessary to do welding on an acid tank that has not been washed out, CO₂ gas must be allowed to flow into the tank to remove all flammable and explosive vapors. Samples of air must be taken at a sufficient number of points within the tank by a competent chemist. The tests should indicate no flammable or explosive vapor present before the use of a flame is permitted. Closed tanks should not be entered without wearing a safety belt with rope attached. The other end of the rope must be securely fastened outside the dome or tank, where a fellow employee shall remain until the workman inside the tank shall fully emerge. Canister type gas masks should not be used in closed tanks, or where there are nitrous gases. Always use the air mask under these conditions. Gas masks should not be taken off while in the tank.

In considering the handling of acids we may take sulphuric as a model, as it is the most universally used. Sulphuric acid is transported in carboys, drums, tank cars and tank trucks. Carboys are covered with porous stoppers to guard against pressure building up and bursting the bottle. When moving open carboys a lead cover should be over the neck to avoid splashing. Hand pumps or siphons are satisfactory if made of materials that will withstand the corrosive action of the acid. If inclinators are used, special care should be taken to see that the carboy is held firmly in place. When a number of carboys are to be used, it is best to have a lead dumping trough fitted with slats across the top, on which the carboys can be inverted. Every carboy must be thoroughly drained and flushed out with water before being returned by rail as empty, to conform with the I. C. C. regulations. Poorly drained carboys shipped as empty are a menace to all handlers. Our accident experience with returned empties has been such that we have designed a long tapered cork stopper, and all our employees have orders to insert it in the neck of the carboy before handling.

Acid drums should be stored in a cool place with the bung up. When received, the bung should be removed slowly, then replaced. This practice should be followed up weekly so the pressure which may have been developed from heat may be released. Failure to do this may result in a serious accident. A safe method for emptying drums is to insert a pipe into the outlet with a 2-inch tee on the end provided with a 1/4-inch pipe bent toward the top of the drum to admit the air. Men employed in emptying carboys or drums should be required to wear goggles.

The usual procedure for emptying tank cars is by blowing with air. Tanks are equipped with a discharge pipe extending from bottom through dome and air connection at dome so that pressure on top of acid forces it up the discharge pipe, also with proper safety valves or frangible disks that will rupture at 30 lbs. per sq. in. When tank car is received there may be a pressure on it due to the atmospheric

temperature or due to the formation of gases by corrosion of the steel. It is important that one should first inspect the gasket and safety valve and vent the tank through the air connection, as there may be pressure enough to force acid out of the discharge pipe. After connections are made to the storage tank and air line, turn on the air pressure. When tank is emptied it should be again vented and then all openings should be closed.

The method for unloading tank trucks is substantially the same as for unloading tank cars. It is advisable to have truck supply connections located so that operators can conveniently place their trucks. Truck tanks are equipped with safety disks rupturing at 20 lbs. per sq. in. Care should be taken in locating storage so that the lift will not be greater than 15 ft., as 15 lbs. of air will raise O. V. 16½ ft. above the level of the liquid.

Nitric acid is stored and handled in glass, stoneware, duriron or chromium steel alloys. When exposed to the air it gives off nitrous fumes which are poisonous. It is likely to cause fire if brought in contact with wood, straw or many other organic materials. Where it is used adequate ventilation should be provided to protect the men from fumes.

Mixed acid, a mixture of sulphuric and nitric acid, should be stored and handled in steel only. The same precautions against bringing mixed acid into contact with organic matter should be observed as with nitric acid. Great care should be taken in cleaning out tanks which have contained mixed acid. Men should not be permitted to be exposed to the fumes that arise from the accumulated sludge, as the inhalation of same may prove to be fatal.

Muriatic acid is stored and handled in glass, earthenware, rubber-lined or hard rubber equipment. No metal withstands the action of muriatic acid. The fumes from muriatic acid are irritating but not especially dangerous physically.

Discussion: In New Jersey many fatal accidents recently have resulted from men entering tanks without adequate inspection and without adequate protective equipment. In one case, three men figured, two of them dying from the effects of poisonous gases. The first entered to clean the tank, the second (plant superintendent) to rescue him, and the third in a desperate effort to get the first two men out.

Discussion further developed the common agreement that prevention of chemical plant accidents is largely a matter of location of all employees in the hazards involved. In one case, a new plant being placed in operation, time was taken to school all employees very carefully, adequate safety equipment was provided; and as a result there were no accidents in this plant throughout the following year.

It is important that employees be provided with the best safety clothing. One plant has made it a point to supply all persons handling acids and caustics with extra heavy wooden clothing. It is supplied by the plant to employees at one-half the net cost. In case of an acid spill, the employee is better protected by this clothing, has time to get it off, and also time to reach a water shower before being severely burned.

ADJOURNMENT.

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Safe Use of Electricity in Industry

WEDNESDAY AFTERNOON SESSION

October 4, 1933

The special session devoted to a discussion of hazards in the use of electricity in industry was called to order by J. I. Banash, president of the National Safety Council, who welcomed the delegates in the name of the Executive Committee of the Council, and then introduced the chairman, Wills MacLachlan, electrical engineer, Toronto, Ontario, Canada, who presided. Chairman MacLachlan briefly outlined the purposes of the session, and then introduced the first speaker.

*Original paper
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The Safe Use of Portable Electric Tools

By CYRIL AINSWORTH

Assistant Secretary, American Standards Association, New York City

The speaker said in part: The term portable electric tools covers a very wide range. There are tools for grinding, cleaning and polishing, drilling and boring, reaming, screw driving, nut setting, tapping, shearing, woodworking, riveting, fabric cutting, blowing and drying, conveying and many other operations. In all of these cases the accident problems are the same and for the purposes of these discussions I have roughly classified these problems into four groups. 1. Design and construction. 2. Installation. 3. Inspection and Maintenance. 4. Employee training.

It would be impractical to discuss these four points here. In fact, it seems unnecessary to do so. The National Safety Council, Underwriters' Laboratories, U. S. Bureau of Standards, Engineering Departments of Insurance Companies, State Regulatory Authorities, and the more reputable manufacturers of portable tools can furnish adequate information to any one who is anxious to look into the situation. I therefore will not go into any technical discussions on these points.

Inspection and maintenance have not been discussed in the past to any considerable extent and a little time on these problems might therefore be worth while.

Again the situation with portable tools is no different from that experienced with the use of automobiles, oil burners, locomotives or what have you. The biggest problems that we have in front of us today in connection with the safe use of highways and disregarding the tremendous problem of individual education is insurance of adequate inspection and maintenance of the motor vehicle. The majority of the difficulties that have been experienced in connection with the use of oil burning equip-

ment have arisen out of the advertisements of manufacturers which picture the cellar of your home as a recreation room or billiard parlor and tell you that your worries are over the minute the oil burner has been installed. It is absolutely impossible to continue to operate portable electric tools safely for any considerable period of time regardless of how much thought the manufacturers have put into the construction and installation of the tools if you work on the basis that your obligation ceases with the purchase of the equipment. Periodic and thorough inspection and maintenance of the tools in the same state of perfection as when purchased is essential to safe operation. When preparing my original notes for this discussion I communicated with many organizations for the purpose of obtaining information as to their experience in handling this accident problem and it is safe to say that fully 90 per cent of the accidents that were illustrated to me would never have occurred if an adequate inspection system had been in operation in the establishments which experienced the accidents.

Specifically, may I suggest that all large tools be inspected on the work at not greater than 90 day intervals and if necessary repaired in position. Smaller tools of this class, such as grinders, should be taken into the tool room at least every six months and be given a complete inspection test. The smallest portable hand tools, such as drills and hammers, should be taken to the tool room for oiling, inspection and test. Such a procedure as this is being followed by many large users of this type of equipment with much success and is therefore offered for your consideration.

The next important point of view is that of adequate employee training. This has become somewhat of an obsession with me recently in connection with many accident problems so that you will have to pardon me if I seem to stress the point unduly.

The industries of the country have paid a terrific price for their lack of effort to insure that those whom they hire to specific jobs are adequately trained for the work which they will be called upon to do. Too long has industry depended upon the record of employment as to number of years engaged in specific occupations as the basis of a person's fitness to do a job. Industry has hesitated to go to the expense of establishing courses of instruction for new employees fearing that after the employee has become well-grounded in his work and that as soon as the training investment is beginning to pay dividends that the employee will give up his job and go to another establishment where he feels conditions are more to his liking. Many firms are finding that this is a false understanding of what actually happens and are developing systems under which an employee will undergo a proper course of training to insure that he understands how to carry on his work efficiently and safely. Those engaged in accident prevention work have always been faced with the problem of handling the man who says that he has been doing his work in a certain way for a number of years and has never had an accident. In 99 out of 100 cases such an individual is using the wrong methods and sooner or later an accident is bound to occur.

The method in the past has been to make employees safety conscious through a medium of safety tests, plant safety meetings, rallies, posters, slogans in pay envelopes, etc. I do not intend to depreciate such accident prevention methods. They all have their place in the scheme of things but to me they are not as fundamental and valuable to a complete accident prevention program as is an adequate training course, which will give him such a complete background of the technique of his job, that he will not only work with a freedom of accident but will insure that his work is efficiently carried on from every point of view.

Specific to the problem at hand, it seems essential that every employee who will be called upon at some time during his daily work to use a portable electric tool, that

he should have some specific knowledge concerning the construction of the tool that he is using, the correct method of handling the tool, the defects in the tool that are likely to occur through its use, and any specific hazards in connection with the tool which can not be overcome through design or guarding and which the employee must therefore have constantly in mind while the tool is in use. I realize quite well that these points which I have brought out are numbered in their application and can be followed in connection with the use of any kind of tool.

The Use of Low Voltage in Hazardous Locations

By E. W. GORRY

Superintendent, Operating Bureau, The United Electric Light and Power Company, New York City

What is low voltage? If I were to put that question to any audience, there would probably be as many answers as there are volts in a kilovolt. Before giving vent to my opinion, let me digress with a few historical facts.

Previous to the development of the incandescent lamp and the electric generation and distribution system by Thomas A. Edison, the lighting of our streets and some commercial establishments was by means of carbon arc lamps. Contact with the supply wires to these arc lamps at 1000 volts or more was generally known to be dangerous. With the advent of alternating current for domestic, commercial and industrial use we entered an era of rapid development in high voltage transmission ranging from two to 220 kilovolts with utilization voltages of 100 to 700 volts.

As a result of this rapid development we still have private plants and some isolated systems where utilization voltages vary within the range quoted. With the extension of service from the larger utility companies, the discontinuance of private plants, and equipment obsolescence, we are approaching the day of a uniform utilization voltage.

I am of the opinion that the majority of us are users of the electricity defined as low voltage, the ordinary utilization voltages supplied for the lighting of our homes and factories, for the operation of motors and other devices commonly used in production and for our convenience. Today ordinary utilization voltages may be classed as any voltage between 100 and 240. A voltage of this order will be understood where the term low voltage is used in this article.

What are hazardous locations? That question prompted a review of the available records of the National Safety Council and the Edison Electric Institute of accidents, fatal or otherwise, attributed to low voltage contact. The records examined, covering the years 1919 to 1932, contain many cases where the voltage involved was undetermined or could not with any degree of certainty be approximated. The information recorded has to a large extent been based on newspaper reports collected through news clipping agencies. For the past few years the National Electric Light Association and now the Edison Electric Institute, have been collecting reports of electrical accidents through member company representatives and have been and are referring all newspaper reports received to these member company representatives for verification. I am citing the procedure followed to indicate that a sincere effort is being made to establish and make available authentic records of low voltage accidents.

A report of the Committee on Low Voltage Hazards of the American Society of Safety Engineers—Engineering Section, National Safety Council, was presented at the National Safety Congress in Pittsburgh in October, 1930, covering data collected

by the National Safety Council and the National Electric Light Association. Additional data have been collected by the National Electric Light Association during 1931 and 1932. These particular records are, in my opinion, the most complete of any centralized records, and, furthermore, they include a majority of verified cases. For the year 1931 I have taken the liberty of classifying these cases as follows: Total number of fatal accidents 184, of which 108 have been classed as industrial, 38 have been classed as domestic and 38 are unclassified.

For the year 1932 the total number of fatal accidents was 131, of which 61 have been classed as industrial and 32 have been classed as domestic, leaving 38 unclassified.

In the unclassified list have been placed all cases that occurred outside the plant property or the home, a miscellaneous assortment embracing in its toll the jokesmith and the suicide who constructed his own death chair.

As we are primarily concerned for the moment with the safe use of low voltage in industry I shall proceed with a further analysis of the industrial record. The year 1931 records 108 as our industrial toll, classed as follows:

Below 240 volts	38
Above 240 volts	23
Voltage unknown	47

For the year 1932 the record is 61:

Below 240 volts	12
Above 240 volts	3
Voltage unknown	46

Now we are back to the question, "What are hazardous locations?" An analysis of the records referred to indicated that any wet or damp location would come within that classification. For example, we find that 9 out of 11 extension cord accidents are definitely involved with a wet condition of the premises, 4 occurring inside of boilers and steel tanks, types of equipment well earthed and frequently wet when under repair. The remaining 2 accidents of the 11 were recorded as having occurred while the deceased were working on machines. I believe that you will agree that it is reasonable to assume that the machines involved were grounded permanently as required under the Factories and Workshop Act or perhaps accidentally grounded at the time of the accident, a condition equally as effective for the passage of electric current to earth as any wet location. In the final analysis the answer would be that a wet or damp location is a hazardous location, when contact is made with exposed wires or defective equipment.

It is quite evident that without this combination of circumstances (wet premises or equally as good ground contact and defective electrical utilization equipment) the accidents here recorded would not have occurred. If the electrical utilization equipment is not defective obviously we would not have a hazardous location. It therefore seems reasonable to assume that low voltage utilization equipment, fixed or portable, when in good condition can be used safely in any location. That is evident when we consider the relatively small number of accidents, coupled with the fact that in the United States there are approximately 200,000 manufacturers with installed electric power of 30 millions or more of available horsepower. It has been conservatively estimated that over 80 per cent of industry has been motorized and in normal times employs millions in man power. When it is realized that millions of these industrial workers contact in some form or another with fixed or portable low voltage electrical apparatus every working day in the year and do so safely, then our casualty list, while deplorable, is not unduly alarming.

It is gratifying to know that the total number of low voltage accidents for 1932 indicates an appreciable decrease compared with 1931. This improvement unquestionably reflects the combined constructive efforts of the various agencies engaged in combating this hazard. Serious thought has been given to this subject by nationally known engineers, and as a result there has been prepared and made available considerable information for our guidance in the safe use of the electricity supply as well as enacted mandatory requirement for the same purpose. For instance, we find in the National Electrical Code and the National Electrical Safety Code specific recommendations as to the type extension cord and lamp sockets, guards, etc., that should be used in damp or wet locations. There is no doubt in my mind that compliance with these recommendations would have prevented many of the accidents we have been considering.

There is reason to believe that the record indicates that industrial management is not fully awakened to the fact that proper maintenance of utilization equipment will prevent accidents. I would recommend to the supervisory personnel of industry that they obtain copies of the National Electrical Code, the National Electrical Safety Code, the National Safety Council's Safe Practices Pamphlet No. 29, "Electrical Equipment in Industrial Plants," Circular No. 397 of the Bureau of Standards, and the "Do You Know" and "Common Sense" pamphlets published by the National Electric Light Association. There is a wealth of helpful information contained in these and many other publications.

I would also recommend, in order to make sure that portable electrical tools and similar devices are kept in good condition at all times, the following procedure for maintaining them, believing that if it is followed the hazards incident to the use of this class of equipment can be almost entirely eliminated.

Thoroughly inspect the connecting cord of any such piece of equipment before connecting it to the circuit to use it. This inspection should include a careful inspection of the fittings at the supply end of the cord and where it enters the device to which it is connected. A thorough visual inspection of the device itself should be made so that any obvious defect will pass unnoticed.

In the case of motor-driven tools in particular, remove the motor heads at regular intervals and thoroughly clean accumulations of dirt, copper dust and other material from the brush rigging and other parts of the motor.

In the case of electrically driven tools make a test at least twice a year, and oftener where the device is used frequently, by connecting together the conductors of the connecting cord at the source end and applying a test voltage between this point and the frame or case of the device. For the ordinary low voltage devices, those rated from zero to 300 volts, I would recommend the application of at least 600 volts. In connection with the testing of electrical hand tools, I would refer you to a simple and effective set-up described in an article by D. E. F. Thomas, Research Department, The Detroit Edison Company. This test has been published in the National Safety News (September, 1931, page 72).

I would make a further recommendation that you discard any connecting cord which is frayed, cracked or otherwise defective. Always use good quality cord, that is, one with sufficient insulation and well protected. Type "S" cord should not be too expensive for general use. Use insulated fittings or connectors wherever practicable, and above all use common sense.

Safety Switches, Their Design, Operation and Maintenance

Editorial Paper—Source By WESLEY M. GRAFF

Director of Safety Engineering Division, National Bureau of Casualty and Surety Underwriters, New York City

The subject of safety switches is one on which a book could well be written and is, therefore, one which can be considered only sketchily at a session such as this. Its consideration must be primarily from the standpoint of the user.

Our consideration of the subject is limited here to industrial applications as excluding central power stations or sub-stations, although many industrial plants either operate fairly large generating stations of their own, or have large transformer installations connected to public utility lines. "Many" is numerically correct, but small in percentage of the total industrial plants in the country. Although, for those "many" plants, primarily and secondary transformer switch gear, generator panels, and power and light distribution panels are of interest, we will restrict this talk to the general run of industrial installations, and, in general, to a maximum voltage of 440. Again, in general, it applies to stationary equipment rather than to portable tools.

Design

From a safety standpoint, the primary consideration governing the selection of a switch is the service in which that switch will be used. For example, air-break switches may be perfectly satisfactory for use in those parts of a plant where the air is clean and free from inflammable or explosive gases, vapors or dusts, whereas, if those latter are present, oil-immersed or explosion-proof construction may be absolutely essential. For accident preventive reasons, all other reasons omitted from consideration for the moment, we may choose among straight manual control, push-button control adjacent to a switch, push-button control remote from the switch, air-break push-button-control of a remote oil-immersed switch, oil-immersed totally-enclosed push-button control of a remote air-break switch, or a control such as the Mercoid enclosed mercury control for a switch of almost any type. The photo-electric cell is, and probably will continue to become, of increasing accident preventive importance as a means of controlling switches of various types in industrial establishments. To cite just one other switch control device possessing considerable safety possibilities, may I mention the Bishop contact cable, which consists of two concentric conductors within an insulating cover, the two conductors being normally separated from each other but making contact with each other wherever the cable is pressed.

On the general subject of remote control, it is important to recognize the difference between low voltage release and low voltage protection, particularly in any case where the unannounced starting of machinery could be dangerous to workmen or to equipment.

It is perhaps obvious, but nevertheless a proper subject for repetition, that there should be a disconnecting switch or a disconnecting station not subject to control from any other point, adjacent to, or at least within sight of, any motor or electrical equipment subject to remote control. There are on the market push-button-controlled motor starters with inbuilt externally-operated manual disconnecting switches which meet this requirement very well indeed.

In order to provide ample protection to the switch itself, to its operator, to plant employees in general and to the materials and equipment in the vicinity of a switch,

all switches should be enclosed. The enclosure should enclose all current carrying parts whether they are dead or alive, it should be of ample strength and rigidity, it should be reasonably dust tight for ordinary work, and more than reasonably dust tight for use in dusty atmospheres or under other unusual conditions. There should be no open holes or slots in the enclosure. The doors or covers should not be readily removable, for they may not be replaced if they have once been removed. All doors should be equipped with adequate latches. Switch enclosures for outdoor use, or for use in very wet places, must be of special construction, equivalent to what will exclude a beating rain, and should be galvanized or given equivalent treatment.

The switch base again should be of material suitable for the conditions in which the switch is to be used. In its selection, one must take into consideration the possibility of extreme heat, cold or humidity, of unusual mechanical shocks or vibration, of acids or other active vapors. These statements apply with at least equal force to the barriers between the switch poles.

The switch handle for manually operated switches should provide a positive "off" position in which it can be locked. The outside of the switch case should be plainly marked to indicate the "On", "Off", "Running" and "Starting" positions, whichever may be applicable to the case under consideration. It should be noted that such markings in English alone may not be adequate in those industrial centers in which there is a large foreign-language population.

Manually operated switches should be externally operated, and should be equipped with a cover interlock so arranged that the switch must be in the "Off" position before the cover can be opened, and so arranged that the switch cannot be closed while the cover is open.

For a safety switch, quick break is an essential. It is preferable that the switch include barriers between poles and some method of limiting or suppressing the arc. It should be recognized that dangerous conditions can be created if the arc or its hot products can escape from the switch enclosure. It should also be pointed out that if the arc is visible to the switch operator, he may be afraid to handle the switch and may thus introduce hazards which would not be present if he could not see the arc.

For switch contacts, copper is, of course, the material commonly used, but it is subject to fairly rapid oxidation and as its oxide is not a very good conductor, there results a temperature rise considerably higher than that produced when the contacts were new and clean, and which may exceed the rise anticipated in the design of the switch. For this reason, the plating of copper switch contacts with other metals, such as silver, is of interest from a safety standpoint. Although silver oxidizes, its oxide is a comparatively good conductor and, therefore, does not cause an abnormal temperature rise.

Maintenance

It is extremely difficult to make more than the most general statements about the maintenance of switches. I do feel that every switch in use, whether it is operated often or seldom, should be inspected and perhaps tested by a competent employee at regular stated intervals of time. A definite inspection schedule will prevent many shut-downs which might be due to switch failure, will reduce maintenance costs by preventing equipment from getting into really bad conditions, and is of distinct advantage in the prevention of fire and of injuries to workmen. What

the time intervals should be between inspections in a given case depends entirely upon local conditions, and can only be determined by a sort of cut-and-try method based on observation and experience.

Maintenance inspections should include the operation of seldom used switches to clean their contacts, the examination of moving parts for mechanical wear, and a check on contacts which, by an undue temperature rise, indicate pitting or burning. For oil-immersed switches, it should also include a check on the oil level and the examination of the oil for evidence of carbonization, particularly if it is known that the switch has been operated under a short circuit or heavy overload.

What is said of switches themselves, in point of inspection maintenance, is equally true of their control devices, such as manually-operated push-button stations, float switches, pressure-actuated controls, etc.

May I stress particularly the necessity for the periodic inspection and operation of all electrical devices, as for instance solenoid-operated switches or valves which are used as safety devices. This is particularly true of switches or switch control devices which are normally inactive and which operate only in case of emergency. I have known, for instance, of solenoid-operated valves, intended for the emergency shut-off of gas to gas-fired bake ovens, which failed in an emergency because they were stuck so tight that they could not be closed. Their periodic inspection and test would have prevented an explosion which resulted in injury and in the destruction of property.

Any maintenance program should take into primary consideration the instructions issued by the manufacturers of the switches and devices under consideration. There is, for instance, considerable variation in the matter of lubricating switch contacts and in the lubricants suitable for various switches.

In conclusion, may I urge that your selection, installation, operation and maintenance of switches and their related devices, take into consideration the National Electrical Code, the National Electrical Safety Code, the Standards of Underwriters' Laboratories, Inc., the ASA codes pertinent to particular industries, and the Safe Practices Pamphlets, in particular, of the National Safety Council.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



The Eye and Its Relation to Safety

FRIDAY MORNING SESSION

October 6, 1933

The special session devoted to a consideration of the eye and its relation to safety was called to order by Harry M. Webber, Illinois Bell Telephone Co., Chicago, representing the Executive Committee of the National Safety Council, who welcomed the delegates. He then introduced Lewis H. Carris, managing director, National Society for the Prevention of Blindness, New York City, who presided as permanent chairman. Chairman Carris outlined the purposes of the session briefly, and then introduced the first speaker.

Principles Underlying the Practice of Eye Protection

Orig. paper By DR. FREDERICK WILLSON

H. 5-33 President, Willson Products, Inc., Reading, Pa.

The speaker said in part: To those who like to consider the subject of eye protection in all its aspects, there is much of interest in the wonderful work of that greatest of all safety engineers, Dame Nature. Man's artificial assistance in eye protection started where nature left off, and it has been an evolution, too. The need of protecting the eyes first brought out devices that were crudely and hastily modeled, but latterly, in our effort to make the working man so comfortable that he will willingly use protective devices, we have gone back to first principles and have remodeled eye coverings to take into account the anatomy of the face and the physiology of the organ of vision.

The slightest study of anatomy convinces us that round eye cups cannot be made to fit every face and that for comfort eye cups should be modeled to the peculiar contour of the orbital cavity. Such construction necessitates the manufacture of eye cups in right and left shapes, just as shoes and gloves are made in right and left shapes to conform more comfortably to the human figure. Having in mind the nerve exits through the bony structure about the eye, it becomes necessary to arrange the facial contact of eye cups so that they will not press on nerves as they emerge from within the skull and this need has greatly influenced goggle design. When eye cups were designed to anatomically conform, there ceased to be a need for extremely tight head-bands and thus one common cause of discomfort was removed. Another notable advance was marked when the size of goggle cups was increased so as to remove contact and pressure from the sensitive ridges immediately surround-

ing the eye. The present size of goggle lens with a diameter of 50 millimeters has fortunately been standardized in our Federal specifications, much to the comfort of those who have to wear goggles.

It seems clear now that the first flood of objections raised by workmen to the wearing of goggles was probably honestly founded on physical inconvenience, if not pain. Some of you will remember the complaints of headache, eyestrain and pressure on sensitive parts of the face—one does not so often hear these complaints at the present day, for the reason that we have learned to be as careful in the shaping and fitting of eye protective devices as we learned years ago to be careful of the shaping of shoes and other articles of personal wear. Also, there must be some convenient means of changing the distance between the eye cup so as to fit goggles to the varying pupillary distances of workmen. However, care must be taken that when goggles are drawn to a correct lateral adjustment the cup be shaped so as not to press too hard into the inner corners of the orbital cavity. It will not do to obstruct or inflame the delicate tissues at the inner canthus of the eye.

Whether eye coverings are made to protect the eye from traumatic injury from blows, foreign particles and dust, or from the effect of radiant energy in large amount, the fundamentals of construction of the device to hold the lenses before the eyes is much the same and such protective devices must be modeled under the conditions I have already described. Welding helmets and hand shields do differ in some important particulars, however.

Now, having provided for our workmen a comfortable, because correctly shaped, goggle frame, let us consider what is to be done with it. Either the workman must be protected from the danger of flying bodies, the result of mechanical operations, or from the effect of intense light. Because the chipping of billets is a characteristic type of hazard from flying bodies, the Federal specifications now characterize goggles for this type of protection as "chippers' goggles" and I shall use this term to describe devices for prevention of traumatic injuries. Fortunately, our Government has devoted much attention to outlining specifications for the production of reliable chippers' goggles and I wish to place great emphasis on the statement that no employer, using devices of this sort, should be unfamiliar with these specifications, since they represent the last word in this field of protection.

The lenses in chippers' goggles are clear because their major function relates to traumatic protection. The question may be asked as to the best kind of clear glass for the manufacture of protection lenses and I must confess that I have pronounced views on this subject. Measurements made for us by the Bureau of Standards indicate a greatly diminished transmission in the near ultra-violet in the case of "plate glass" as compared with so-called "optical glass" when used for protection lenses. For instance, at a wave length of 313 millimicrons (a wave length in the near ultra-violet which approaches rather too closely to the field of irritation from invisible radiations) optical glass shows a transmission ranging from 13 per cent to 19 per cent, whereas plate glass shows a transmission ranging from 1.3 per cent to 2 per cent. Under trying conditions of shop lighting it is altogether reasonable to infer that the transmission of so large a percentage of invisible radiation of a questionable wave length tends to fatigue the eye. The uniform refractive index of so-called "optical glass" is of no value in eye protection and, hence, there is no offsetting advantage in optical glass to compensate for the transmission of from six to nine times more near ultra-violet at 313 millimicrons than does clear plate glass. The slight greenish tint in plate glass, indicating a certain metallic content in the glass,

is therefore desirable and protective. With this type of plate glass the transmission of the incident visible light remains above 89 per cent, as required by Federal specifications.

Lenses of chippers' goggles should be as free as commercially possible from refractive power and, hence, the two surfaces should be relatively parallel and in no appreciable degree warped or distorted. I have already alluded to the complaint of workmen that the wearing of goggles causes headache, and another early complaint was that goggles caused eyestrain. Most likely there was good reason for this second complaint because undoubtedly in the first days of eye protection enough care was not used to provide lenses that were parallel as to their surfaces and free from the aberration due to surface distortion. A workman, having to put in long hours behind a pair of chippers' lenses so distorted that the eyes were under constant muscular strain, had good reason to complain, and even at the present day, except where the greatest care is used in manufacturing chippers' lenses, this defect is not absent. In the last edition of Federal specifications for chippers' goggles, this danger is recognized and covered by definite stipulations. It is both practical and humane that these safeguards should be set up for the prevention of discomfort.

For greater protection Federal specifications now require that chippers' lenses shall be heat-treated so that they do not readily break when struck by flying bodies. There have been tremendous advances in the heat treatment of lenses, but here also great care must be used by manufacturers to see that in subjecting lenses to such treatment surfaces are not distorted or the tension within the lens raised to such a point as to cause dangerous fracture when lenses happen to be broken.

Obviously, the purpose of goggles is to protect the eyes and nature aids in this work by causing the eyelids, by reflex action, to close, if possible, before a flying body strikes. By interposing a protective glass between the eye and the flying body sufficient time is often given to permit this reflex to operate so that should the glass break it is the outer surface of the lid which is damaged and not the eyeball itself. This being the case, the prime efforts in lens production for goggles should be to obtain a certain condition of the glass which assures safe fracture. It is not difficult to produce glass that is hard, but it is less easy to make goggle lenses that are safe to use.

With the greater attention given during the past decade to the correction of visual defects, it has been necessary to provide a special type of eye protection for those who are obliged to wear correction spectacles. This can best be accomplished by mounting the protection lenses in light goggle cups so designed that they can be worn over other glasses. A safety device of this character does not interfere with the use of any kind of correction spectacles and yet provides maximum protection.

We now come to the second division of eye protection, that is, the prevention of injury to the eyes through radiant energy in excess.

Until within the last 25 years all that the human being required in the presence of glare was a smoked glass to cut down intensity of the visible light. However, with the introduction of industrial processes involving acetylene welding and cutting, to be followed by more intense processes, such as carbon and hydrogen arc welding, it was found that even with the use of a dark glass workmen developed conjunctivitis or, in other words, inflammation of the external membranes surrounding the eye and lining the eyelids. It was evident, too, that a mere increase in the density of color in the welding glass did not prevent this destructive action, nor did it prevent prolonged discomfort and burns from intense heat. Research revealed, at this point,

that mere color protection was not ample and they were driven back to a study of the scientific reasons for the eye injuries then so common to workmen doing welding.

The problem of protection in welding operations was not easy because, although it was not difficult to make welding glass opaque to ultra-violet rays (by introducing sufficient density of color to absorb these rays), it was extremely difficult to hold back the infra-red rays, in view of the readiness with which radiant energy in the wave lengths is transmitted through ordinary colored glass. Mere density of color in glass does not, to any satisfactory degree, hold back the heat and even when extremely dense colored glass was used in early welding operations, workmen complained of marked discomfort induced most likely by the transmission through the glass of sufficient heat to burn the external tissues of the eye.

In early welding glasses, even in extreme densities of yellow brown color, showed a free transmission of over 30 per cent of radiant energy from the invisible spectrum, practically all of which was in the infra-red range. With such glass, as welding operations became more intensive by the use of the carbon arc, eye burns were frequent. Latterly, however, those manufacturers who continued research in this field found that certain metals could be added to a glass solution and that these metals, when properly incorporated in the solution, would render the glass practically opaque to all invisible rays, including the infra-red.

In the beginning welding glass often showed as much as 30 per cent transmission of invisible radiant energy but at the present day it is quite possible to produce a glass of no greater density in color which blocks all but a trace of invisible radiant energy, the amount being rather too slight to be accurately measured. The Federal specifications for welders' goggles, always reasonably moderate in requirement, stipulate that the maximum total infra-red transmission for "shade No. 12" shall not exceed one-half of one per cent; and, since the Federal specification requirements are based on the ability of reputable manufacturers to furnish material, this will evidence to you the tremendous advance of late years in the production of safe welding glass.

One precaution, which is plainly apparent from the explanation already made, is that the safety of welding glass cannot be predicated from the density of color in the glass. Whether the welding glass is yellow, brown, green or a combination of red and blue, it will not hold back destructive radiant energy unless the glass has been specially compounded to introduce ingredients which block the transmission in the invisible range. The Bureau of Standards specifies that welding glass shall be yellowish green in hue, but instead of stopping at this point it goes on to specifically state the transmission of radiant energy which is permissible and also specifically states the technique for determining and measuring the amount of transmission. Whether used in welding goggles where the hazard is slight, or in welders' helmets and hand shields where the risk to the eyes, and even to the skin of the face, is extreme, no glass should be used which does not fully comply with the United States Federal specifications.

Owing to the density of the glass used in welding operations, the matter of grading shades is in itself a scientific procedure requiring special instruments and great care. In the Federal specifications the limits of permissible visible transmission for each shade number are exactly shaded. Workmen accustomed to one range of density are much affected by the incorrect shading of welding glass, hence, the extreme necessity of keeping the range of transmission for each shade safety within the limits specified by the Bureau of Standards.

It stands to reason that welding goggles, welding helmets and hand shields should be so designed as to block the passage of all light that might be injurious to the eyes. Welding goggles which leak light, or helmets and hand shields which permit flashes, are a distinct menace and often the cause of severe eye injuries. A welder working in proximity with other welders must be guarded against light flashes from his neighbors, as well as from his own work; in such operations a workman should not be obliged to wear flimsy devices, the joints of which will not remain light-tight in the presence of intense radiated heat—Federal specifications lay great stress on this detail.

There are, of course, many other considerations in the development of modern eye protection devices, but I have attempted to outline those which seem to me to be the most essential. With the rapid development of all industrial operations undoubtedly new requirements will arise. The improvement of eye protective devices must keep pace with the needs of industry, however severe. Not to do so would be the most essential. With the rapid development of all industrial operations, inadequately protecting workmen who have to labor under the abnormal stress of this machine age.

Orig. paper 4553 **How To Prevent Eye Injuries**

By G. A. KUECHENMEISTER

Personnel Manager, Dominion Forge and Stamping Co., Walkerville, Ont., Canada

The speaker said in part: If you were to ask any man in our plant how to prevent foreign bodies getting into the eyes, the answer would be prompt and emphatic: "Wear Goggles all the time." But that answer covers only part of the problem, as I see it.

The men in our tool room showed us the problem, way back in 1918 and 1919. In those days we did not have a rule making it necessary for all men to wear goggles all the time and we had a steady stream of men going to the first-aid room to have foreign bodies removed from the eyes. There were not many cases from the grinding department. The men were wearing goggles at that work. We all knew that it was necessary to wear goggles when grinding but were not yet convinced that it was necessary to do so in all departments. The eye cases were coming from the departments where it was not thought necessary to wear goggles.

To get some ammunition for our goggle wearing campaign, we instructed the first aid man to ask each man who came in to have a foreign body removed the simple question, "how did you get this in your eye?" He was not to start any argument but merely to find out this fact. When those answers were later summarized it was found that most of them were like the following: "I don't know." "I was standing in the aisle." "I was working at my bench." "I was walking to the other building." Of course, there were plenty of cases where the man knew he got it when he stepped to the grinder to "touch up the tool," or while working at a lathe, slayer or other machine, but most of the men professed not to know where the pieces came from. In 1921 when the order came for all men to wear goggles, we used that list of answers to show the tool makers that by their own statements they were not safe anywhere.

Wearing goggles all the time may not be the only way to prevent eye injuries, but we have come to the conclusion that it is the best and least expensive way.

There are so many ways of losing an eye in any plant that it is simply impossible to cover all the hazards with guards, screens or shields.

The men in our plant (and I mean the workmen, not only the foremen and other bosses) are so firmly convinced that wearing goggles is the right thing to do that they consider it foolhardy for a man to work without them, and criminal for the management to allow them to do so. They are so sincere in their belief that they simply cannot understand why the wearing of goggles has not been universally adopted. I feel very much the same way about it.

The total cost of eye injuries in the United States this year may never be known. Dr. Louis Schwartz, senior surgeon of the United States Public Health Service, estimates that the total cost of eye injuries for one year is at least \$50,000,000. In a survey made some years ago, conducted jointly by the National Safety Council and the National Society for the Prevention of Blindness, the experience of 583 plants employing 578,396 men was studied. It was found that during one year in these plants there were 2,650 cases where one lens of the employee's goggle had been shattered or splattered by molten metal or chemical while being worn, and that 1,974 cases had both lenses shattered or splattered; and the year previous there had been 2,787 such cases; making a total during the two years of 7,411 eye injuries prevented by goggles in those plants. Estimating the compensation cost of the loss of one eye at \$1,800, and the loss of vision of both eyes at \$3,500, we arrive at a saving in compensation costs of \$18,000,000. A saving of wages to the workmen is another \$10,000,000. There you have a saving of \$28,000,000 by the simple process of wearing goggles. The cost of equipping those 578,396 workmen with suitable goggles would probably not exceed \$1,000,000. Bringing it down to figures we can all understand, we see that by spending \$1 you save \$28.

I can give you an example from our own plant, one we fully understand. The average cost of the loss of one eye in Ontario is about \$3,000. The loss of two eyes is total disability—in the same class with death. The cost depends very much upon the number of dependents.

Last June I walked into the first aid room just in time to see the nurse pick a lot of lead out of the teeth of a workman. He had been babbitting a bearing and the lead exploded. In addition to his teeth being full of lead, all the rest of his face was badly burned excepting where his goggles covered his eyes and cheeks. Both lenses were completely covered with a film of lead but his eyes were unharmed. One lens was cracked and because he was wearing correction lens goggles, we at once ordered a new pair. The first of the next month one of the boys in the purchasing department rang me up and said, "We have a bill for \$6.50 for a pair of goggles for Jack Moon, do we pay that?" I promptly told him, "You're damn right we do."

In these days of poor business I can still spend \$6.50 of company money without an O. K. from the main office and there certainly is no kick coming when the spending will save \$3,000 or more.

Until recently I thought the goggle problem had been pretty well licked in this country and that most plants were really trying to put a stop to eye injuries but I have become convinced that very little is being done. It is not for lack of information on the subject. I am still wondering why, after all that has been said and written, there are still so few plants that are really trying to prevent eye injuries.

Wearing goggles all the time is not the ordeal it was in the pioneer days. The goggle manufacturers are producing goggles that can be worn with comfort by any

man or woman and the proper corrective lenses can be provided when necessary with great benefit to the wearer. Every problem and every honest objection has been successfully overcome and all the information on the subject can be had for the asking. There is one unavoidable conclusion in this matter and that is that the men whose duty it is to provide the protection do not want to do it.

To put the whole matter in one sentence, I would say that any time the operating head of any plant wants all his men to wear goggles all the time, they will do so.

To any safety man who wants to put it across in his plant I would say: "Get the big boss to want it and order it done, and it will be done."

Take our own case first: I know that one from bitter experience. My interest in preventing eye injuries began in the fall of 1907 when I lay in the Tacoma general hospital for three days with a bandage over my eyes, not knowing whether I would ever see again or not. It was the year I was engaged to be married and those three days were hell. For three days and nights all my hopes, plans and ambitions were shot to pieces and when I recovered I knew I never wanted another experience like that.

That made me an open-minded candidate for conversion at the very first safety meeting I ever attended. That first meeting was in Milwaukee. Harry Guilbert, safety director for the Pullman Company, was there, and for the first time in my life I heard a man talk about wearing goggles. I came away from that meeting knowing that eyes could be protected and I began to wear goggles and preach the wearing of goggles. As foreman of a welding department, it was easy to get my men to wear goggles. The nature of the work necessitated wearing them while welding and the step to wearing plain lenses at other work was easy to take.

In 1915 I went to Walkerville as a foreman and soon after getting there I began to get grinders to wear them. I remember the first dozen pair of goggles we ever bought. We paid 59 cents a dozen for them but they did protect eyes. Then, in 1917, when I became a full-time safety man, I began to work in earnest, and what a job I had on my hands. The foremen called me crazy, the workmen called me all the names that they could think of—when I wasn't near enough to hear. It was a case of fight, beg, plead, coax and argue all the time. I read everything I could find on the subject. I knew all of Harry Guilbert's stuff by heart and tried all the tricks he advocated, and occasionally got a man who had been hurt to wear goggles all the time—or at least until the scare of the injury he had received was forgotten.

In 1919, when one of our men lost an eye, the boss asked me how we could prevent such a thing, and I told him "We will never stop it until all the men wear goggles all the time." Then I asked him for an order making it necessary for all the men to wear them. He hesitated, and then said "That is very drastic, I'll take that up at the next drop forge meeting." He made a note of it in his book. Had we waited until the drop forge association adopted that rule for the industry we would be waiting yet. It has not yet been done.

After that we kept right on plugging along the same old lines. I say we, because by that time I had made some enthusiastic converts and was getting a lot of help from a few foremen and some of the men. The climax came on May 9, 1931, and it was almost dramatic.

C. W. Price, then with the National Safety Council, was at the plant and while he and I were out in the shop, a man told me that the superintendent was looking for me. Later I met the superintendent and he quickly told me what he wanted. Tousignant, one of our best workmen, had just lost an eye in the plant, and the

superintendent wanted me to put up a notice that from then on all men must wear goggles.

When I was alone and began to think about what had happened, I got scared. Here was the thing I had wanted almost more than anything else in the world, and I was afraid of it. I was afraid of what the men would do when they read that notice. I was afraid of a walk-out.

I wrote the notice and took it to the president of the company and asked if that was what he wanted. "If that is what the superintendent wants he will get it," the president replied, and promptly signed the notice. The superintendent also put his name on it, but even then I was afraid to post it until Saturday noon after all the men had left the plant. When I finally put it up I asked the first aid man to be near the bulletin board on Monday morning when the men first saw it and tell me what they said. When I came in Monday and heard the first aid man tell me that the first men who saw it said "Hell, that should have been done a long time ago," I knew we were on our way. Since then our goggle problem has been merely the routine of getting suitable goggles, fitting them properly, getting eyes examined, repairing and sterilizing the goggles when needed, and things of that sort. New men wear them as a matter of course and we have no trouble with them. If we put up a notice today prohibiting the wearing of goggles I am afraid we would have a walk-out.

It doesn't require a full time safety man to put the thing across if the big bosses are on the fence ready to be pushed over.

Three years ago we built a stamping plant on some vacant property across the street and rented it to a lamp company. It was decided that several of our departments would take over similar work in that plant. The safety and personnel department was one of those chosen. We were to do the first aid and safety work and quite naturally the matter of putting goggles on all the people in that plant came up for consideration. The bosses and workmen admitted that goggles were necessary in the forge plant but they could not see the necessity for wearing goggles in a nice clean stamping plant. It had never been done and they had to be shown. My guess was that it would take a year or two to break down the resistance and do the job, but I was wrong.

The annual meeting of our local safety council was held in January of that year and we invited the new president of the stamping company to attend. Walter Darling, the blind boy from Cincinnati, was the principal speaker and he told his story that night about as well as I ever heard it. When the meeting adjourned the president of the stamping company asked me whether we could get Walter to come to our plant the next morning. That was easily arranged, and the next morning Walter talked to every man and woman in that plant except the telephone operator. When Darling finished the president of the company told his people that I was to get the goggles and "commencing tomorrow morning" we will all wear them all the time we are in this shop. He added that anyone who did not want to wear goggles did not have to, he could get his money at the office any time.

When that meeting broke up, I jumped into my car and bought all the goggles in the Border Cities and then went to Detroit for more. When I got back I found a sign painter putting a sign on the door leading from the office into the main shop. It read: "No admittance without goggles", and it is there today.

We got organized and began fitting goggles. By noon the next day every man and every woman and girl in that plant had on goggles. While fitting the standard

man-sized frame type goggles onto the girls I wondered what some of my friends would say if they knew what I was doing. I had heard some very learned discussions about having to have special light weight goggles for girls but I didn't have time to wire for help. The president wanted goggles put on those people and I was there to do it.

The biggest trouble I had with the girls was finding ears to hook the temple pieces over. I'll swear that some of them didn't have any ears. At least I couldn't find any so first we replaced the temple pieces with rubber bands, but later I figured it was a glorious time to kill two birds with one stone, so downtown I went and came back with a couple dozen hair nets. That worked fine. We put the hair net on and hooked the temple piece into the net. That's another use for a good strong hair net.

There must be a reason for the sudden change of attitude on the part of men who have put the goggle problem across in their plants. Nothing "just happens" in this old world of ours; there is a reason for all things. I think I know the reason for the sudden change from apparent indifference to positive action. Most every plant in the United States has, or has had, a shop rule which says, "Goggles must be worn when chipping, grinding, pouring hot metal or—" and then because the rule-maker either doesn't know any more specific hazards to mention or because there are too many to enumerate in one rule, he finishes by adding the words—"where necessary."

Those two damnable "weasel words" are responsible for most of the eye injuries. "Weasel words" were defined by Theodore Roosevelt as being words which, harmless in themselves, when added to an otherwise red-blooded statement suck the life blood from that statement.

"Wear goggles." "Wear goggles all the time." "Goggles must be worn in this plant." These are statements that cannot be misunderstood. But when you say "goggles must be worn when necessary", it throws the whole thing into one grand guessing contest as to where and when goggles must be worn. We have tried to guess and have found we are rotten guessers. Judging by the \$50,000,000 loss per year the United States is full of rotten guessers. When we quit trying to guess where, when and how men can lose eyes and do the one simple thing of equipping every workman with proper eye protection, our eye injury problem will be licked.

The reason for the sudden change of attitude in every case that I have studied was simply that the man with the necessary authority suddenly decided to quit guessing and put a stop to eye injuries.

Proper Lighting As It Relates to Safety

By A. B. O'DAY and ALSTON RODGERS

General Electric Co., Nela Park, Cleveland, Ohio

The speaker said in part: Considering the question of lighting from practically any standpoint, we find that its importance lies primarily in its positive connection with the question of seeing. From the standpoint of safety, the matter of seeing may affect the physical and mental welfare of human beings in two ways: (1) Imperfect seeing introduces a direct possibility of accidents; (2) Difficult seeing saps nervous and muscular energy and may result in impaired health.

Many factors tend to tax the powers of vision. Man originally used his eyes almost entirely for objects out of doors. Outdoors the objects to be seen are generally at an

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appreciable distance and as a consequence our eyes are normally far-sighted. Private day working conditions, however, demand that we concentrate our vision on work close to our eyes. During daylight hours, the illumination outdoors is generally 500 to 1,000 times greater than that which we ordinarily provide in our places of work. These low levels of lighting are a further strain on our powers of vision.

Where the lighting is very "spotty" with extreme contrasts between bright and dim areas, it generally causes eye strain and makes continued vision difficult because unconsciously the worker's eyes are continually trying to adapt themselves to the many lighting conditions in the field of vision. Spotty lighting may be the result of: (1) incorrect spacing and mounting heights of lighting units; (2) old style localized lighting with no general illumination; (3) using the wrong type of lighting equipment; (4) depending on natural light through the windows with the result that the areas near the windows are brightly lighted and contrast sharply with the dim areas further away; (5) using only a few of the lighting units intended to illuminate the area evenly; (6) the presence of dark colored surroundings which form a harsh contrast with the lighter working areas.

Glare presents an accident hazard because it makes it difficult to see properly. In its worst form, such as in the case of an unshaded lamp near the work, it induces a temporary partial blindness dangerous to the worker. The resulting eye strain causes fatigue and headache and often results in permanent eye defects.

Insufficient light is an accident hazard and proves detrimental to work and health because it hinders easy and accurate seeing, retards speed of vision, decreases speed of focusing the eyes, causes eye strain, and saps nervous and muscular energy. It has been definitely proved that better lighting reduces the nervous muscular strain of working.

The factor of maintenance is important. Accumulation of dust and dirt on lamps and reflectors will often decrease the light output as much as 40 or 50 per cent in a few months. Cleaning the equipment with a damp cloth will effectively remedy this. Where dust, dirt, oil, etc., are prevalent, dust-proof equipment with glass covers assists materially in keeping the equipment clean. Burned out and blackened lamps materially decrease the efficiency of the lighting and these should be replaced promptly. To care for this condition, a good maintenance system should be instituted for cleaning the equipment at periodic intervals, generally not exceeding one month.

Light colored ceilings and fairly light walls reflect a large part of the light striking them and therefore increase the amount of illumination on the working plane. Painting the machinery and other equipment in a light color aids the lighting system and helps eliminate shadows and brightness contrasts. If these surfaces are not cleaned or repainted periodically they become dark and discolored, reducing the lighting efficiency.

While definite statistics have been lacking regarding the exact relation of lighting to industrial accidents, one of the recent estimates by reliable authorities indicates that faulty illumination is a direct cause of about 5 per cent of all accidents and a contributing cause of about 20 per cent.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Mental Training for Safety

By HAROLD S. HULBERT, M.D., F.A.C.P., Chicago Illinois

AXIOM: *The facts of the nature of things are neither comforting nor uncomfortable in themselves; the knowledge of these facts may be either used or ignored. Wrong thinking or no thinking about a fact will not change a fact nor its existence; saying, "It is a rainy day," "my enemy will perish," "I will be rich some day," "chaos was chaotic," "this thing is safe," does not make any such thing so.*

1. Psychiatry is the understanding and modifying of the actions of the human mind under all circumstances of health and ill health (mental health and mental ill health as well as physical health and physical ill health), and under all circumstances of environment (including accident risk), as well as under all circumstances of social problems or constellations.

Much of that is understandable and usable by leaders of good sense and good education and good-will without protracted technical training or experience in morbid psychiatry.

2. The problems this year and as foreseen in the next few years are a bit different from those in the past, but the laws of Nature, including the laws of Human Nature, are fixed and constant and immutable. Further knowledge of some of these laws of Human Nature, simply expressed, may help us to meet modern problems.

TUESDAY MORNING SESSION

October 3, 1933

LECTURE I

What Mental Equipment and Mental Habits Has Man to Meet Today's Man-Made Problems

Work inflation means increasing accident risk. Some understanding of mental processes of workmen and others may indicate how intelligent leadership may modify accident risk.

As the causes of accidents are so multiple and the combination of causes in one individual so unique and propitious, it is not possible to generalize as to the one

universal cause of the human contribution to accidents and the violation of safety, and it is not possible to develop psychometric or aptitude tests for safety.

Aptitudes

Few people are over 40 per cent of their potential efficiency. I believe that heredity limits the development of any individual, and he can not be helped beyond his hereditary limitations. Until he becomes blind, hardly any person develops his ability to hear to his potential maximum; but even then he can not hear everything; the limit is hereditary. The same might be said of most of our other characteristics; heredity limits us. It is very interesting and perfectly possible deliberately to modify oneself, to guide and guard one's physical and psychological habits and tendencies, and to develop one's personality even beyond one's apparent limitations. All this is profitable both to oneself and to society.

Special Abilities and Special Defects

Some persons are gifted with special ability along one line or another, and there are a few humans who have several special abilities. One person may have exceptional ability in mathematics. That does not mean that he has a fine memory for everything, such as posting letters given to him to mail. A person may be a stickler for punctiliousness in appearance, yet be slovenly about paying bills. A workman may be very clever, apt, quick, and sure with his hands, yet careless in leaving tools around in dangerous places. A woman may drive a car skillfully over rough roads, yet she may become flurried in thick traffic in the rain.

The danger we are all too apt to fall into is the making of over-expectations of others, or of ourselves. Just because a person is much above average in some one trait or characteristic, we are apt to expect him to be just as much above average in all of his traits. Over-expectations of course fail. This failure leads to disappointment, and then that leads to hostility. Hostility becomes mutual. Loyalty, loyalty up and loyalty down, disappears. Without loyalty there can be neither leadership nor followership.

It is judicial, not critical, to keep on making ever NEW evaluations rather than to adhere to prior over-expectations.

Every mistake in human relationships brings its own penalty. The price is high.

Similarly there are special defects. Persons may appear to be average, but scrutiny over a period of observation will reveal some glaring defect. To us in medicine there are two pronounced defects. One is a healthy and well built body equipped with a child's mind. Mental defect we call feeble-mindedness. Another is acquired defect, such as the loss of memory and judgment after a stroke of apoplexy. Other special defects are deafness, blindness, color blindness, no sense of rhythm, and motor or muscular awkwardness. There are a great many kinds of special defects. One person simply can not learn nor be taught to spell acceptably. Others are slipshod in arithmetic, like the woman who whined at her husband when he was going over her check book stub at the end of the month. (Remember those good old days?) "Well, why make such a fuss, Charlie? I only slipped a little decimal point one place." You know, most family fights are over money they have not got. Silly, isn't it? Or good looks, or luxurious hair, long since departed. Fighting over things that are not! And your foremen will make just that mistake, and your workmen will, and this fighting leads to accidents. There is no gain in being emotional about special defects or non-existent things.

It may be hard, but it is fair and just and useful to be open-minded, open-eyed and open-eared in continually sizing up people, especially co-workers.

Coach Yost one evening explained to a group of us wild Indians the problem of sizing up sophomores who turned out for the football squad. In effect, he said that these boys came bearing fine football reputations from their high school teams and from the freshman squad. Some soon showed that they were not gifted with what is called the spirit of team work or team play. The coaches could not teach them that, nor use these men. Some players did not have loyalty. Or call it faith—faith in their coaches, faith in their plays, faith in their team mates. Others had. They had it or they had it not. Some players, it was observed, tended to shirk or avoid mauling plays. It is hard to charge a man with lack of personal courage. But they had it or they had it not. It depends upon the formulation and the development of their character as influenced and modified and evolved at home or in adolescence. It can not be added as a native endowment in the three months of the football season. It is better to tell the boy in some non-crushing way, "Son, sorry you had the flu. Better turn in your suit. Try something else than football." But skill in the technique of football, that we can teach. And I think that we do. And we can *develop* faith and loyalty and courage if the boys come already endowed with a good measure of these personality traits.

So, with your workmen, in the various mental, emotional, health, and social factors that contribute to safety or to accident. Of any one specific factor under consideration, some have it and some have it not. I would further say, that under varying circumstances a factor may be less prominent and less useful than under other circumstances. Life is an endless parade of variables interacting. But skill, ah, there can be training in skill and in safety practices. Let us look into that.

A Few Definitions

Intelligence is the ability to use ideas. The proper use of ideas depends largely upon the constant use of them. It has been shown that twenty men with no musical training and no typewriting experience can be taught to play the violin and can be taught to typewrite. Their efficiency, except four, was all about equal. This was at one summer school. During the ensuing year, half did not use the violin any, and by agreement the other half did not type any. They all met at the ensuing summer school, and all had one review lesson on the violin and one review lesson in typing. Then they were tested. The average result, excepting the four I have mentioned, was that those who had during the year used their acquired ideas and skill in typing did better typing than the others, and that those who had used their violin skill and musical knowledge did better on the violin than those who had had a musical moratorium. If intelligence is the ability to use ideas, isn't it intelligent to use 'em once in a while? I do not refer to elections and things controlled by prejudice, habit, need, or hope.

But if we want our workmen and others to be intelligent about safety, they must have ideas on safety before they can exercise or use these ideas.

Sources of intelligence are two, at least. One is conscious imitation, and another is association of ideas. A workman may be aware of his conscious idea of intending to imitate a foreman, safety engineer or executive, but at that same moment, the foreman, engineer, or executive may be relaxed and not thinking of his being an example which will be imitated. So may we not paraphrase the slogan of "Watch your step" to "I must watch what example I everlastingly show"? In

other words, don't you scratch matches on a "No Smoking" sign as you go through the factory.

I am frank to admit that there may be hours when no one thinks to imitate you, to moments when someone will. We can find consolation in the parable of the sower—"Some fell on barren ground." Math. XIII-3; Mark IV-3; Luke VIII-5. Had he not made a conscious effort to sow when he could, there would have been no subsequent harvest.

In the association of ideas, thinking really is hard work for humans. Talking is easier for many, maybe for most of us. Conferences by inter-communication may help in associating ideas. All kinds of conferences, from family fireside conferences, to safety councils, to foremen's councils, to a congress like this, to legislative and oratorical congresses, to international conferences on this and that. There is much to be said for "participating talkies."

There remains, however, a duty on every man to try to associate his ideas into a useful arrangement.

Knowledge is information from others. It is acceptable in proportion to various things, such as: A. Impressiveness or prestige of the teacher (or author), and his attractiveness, i.e., pleasantness, or at least his avoidance of being repellent, and upon the community of interest shared by both teacher and learner. B. Concrete vs. Abstract presentation.

Pre-adolescent thinking is worthy of some attention, so I should like to digress here and speak for a few moments on puerile thinking and the change of thinking which takes place in the latter part of adolescence. I do this because it is so much easier to think in the way a child does and because when sick or convalescent, or very tired, or sometimes when or after being highly emotional, or when too relaxed, or when we feel free from observation by either our equals or by our constant associates we slip back into some of the traits of childish thinking.

One point is that a child can not think by analogy. We can, sometimes. The child may learn or be taught that he must not take pennies from mother's pocketbook on the bureau. All right, he quits, especially if he is given a regular allowance of a few pennies a week, for which he does not have to make an accounting. But being unable to think by analogy or comparison, he sees no wrong in helping himself to pennies from grandma's pocketbook on the kitchen shelf back of the clock. Then he is taught that that is forbidden. He, being a child, can not think for himself that it is wrong to take any money from any source. No. Not yet. So he swipes some from the teacher's desk at school. Caught. That too is out of bounds or contrary to that rule. Only when body and mind mature together does he think for himself that all swiping is forbidden and that it is up to him himself to forbid him taking things not his own or not yet earned nor given. Yet how easily we grown-ups slip back. I would not think of picking flowers from the yard of my neighbor, my constant companion. No indeed. Yet at Lincoln Park they put up signs for such as me or all of us, "Do not pick flowers." Away from home it is often too difficult for adults to think in a grown-up fashion, too difficult to think by comparison that if it is wrong to pick flowers one place, it is wrong to pick them in another place. This is called the "Holiday Conscience." You doubt it? Visit some big convention sometime, and see and hear and feel for yourself.

Women are prone to think by analogy. One of mother's maids was observed taking some medicine of mother's. Questioned, she replied, "If it is good for Mrs. Hulbert, it must be good for me."

Men too. For example, several autos approach a railroad crossing. The driver

of one of the rear cars says, referring to the driver of the car just ahead of him, "If it is safe for him (to cross), it is safe for me."

I do not want to go on record as saying that thinking or reasoning (?) by analogy is high grade thinking. It is not. It is higher than being unable to reckon to analogy, but it is much lower than factual or judicial thinking.

Another difference between the thinking of childhood and youth and adult thinking is that a child's memory is fragmentary and an adult's may be continuous. "Maybe," because there is a difference, as we shall see soon, between "total memory" and "available memory."

Another difference is that a child imitates but does not respond from internal stimuli, self evolved, to such sentiments as motherhood, loyalty, patriotism, impersonal moral indignation. Surely a little girl can "mother" her doll apparently just as her mother actually "mothers" the baby. It is imitation. Comes a fire department, and she leaves the doll carriage where it is while she runs to the corner. Towards marriage and its duties and obligations, some childlike-minded persons leave their mate, for when a torch dancer (or what not) comes they rush to the corner. Another example is waving the hat and cheering at a parade when massed flags go by, while there reposes in the pocketbook an unpaid tax bill. "I must see the alderman about it and maybe he can fix it." Loyalty? Patriotism? Yes, of a kind, but not of an adult kind. It is so easy to slip back. It is also possible to be very mature. We are a nation of volunteers; the drafting of men and supplies has the merit of being equal for all.

Another trait is that a child can not think in the abstract, but can think only in the concrete—from example. And it is much easier for us to think in the concrete, even the brightest of us. Therefore, gentlemen, you teachers and professors of safety in your work and in your own communities, I recommend that you teach in concrete ways by example, although in your own studying of safety and in contemplating it, you think in the abstract. When I have a class of senior medical students, bright young men in their seventh or eighth year of college, and I want to teach about a certain disease, I bring in a patient and place her before the class. Then the various symptoms become really concrete. I pick up the wrist and talk (teach) about the rapidity of the pulse and the heart's effort and strain. Thus the boys learn, and retain what they learn.

Returning, from the digression, to other things which affect the acceptance of ideas from others, which we defined as knowledge, another point is that the learners must not have a feeling of hostility toward the teacher. If there be hostility, there will not be learning, although force may inflict acquiescence of conduct. I do recommend that a foreman or teacher of whom everyone is in awe should be transferred to work of such nature and place that he will have a minimum of human contacts. Especially after strikes, the safety instructors should be selected for their agreeability or suitability from the workmen's viewpoint.

Ideas are impressed upon the minds of others by the intensity of the emotion used in the exposition. An Irish cop or police officer is a wonderful teacher. He can be both intense in his emotional display and be witty.

Ideas are retained, other things being equal, in proportion to the repetition of them, provided the repetition is so presented as to be heeded.

Ideas are acceptable if the learner realizes that he needs these ideas and will be bettered if he adds these ideas to his mental storehouse.

Ideas are also acceptable if within the mind of the hearer (or reader) there are

not already in existence prior opposite ideas. Re-education is vastly harder than education in the first place. Godly children from godly homes make better citizens than godless children do when they grow up. Good training, early in every phase of life, is the greatest single contribution to good practice subsequently.

Beliefs are information self-derived or from imagination. They are tenaciously held and are impervious to argument. Every inventor believes that HIS idea is wonderful. Did he not think it up himself?

Wisdom is knowledge with the capacity to use it. Like gold, there is not enough to go around and give everyone a useful amount. Therefore we must train persons whose wisdom may be deficient, train and train them in what they should do under a set of future circumstances. If they had wisdom, they would not need to be slaves to precedent and to training. In the army it is felt that only majors and higher rankers have wisdom in tactics.

We just said that wisdom is knowledge with the capacity to use it. Here, knowledge should be defined as *available* knowledge. All one knows is not always available, for mood, health, or circumstance (such as in a strike or in a panic) varies the amount of knowledge available at a given moment. The influences of moods or emotions, of health, and of social circumstances will be taken up in the three succeeding lectures.

Common Sense is the sense of proportion. It is a native endowment, I believe, and it can not be taught. You have it, or you have it not. Of course, everyone believes that he has these two senses, common sense and a sense of humor.

But this much about common sense may be learned. Do not nag about what others consider little things. A woman who makes as much fuss over her husband's spilling ashes on the carpet as she does about his coming home drunk so often lacks a sense of proportion, lacks common sense.

Why not nag? Complaining over two weeks at a stretch is nagging. Not only does the listener become calloused to the language, but a change takes place deep in his mind. Why? The subconscious mind has no negative. Like the bank clerk promoted to teller. He says to himself, "I must not steal. Oh, I must not steal. I *must* not steal." He may even seek strength from his Y.M.C.A. secretary or from his pastor. And they kneel down and pray for strength for this brother that he does not steal. Then he does steal. Of course. Why? Because the subconscious has no negative, and all it has been doing has been putting emphasis on the idea of stealing, not upon not stealing.

So in your safety work. Do not put emphasis upon the avoiding of accidents, although it is a spectacular way of teaching, but teach safety.

Mental Development is largely proportional to the experiences with which the mind comes in contact. Therefore, a rich life is one of varied experiences. This richness may be in part second hand. You safety engineers with your rich experience in safety work are teachers. You volitionally increase the mental development in safety of those who are receptive to your ideas as you present them. Use your prestige, gentlemen, so that they may be more receptive.

Memory depends upon many factors, such as recently learned material is soonest forgotten, whereas earlier impressions are more lasting. So start your safety instruction of a new workman just as early as you can. "All of us at this factory are keenly interested in safety, and we think poorly of men who cause accidents. If you want to know the methods which enhance safety and what you yourself can

do and learn to be one of our 'safe' workmen, we will teach you." Tell him that when you hire him.

Memory is increased by repetition which attracts and holds the attention. Also if thoughts are connected and related. Particularly the vividness of experiences fixes memory. Since 70% of the experiences which permanently color the memory are experiences of childhood, we who deal with adults are handicapped compared with teachers and parents in moulding personality.

Apperception is the ability to relate things together and form one picture image in the mind. Some folks simply can not see for themselves the relation between cause and effect. Some folks are too impetuous to correlate things even if they tried, and they are often the offspring of an alcoholic or otherwise poisoned parent.

Attention is affected by the intensity or by the emotional tone of the stimulus, by the ease of conforming to a late memory image, and by the relation of the idea claiming attention to constituted ideas. Attention may be diverted to more intense or more emotional topics or to one's personal problems. The man who finds his work of greater interest during working hours than his unsolved personal problems is not accident-prone, but is apt to be above average in success. If his work is so interesting as to hold his attention in the early morning hours while his rivals sleep, he will progress far: this presupposes good health and hygiene, for without an abundance of this, Nature enforces rest at the expense of qualifying for social advancement.

Training

Man and some higher animals can be taught by repetition of similar stimuli to react in certain ways, which are not the original way of reaction to those stimuli. For example, the smell of coffee and sizzling bacon arouses hunger. If breakfast is always prepared when the seven o'clock whistle blows, eventually the sound of the whistle without the odors from the galley will arouse hunger.

This is called "conditioning." Well conditioned children are neither curious as to the source of the smoke nor in panic from it when they hear the school fire alarm: they are habituated to start their fire drill.

Training of workmen in safety attitudes is a matter of conditioning, of getting the safety response.

One of the best ways to achieve this is the apprenticeship-in-safety method, apprenticing either to a workman known to be a man with a good safety record or to a foreman.

An essential in early training includes the establishment of bonds of sympathy, mutual understanding, and approval in one or two things unrelated to the conjoint occupation, such as interest in band music or old-country customs, or passing on at noon a copy of the "Detroit Free Press" if both men originally came from Michigan, or conversation about big league baseball, or an invitation to go to lodge or church together. These will lead to a real interest on the workman's part in the foreman's hobby—safety.

The classic method of teaching for permanence of belief is the method of the old Greek Socrates. He taught by asking questions. But each question was so phrased that there could be but one proper answer. A series of questions led to the inevitable conclusion. The student believed, however, that he had discovered for himself certain truths. He and that conclusion "lived happily together ever after." So, if you can lead a man to think out for himself certain safety principles, he will, other things being equal, be an exceptionally safe man.

Take the field of slogans. No matter how unimpressive a slogan may be, if a workman evolves it out of his own mind, let it be placed in a position of prominence and honor for a few weeks. Of course he will think better of it than will the other workers, and his interest in it will last much longer. The intangible benefit from it is that from then on, he will be safety conscious or safety minded. Slogans which are epigrammatic "click," such as automobile slogans like "Children should be seen and not hurt," or in re night driving, "Turn down your brights when you see two lights," or re sunset driving, "When the sun's at your back, don't let your car look black," or "Turn on your lights when you see your own shadow before you."

Priority establishes normalcy. The first experience of a kind to which an individual pays heed becomes the precedent for him forever afterward in what he regards as the normal or proper thing. So with new men and with men returning to work after an injury or lay-off or strike, it is imperative that their first work be done safely and successfully; this result can be achieved by supervision and by selecting for them then tasks which they are sure to do safely and successfully.

Some persons need continuous training or supervision: only the brightest or most mature or those of good family (then only when healthy and when not fatigued) can get along after training and supervision stop.

Due to resistance to change, which the physicists in their laboratories dealing with inert matter call inertia but which is equally true with single and group human minds, things once started going in one direction tend to keep going the same way. People so resent change that novel changes are called unorthodox, the inferences being that there is something wrong about the new compared with "the good old days," or "when I was a beginner," or "under the old man we did" such and such or so and so.

To decondition a person and then in a different way to recondition him is extremely hard. To forget and then to learn some other pattern of reaction is so hard that the enthusiastic aid of the individual must be enlisted. Once when there was a student riot at Ann Arbor the public officials and the college officials made deputy sheriffs out of the ring leaders. The riot died. A fine man known for reckless driving was so often arrested that he and the police officers became well acquainted. One day at the station while visiting (and awaiting bail) the Lieutenant interested him in participating in the conjoint citizens' and police committee engaged in finding jobs for homeless boys. Later he was put on the village Safety Council. He now is a fine man and a careful driver.

Training and practice until automatic is a desirable goal. Rehearsals are valuable and tend to obviate the need for the making of decisions and definitely tend to lessen the uncomfortable and the useless state of mind called surprise.

Identification

We tend to cast ourselves in different roles, to identify ourselves with our heroes and see ourselves in them. It is stimulating and a basis for ambition. It is effective when a man himself makes the identification of himself with another, but it is disastrous if an outsider audibly COMPARES the man with someone else. Specific comparisons are objectionable.

Sometimes, however, both speaker and listener may be cast into new roles temporarily. A passenger upon dismounting told the bus driver that his driving had been atrociously reckless. The driver sputtered justifications. "Well, when the

road is narrow and a private car comes toward me, I let him go off the road as his car is light and his wheels won't sink into the shoulder." He lost his brass when the passenger said, "Sergeant, if we were both back in the army, I'd break you back to the ranks for your driving." "Sir, I'd not stay there in the ranks, but I'd earn back my stripes. I can be a good driver. I must have put on a leousy demonstration. Thank you, sir, for calling it to my attention." He saluted smartly and turned away. I'll bet he never had a higher rank than corporal either. Sergeant! Identification.

Rationalization

Only *after* the mind has formulated an idea or belief does the person attempt to explain how in a rational way was that idea or belief thought out. This process of after-thinking is called rationalization. It is always incomplete and usually inaccurate. In fact, the more emotional the idea or belief, the more inaccurate the rationalization. It is useless to ask a man, "Tell me just why you did so and so." It would be still more useless to ask him why he did *not* do so and so. It would be folly, you realize, to ask someone to explain *fully* why he is a Democrat, or an Episcopalian, or a Mason, or why he prefers "Who is Sylvia" to "With a hot cha cha." It is sense to ask a man, "Tell me what you can about what happened and what you recall of what were your contributions toward the episode." The primitive need for self-justification creeps in. Without some self-justification, some self-excuse, some memory failure and some retrospective falsification of memory we and all our ancestors would have or would have had need to face suicide. However, an abnormal and a hurtful amount of self-deceit is called paranoid and is incurable. Equal self-criticism and self-approval, well based, is proper and stimulating.

Conscience is self-direction to act alone in the same way we would act if we realized we were under observation. It is funny, but conscience, like so many other mental traits, is not a constant. It increases and shrinks like an accordion. We are better (golfers excepted) on Sundays than on week days. We are worse alone or almost alone. We are better when we are not tired, and one mother said, "The kids act fresh when they are tired."

Good influences with normal people linger longer than bad influences. Hence the enormous influence of churches, ritualistic fraternities, and contacts with our superiors, noblemen.

Accepting for the moment this definition of conscience, then there may be many kinds of conscience, moral, financial, social, and, what we are mainly concerned with today, SAFETY CONSCIENCE. It varies, depending upon health (and under health I include both constitution and age), upon mood, and upon environment. But before it can amount to much, it must be developed and the ideas relating to it implanted in the minds of men.

Conscience needs reinforcement. The best reinforcement is having friendly supervision and at both expected and at irregularly unexpected times. One college student said, "I never needed a chaperon when I had one, and never had one when I needed one." I bet she told the truth.

Spirituality

For success, man needs a spiritual factor in his make-up. If it is powerful within him, it becomes a guiding force. It augments faith, colors determination, causes him to grant and to expect mercy, and, by balancing self-interest and concern for others, is the basis for this glorious national movement for SAFETY.

WEDNESDAY MORNING SESSION

October 4, 1933

LECTURE II

The Role of Emotions or Mood on Effort

We are only apparently blasé or non-emotional, and actually normal persons react more to their emotions than to their knowledge or intelligence. Discipline of mood is by modifying the environment of the mind.

Problems

A problem workman, like the problem child, is not so much a problem to us in trying to handle him beneficially, as he is a person who has problems of his own which are still unsolved. These problems are to him highly emotional. When a workman is highly emotional about anything except the work in hand, he becomes accident prone and a bad accident risk. His attention turns to the thing of greatest emotion, and without attention to the work his hands are doing or should be doing, his poor handiwork may invite an accident.

It is worthwhile to look into the subject of the emotions, and if possible to see what may be done about them by the individual involved, or by the others concerned with his welfare.

A Few Definitions

Emotions may be called affects (cf affectionate, a most common emotion). Affects are feelings which affect the body. Moods are feeling tones of long duration: they may be buoyant or depressed, may be transferred from one idea to the next and others, may suffuse or irradiate (like sunrise beams) to many other ideas entering the mind about that same time, or the mood may be one of dullness. Affects may influence the speed of flow of thought and the speed of reaction; we are slowed up when we are in a disagreeable or pessimistic frame of mind, but speeded up more and more forceful when pleasant and optimistic. Little waves of emotion of the same kind can accumulate (summation of affect) until they become very perceptible, such as in outburst of anger, or in joyous actions. Then there are certain prolonged states of emotion, such as ill humor, or being grouchy as when a patient has jaundice. There are even constitutional states of emotion, such as a sour or dour disposition. Emotions may be repressed from the conscious memory store, whereupon they may cause bodily symptoms, or although buried in the subconscious mind may break into the conscious mind at times and upset it. This break-through may be with clear or be with distorted memories. Homesickness and longing is disturbing and is in the conscious mind. Anxiety is a form of sadness plus tension.

Emotions may arise from many sources. They may originate within the individual, from memories, from readings or experiences or things previously thought of, from appetites, and from the state of health; or may arise from the environment, material or personal.

We are particularly concerned with the perservation (from *v.*, to persevere) or "hang-over" of the emotions, with emotions aroused before coming to work cluttering up the mind of the workman at his work bench.

Untrained

In the first place, emotions are more primitive than ideas, hence are more powerful in influencing us. Ordinarily one's reaction to emotion is five times as strong as one's reaction to ideas, but it may be countless times stronger yet.

In the second place, they are unschooled. We school our minds, the intellectual parts of our minds, in schools of learning. We school our morals and conduct in Sunday school. We school our bodies in sports and exercise and work. But where do we go to learn how to love or hate, whom, where, when, how much, how long, and what to do about it? Or worry and anxiety? Or fear? Or desire, or aversion? Or anger, or tenderness? Or pride or shame? Or any of the whole gamut of emotions?

We are brought up upon an ancient, incomplete and inadequate code of don'ts. Thou shalt not kill, but are we taught exactly how to keep others within the bounds of law and order? Punishment and reward, confinement and greater privilege, loss and profit are instruments at hand. We do not know exactly how to use them, for we are not trained. We have highly skilled and thoroughly trained pianists and violinists and surgeons and specialists in every vocation. In emotions we are all rank amateurs, very rank.

Worse than that, we have snarls of a lot of emotion with little intellect plus a memory disorder. These are called complexes. Of them *anon*. We can not handle them in ourselves, and we can not handle them in others either.

Complexes are identifiable by *ecremotionalism* from apparently slight immediate stimuli. They are not subject to voluntary control. So, in handling persons, keep off their complexes, and make enormous allowances for them.

Some persons are called "sensitive." It is too bad for them. To get good work and safety from them, train your foreman to speak quotably, fairly, but not harshly.

Worse than that, our emotions are most closely intertwined with our biology, with our many appetites and their cravings and their surfeit. The emotions, to and from one of the lower brain centers called the thalamus via the sympathetic nervous system affect all the internal organs of the body, also these organs affect the emotions. Example, anxiety from any cause gives heart symptoms, and heart disease always causes anxiety.

Fortunately emotions are responsive to persons and conditions in our environment. There lies a lever to move them purposely.

Three Important Things

Probably the three most important things about any and every person are: (1.) Being born. Birth control is silly and unnatural, and one-sixth of women who practice it, eventually, at the menopause, become psychopathic. (2.) One's immortal soul. (3.) One's emotions. There are other things of importance, of course, such as health (including heredity and constitution), social and economic status and others which come to mind. Emotions are too valuable to misuse.

Conflicts

Conflicts are normal, especially for males. Conflicts may wound, but conflicts are not sickening. That is, if when in conflict, something may be done about it, and if the conflict has an end.

Being in a state of mind to engage in a conflict, yet being unable to engage in conflict does hurt both the personality and health.

The worst conflicts are when a person is at war with himself. I can not fight me. Another malign form of conflict is against intangibles, like contradictions in theology, or wishing the past had been different.

Use but do not misuse the intangibles. For example, use religion; do not get wrecked upon its bar but cruise within its protection and guidance. Leave the study of intangibles in religion to the theologians, while you get to understand and live up to the rules of good conduct according to your teachings and belief. In the same way, you should know the rules of hygiene without knowing the philosophy of medicine. And in the same way persons should come to know the rules and practices of safety without the deep knowledge of the rationale of them as the safety engineers must.

It is unfortunate also to be in conflict with an enemy or with an inimical force which is so distant as to be inaccessible to counter attack. Poverty classifies here, and kidnapping. It is sickening to be at heart in conflict with the actions of those whom we love. "Oh, I hope (or hoped) that our daughter would become engaged to Peter and not to Paul." Or "I wish my wife would not drink; nor dance with Oscar while I am on the night shift."

I think it is proper and good sense for a person in conflict to get aid, and I think it is smart for the personnel division to invite those in conflict to seek their pastoral advice. Probably the welfare worker can pour some oil upon the troubled waters.

Conflict which has no end and no outlet leads to mental and to nervous exhaustion and may lead to terrific physical fatigue, tremors, inaccuracy and irritability. Perplexity over entanglement by a loan shark is one example of unending conflicts in the mind. Living perforce with too many relatives seems interminable.

A man engaged in conflict going on in his inner mental life is the most accident prone of any healthy workmen.

Effect of the Home

Anxiety and anxiety states, feelings of insecurity, and morbid doubts usually have their origin in the home, either by certain deprivations in the social or biological aspects of family life, or by imitation.

This is most easily seen in problem school children. The emotional stresses and strains of the parents at home are impinged upon the children. The children come to school emotionally fatigued. There they show distraction of attention. Consequently they can not react emotionally to those things which arouse the other children, who are not emotionally fatigued but are fresh. School work does not interest them. Their capacity for interest is burned out. Also they can not accept into their crowded minds the new ideas the teachers offer them for absorption. Thus, we see, there are accumulations of the disadvantages resulting from domestic stress.

Many of these children become workers, and all of them, like the rest of us, are exposed to risk of accident in their personal lives. The habits of worrying and of doubting or feeling insecure carry on into adult life. And if they fail to establish homes of their own full of mutual love and esteem, rich in the fulness of life, then they, already predisposed, become flighty and unstable.

Being in love is hard work and occupies the mind more than forty hours a week. Being in doubt about love is terrible and troubles one almost 168 hours a week. It ranks next to the distress of semi-facing the probability of impending death.

Hurry

Being hurried too long, especially being hurried by others, ordinarily causes emotional and mental fatigue before it causes physical fatigue. When one is free from self-blame and hurries himself because more or less indignant at circumstances, then hurrying is not productive of trouble.

Some persons are impatient. They provoke accidents. They are usually below par in health. Comfortably fat folks are not apt to be impatient.

Impetuous men are bad risks. One effort, and then a jerk! "Hang it all!" Usually they have alcoholic ancestors; and if so, their impetuosity is incurable. They should be transferred at once to less hazardous work. They can not be trained nor become self-trained to be cautious. Judges should be strict in taking from them their driver's licenses.

Gamblers, too, are unsafe. Often subconsciously, they prefer excitement with risk to monotonous safety.

While we are listing constitutional bad risks here should be classified psychopathic and sadistic (cruel) persons, for they remain psychopathic and the sadists are repeaters of recidivists. They should be shunted aside, as a street car snow plow and rotary brush shunt snow and slush into the gutter. They should be retired from general circulation. There is no free place for them in a civilized world.

After Injury

Self pity is weakening to the personality. A person occupied, even in light duty, is not self pitiful. Therefore, keep your convalescent workmen busy within their strength, and upon recovery you will have trained and experienced workmen. That is better than hiring green men to replace them.

We hear a good deal about compensation neuroses. To avoid a chronic neurosis do not let the injured man offer a settlement and then allow your claim agent to try to beat him down. No. You should make an offer and give some sensible reasons for the amount of the offer, and let the injured man chew you up. Once you and he arrive this way at an agreement, both his conscious and his subconscious minds are in accord and not in conflict with each other. There will be no neurosis. Especially this will be true if meanwhile he is kept reasonably busy.

Sense of Guilt

We may be guilty of wrong things done, or of right things left undone. Even women admit having made mistakes of commission: of omission, never. Do not let a foreman try to make her plead guilty to something not done, for she can not see it. But have a big, hoarse, elderly matron or forelady iron out the working woman.

With the sense of guilt of things wrongly done, every individual needs must, and because his ancestors were human, does offer to himself self-acceptable, sufficient self-justification to be at least 51 per cent or more not guilty. At that, he is probably right: we are so complex and so little master of our fate.

Some poor souls are obsessed by a sense of guilt of things thought about, of things not done at all. They are haunted. Their work falls off. They become slovenly. They lose weight, hence the phrase which is really keen, "What's eating you?" They need reassurance after confession. All thinkers on this subject agree that no one is responsible for unwholesome ideas which pop into the mind if those ideas are rejected at once. What these folks next need is a hobby or diversion, which leads to at least a bit of success and local renown. Incidentally but essentially

they must regain the lost weight. Diet and hygiene should do that. Sickly or half-sickly states of health too often cause sickly emotional tone to sickly ideations. Few folks have enough exercise away from their work.

Shame and Inferiority Complex

From childhood on up we recognize inequality between ourselves and others. A boy says to himself that his big brother is a man, almost as much of a man as his father is, but that his little brother is only a kid. A foreman realizes that Mr. Kirk is the superintendent or the "Old Man," but that Isadore Kominski is a green hand freshly employed. All that is normal. Why? Such contrasts are factual. They are not sources of embarrassment.

However, when an unwarranted comparison is made, then there is mental hurt. When a pale thin stooping boy is compared with a short stocky ruddy active boy of about the same age, when someone says to him, "Why don't you play baseball like Rudolph does? You ought to be ashamed of yourself for reading so many books," then an inferiority complex is born. All the necessary factors are here. (1) An unwarranted comparison. (2) A physical condition below par. (3) The idea of shame. It would be the same if the boy made the comparison himself. "I wish I played as well as Rudolph. I'm ashamed of myself."

Sometimes there are variations in the formula. Instead of a physical or bodily inequality, there may be a material or a social inequality. On a cloudy or threatening Easter-morning a lady decides to wear to church a storm proof (and storm battered) rather dark felt hat. She is seated behind a more courageous or frivolous woman wearing a bright colored straw and lace hat. "I never did like her anyway, I know something about her." She has an inferiority complex. She hears only part of the music. "Why don't they get a new tenor?" She is attentive to only part of the sermon. "Why do ministers always scold the congregation for those who stay away?" Feeling inferior, she is *pro tem* unable to appreciate excellence in which she does not share and to which she did not contribute.

Tell your foremen not to compare one workman with another lest he sulk, and not to use the word "Shame" or the phrase, "You ought to be ashamed of yourself" lest he become slovenly, slipshod, careless, and accident prone. It is better to say that he is a good man and a good workman but has a bad habit—let us say, of leaving gear around upon which others may trip.

Suicide

There is always more than one cause of suicide. Depressed mood is not enough. Feelings of intense self-blame, feelings of reproach and of remorse, feelings of hopelessness and of futility, feelings of impotence, any of these tend toward self-destruction. But they are not enough. There must be in addition a feeling of futility, of desertion. Love, support, encouragement, approval, everyone craves, and deserves, too, to a more or less extent.

Loyalty in time of failure, and a full biological existence, and wholesome hygienic living and some creative work of self-expression prevent suicide.

Since suicide is as much a community failure as it is a personal failure, we should be heedful not to increase its bad factors of shame, desertion, or lack of loyalty, and we should everlastingly push forward the antidotes of encouragement, hygiene, and expressions of our esteem of orthodox public and domestic living.

True Inferiority

There are many types. In every body some organs or systems are inferior to the rest. We are not built like the one boss shay of equal sturdiness in all the parts. Eyes may be weaker or wear out sooner than the heart, so we wear glasses. The heart in another is frail compared with the digestion. Such inferiorities are normal.

However Nature sometimes puts "seconds" on the market. Like tire seconds, they blow out or fail on lesser bumps in the road. Some persons are born inferior through and through. We call them cases of Constitutional* Inferiority. (C.I.) Mentally some are dull and limited, some are cowards, some are spunky, and some may be anything.

But to our topic. There are certain mental and emotional sub-classifications of C.I. The C.P.I. or Constitutional Psychopathic Inferiors are lifelong burdens. There is the Emotionally Unstable Type, easily excited, easily ecstatic, easily depressed or discouraged, easily angered, easily aroused, easily attracted, easily attracted elsewhere, and not faithful. Another type of C.P.I. is the Inadequate Personality Type, inadequate in love and in hate, in patriotism and fidelity, in honesty and sacrifice and service, in school and play, in workmanship and in safety, in sportsmanship, in everything except talk. Many are verbalists. They are not thinkers. They regard themselves as brain trusters, but I for one do not trust their peanut-sized brains. They and the preceding type are the prey of agitators, and many of the agitators belong to the following type. This is the Paranoid Personality Type. While it is true that these mild paranoids are constitutionally too frail to commit the mistakes and excesses of more rugged men, there are insufficient grounds to warrant their holding themselves in such high esteem. They are of jealous disposition, fault finding, suspicious, and self-pitiful. Self-excusatory, of others accusatory, when things go wrong. Home-made and homely reformers with a mission in life to perform. patient, painstaking, and persistent to an abnormal degree. Not clear thinkers, but protesters always. Verbose, not fighters. The blind leading the blind is a prettier picture than one type of psychopath leading other psychopaths. A communistic meeting is a clinic of C.P.I. and C.I.'s. They are a low blood pressure, low success record group who have a common blind spot for appreciation of orthodoxy and past achievement. There is no room in competitive industry for the C.P.I.'s, and in America there is no room for them except in private homes and Public Homes. Do not employ them. If by inadvertence you have employed some, assign to each of them an impossible task, and then discharge them for obvious failure.

Of all groups of workmen, the most unsafe are the Constitutional Inferiors and the Constitutional Psychopathic Inferiors.

Sublimation and Easement

Waves, sometimes accumulated into tides and floods, of tension sweep over us and almost engulf us at times. Emotions are baffled because the force of them is greater than our own puny force or ability to combat them. It is each man's duty to save himself by swimming. It is everyone's duty to permit others to save themselves, and if possible to help a bit in the struggles of others to survive.

*Constitutional: born with, not acquired. One is constitutionally two handed, though later one arm may be amputated. One is constitutionally blond, or tall, etc. No treatment or guidance can change constitutional conditions.

How may this individualism be assisted or accomplished? Sublimations bring easement of tension. One should sublimate his need for self-expression if and whenever he may not give rein to self-expression in customary and normal ways.

A sublimation must meet the following postulates, just as a key to fit a lock must have crests and troughs and channels to fit the tumblers in the lock:

It must be self-selected and not assigned by others.

It must be creative, in part at least, unusually largely creative, and not merely maintenance nor repair.

It must permit the person to do the planning, or at least to share in the planning of it.

It must permit the person to execute, in part, at least, the plans.

It must engage the hands as well as the mind.

It must be pleasant.

It must be a rather short task, not interminable.

It must lead to a visible result, the existence of which no one can deny.

It must be something of which one is not ashamed. Note, I do not say "it must be something of which one is proud." No. Something of which one is not ashamed.

For example, building a house or part of a house, such as a rock garden or making new curtains, writing a book, starting a movement like a local "Y" or Safety Council or Scout Troop, or a house organ, or a poker-debating-eating club. Anything creative, self-selected, permitting planning and execution and some hard work; and the other postulates.

New sublimations grow out of the old ones, and like so many original by-products, become greater and more interesting than the original sublimation. New sublimations ordinarily engage our minds and emotions (interest) and hands, about every two or two and one-half or three years.

They are wholesome and healthening. They keep one young.

Wishing vs. Teaching

Wishing is an extravagant dissipation of emotion. The silliest wishing is wishing others would change themselves. Proper mental activity is desiring others would change, and then engage oneself just as actively as possible in getting them to change. The world needs to be reminded as well as informed. The impressive forceful teaching of safety and safety practices is a practical way of getting others to change, provided we realize to some degree both their capability and their limitations for change.

Adaptability

It is folly to debate an accomplished fact. It is smart to adapt one's self to changes in the environment. The ones who adapt most promptly succeed best, be it daylight saving, right hand drive, elections, N. R. A., war, peace, or the enforced restrictions of on-coming age. The smartest persons are those who use their perceptions and their reasoning ability to anticipate changes in their environment so that they may make the necessary adaptations promptly and without emotions (pet on fire chains and put up the curtains before it storms) so that they can use their emotions in pleasant ways for the enrichment of their personal life.

THURSDAY MORNING SESSION

October 5, 1933

LECTURE III

Physical Health Modifies Mentality in Many Ways

The relation of the state of good health or ill health on lessening accident risk. Constitutional States. Youth and Age Transient or progressive conditions. Energy and alertness. Heredity, familial and racial.

Temperament

Temperament, by our definition, is not emotional sprees of self indulgence, but is the physical support the body gives to the mind by the support it gives to the brain.

A person with Bright's disease and some uremic poisoning is terribly dull. A person without anemia but with rich blood, and with a body healthy in the other characteristics, has his mind at its clearest. An unduly tired body means a tired mind.

As a body gets old and worn the mind grows old and worn. A body slow to mature has a mind slow to mature. A body poisoned, whether by an external poison like alcohol or by an internal poison like thyroid-toxin has a poisoned mind. A body denied something it needs or something accustomed to, be it a chemical like calcium, or a vitamin, or reasonable activity of one sort or another, has a mind which functions irregularly and unsatisfactorily. A body working under strain, like eye strain, has a mind which is touchy and sensitive. A body in pain has a mind which is grouchy or irritable or emotionally unstable.

Temperament is of bodily origin. A sickly body means not only sickly thinking, but sickly emotions, and sickly adjustment to society and to the environment and its changes.

Dis-ease

Attention is attracted to the state of health because of pain. Dis-ease, lack of ease, is called disease. Symptoms are what a person feels. Signs (of disease) are what others by observation, examination and tests find. We now know that there are many pathological states of body, and of body and mind, where there are no feelings of pain or distress, where there are no symptoms. In fact, in some of these the afflicted one feels extraordinarily good. Witness the euphoria or feeling of well being early in intoxication.

There are many painless diseases. Anemia, adenoids and tonsils, tuberculosis, epilepsy, Bright's disease, diabetes, blood pressure disorders, worms and amoebae are some. Some non-disease conditions enforce inactivity on one, cause distress. It is painful to be unable to be busy. As any of these may interfere with clarity of thought and with agility or stability or endurance of muscular effort at important or critical times. Is it not indicated and worth while to inquire into the state of health every once in a while of persons who are accident prone, and of those who are in positions of responsibility for the welfare of others, and also of people who are important to the world? Bright people who realize their own importance are the ones who are most apt to accept the idea of an annual physical examination on their birthday.

Inequalities

It is obvious to the observant world that people are unequal in every observable characteristic. No two faces are alike. No two persons are just alike, excluding of course contemporaneous siblings like twins. Since we are not alike in structure, it may not be assumed that we are just alike in function. One man's eyes or heart will fatigue easier than another's under the same strain.

It is proper to infer that there are hidden inequalities too. One person is more anemic than another. One needs more brain, or more rest, or more exercise than another.

I am here referring to the spread of what is called normal, and not having in mind those who really are sick whether they know it or not.

These inequalities may be of great number. And as each person has his own constellation, the whole problem of physical structure and function is very complex. No two of us are alike and from day to day no one is just like he has been nor will be.

Most of us have a tough time getting along with ourselves. And being a mother-in-law must be as hard a role as any in life. Or it would be if minds were transparent and easily read. It is hard to get along with others, if we be fog our vision of them by falsely assuming they are just the same always. Since the human mind does not always receive identical chemical and mechanical support from the body, and since the environment which stimulates it is forever changing without reduplication, and since the memories which flood it are kaleidoscopic in their alterations, and as emotions are in a state of flux, is it any wonder that personality is infinite in its presentation? Add the growth factor and our wandering toward an unknown goal (unknown to us frail temporary mortals), it is inevitable that there be a parade of reactions.

This is not discouraging, for we all fairly well know that, unless sick, any person's reactions will be within his normal variation of reactions. We need only to observe him with scrutiny to know what are the limits of what he might do or be or feel.

Normal is far short of ideal.

Ecology

There is some relation between the mind and the influences of geography and elevation. The mountaineer type is as rugged as his native hills, slow and resistant to change. Shall we call him persistent or stubborn? 150 years is too brief for them to transfer their loyalty. They are not as socially graceful as midlanders. Lowlanders, swamp livers are retreaters, are defeatists, are easily proselyted to new ideas or philosophies, and thence to still newer ones.

Heredity as shown in racial culture is more enslaving than familial heredity. We who deal with groups of men of definite racial differences know quite well that racial groups differ one from each other and that within each group there is marked similarity of characteristics. I believe that the racial culture is, for each group in its natural habitat and environment, a splendid culture, and is probably the best culture for it. The question is, is it a suitable culture for industrialized America?

I do not mean to say that members of any one racial group are safer or more accident prone than any other racial group. I do say that different racial groups need to be differently handled and differently taught. It is best to handle groups

(not your own) through their leaders, the foremen. Foremen are educable, are biddable, and are leaders among their own kind.

Constitution

Constitutional states depend upon a mixture of family pattern and upon the endocrine glands of internal secretion such as the thyroid, thymus, pituitary and others. Some human beings are born to be gigantic, others miniatures or runts; some to be fat, others thin; some to be dynamic, others to be passive; some to be mature, others sweet and simple; some to be alert, others dull; but none are born to speak any certain language or to be of any certain occupation, and none are born to be either safe or careless for such are matters of training and habit pattern of reaction to environment and self discipline.

Constitutional physical states do affect the mind in rather typical ways, affect it but not fix it. For example take the thymus and pineal glands. While the thymus gland functions the individual is sweet and nonaggressive and child like. This gland should wither at the age of nine years, permitting the individual to prepare to adolescence physically and meanwhile to prepare to wear himself from close parental supervision. Then the pineal gland begins to function, and by twenty-five or thirty it has lived its life span and by then the individual has fairly well attained his plateau of maturity. In some children the thymus lingers on too long; such children do not become self independent. A thymus child never would be chosen by his playmates to be umpire of a playground game. Not sufficiently self reliant and mature. In high school days, when continuous memory is well inaugurated, this sweet and passive attitude stamps out mental attitudes which persist for life. Or on the other hand, assume the thymus underwent its decline rather early or precociously. The child becomes quite independent in early years. Depending upon how well socialized he is in using this independence, he will become either a Horatio Alger supporting himself and family from tender years on up, or he will be the neighborhood desperado and incorrigible. Did McGraw of the N. Y. Giants ever have any thymus? Dynamic fighting leader!

Constitutional state of health, especially the evolution of the endocrine glands determines social maturity. The most frequent disorders of mental maturity are two, irregular maturity in some aspects (faster in one than in another like a basket ball captain who had a lot of leadership but was not manly in handling the team's funds entrusted to him), or the premature stopping of the development of this or that trait at a juvenile level.

Maturity is the assuming of self responsibility and of self guidance, feeling able to do the right thing or say the right thing without guidance, prompting or restraint; maturity is the functioning of conscience. It also includes willingness to accept credit or discredit for the past and equally to claim rewards or to pay in full for past mistakes and debts. The idea of a statute of limitation is immature, is puerile. Maturity includes the mental trait of being able to suspend judgment, final judgment. Last acquired, first lost. Real old people decline in maturity as irregularly as they had achieved it.

And so we speak of types of personality in terms of over function or under function of various glands. The point for us to consider here this morning is that all persons need to be *taught safety*, but that depending upon their constitution and personality they will *learn* differently. So to get them all for their own sakes and for the sake of those whom they do or might affect, WE MUST OVER-TEACH SAFETY.

Laziness

There is such a thing as laziness.

The term "lazy" should not be applied to children, because the so-called lazy child is not a well child, and examination shows anemia or Bright's disease or poisoning from adenoids and tonsils, etc. It should be reserved for the self-indulgent adult—then applied only if it has been ascertained that he was well-born and is in good health and has sufficient energy if he but will make adequate efforts to do what he really knows is the right thing. Most so-called lazy persons are not only self-indulgent but are cheaters habituated to impose upon others, and therefore are selfish, like the road-hog or like the chronic fishing-bum whose wife labors to support the family. The treatment for this type of selfishness is the same as the treatment for vice and criminalism, namely, take the profits out of it: this may include penalty and restriction of liberty. Many folks are too lazy to make the proper effort to apply their knowledge of safety measures; they should be disciplined severely, especially upon their second offense, for their own sake as well as for that of others.

The impetuous child and adult is the offspring of an alcoholic or otherwise poisoned parent, or else he is hungry and craving natural intake or activity. He cannot be deliberative to suspend judgment nor suspend activity.

Daily Variations

The terrific late morning and mid-afternoon fatigue which leads to nervousness and weakness (lack of endurance or lack of initiative or both) is caused by insufficient diet. Many people do not eat enough. "Eating makes me feel full." In time their stomach and bowels get small and get used to small meals. But the body's need for good food, mixed food, in adequate amount, has not lessened. Nature then puts the brake on loss or drain by a feeling called "tired" which lessens work.

Self indulgence in denials is as common as, in others, is self indulgence in excesses. Mental self indulgence shows itself in the fallacious policy of self forgiveness in advance. Self indulgence weakens particularly those who already are weak or weaklings, especially the psychopathic inadequates and immatures. They need strict orders given by someone with prestige. Self indulgence only is proper in the seniles or in an early stage of convalescence. Self indulgence in most of us shows in denying ourselves opportunity to work or exercise often enough and hard enough to sweat.

Night dreams and night terrors affect the health and spontaneity and fatigability the next day. So does night life! Normal good conduct and normal daily activity helps us bear our burdens: poor hygiene means the selfish, uncivilized subconscious mind works through the night in devising some expeditious method of unloading troubles. Without calm rest we awake already tired. The sedentary wife who has on her hands a husband at home irritable and sick, at home for a few days because he has tonsillitis, dreams of death. Whose? And the next day she is overwhelmed by lassitude with insufficient energy to meet even ordinary problems.

Included under daily or periodic variations of health may be listed constipation headache, headache from eating wrong foods, from not wearing glasses, from toothache, from twinges of neuralgia or of rheumatism, from neglected painful feet.

The toxic effects of colds, sinus affection, bronchitis are shown in dullness.

Many persons of well integrated personality and who are self-disciplined into good mental habits and attitudes can "free wheel" for a few days when a bit sick

and maintain their poise and rhythm. Weaker ones last only a day or so before they "go to pieces." It pays to be constant if we want to be esteemed while sickly.

The Half Sick

There are relatively fewer healthy sturdy persons now-a-days because more frail children are assisted to grow up. Lower death rate among children means more semi-invalidism or lack of ruggedness in mid-life adults, and also means more folks live to the decades of cancer and apoplexy.

We have fewer epidemics. Yet we have relatively fewer good bodies to support the minds of our people. This may mean an increasing irreducible minimum of minor mistakes in all kinds of thinking and reactions, social, economic, political, safety and what not.

The fact that a person reaches a certain age, 40, 50, 60 or anything you will, may have meant that he was unusually sturdy: now it may mean that he is frail but has been safeguarded. Better get as strong as you can, and keep strong as long as you can. Theodore Roosevelt exemplified what he preached, the strenuous life.

Therefore, those from 35 to 55 must realize that though it may be possible for them to meet the competition of those of equivalent years, they must be strenuous in their own hygiene if they hope to compete with younger men and women.

The half sick includes especially those with low blood pressure. They usually have an associated low blood chemistry, low blood sugar, low calcium, low iron (anemia), and low vitality and endurance. Many are heroes, engaged in the battles of life with low velocity arms, yet they force themselves heroically to keep up. They are more comfortable in sedentary work and living, yes, but they run the risk of that dreadful condition of senile dementia. There is no medical cure for low blood pressure. A little repair work here and there, shed a tooth, take some iron. The prevention and relief of low blood pressure is outdoor work and outdoor play.

High blood pressure is the risk of the slave driver who has made a slave of his body and driven it too hard and too continuously. "Who do you think you are anyway?" I often say to such a man. "Do you really believe you can improve upon nature, tinker and alter natural equipment, and without really giving the matter your deepest thought either?" "Be reasonable. Haven't time? All right, it's your stroke and not my headache." Fifty-five to 65 are dangerous years for the human dynamo. However, with reasonable attention to health and hygiene our best men may remain our best till their seventys. Otherwise judgment and memory and emotional stability and T. P. M. (thoughts per moment) insidiously start to fail.

Alcoholism. Changing political viewpoints can not change physiology and pathology. Eyes read, yes. But chronic gastritis and toxic parenchyma of the liver and heart muscle cells, etc., can not read to see what is the latest bulletin on the legality of permission regarding the sale of liquor. In all seriousness, I do say that the constitutional make up of the body has a great deal to do with the ability to withstand moderate alcoholism. Poisoning is poisoning, whether it takes 60 CC to poison a civilized man or 120 CC to poison a hairy atavistic man. If poisoned, then poisoned. There may be every gradation of poisoning in degree, in symptoms and in duration. The social implications are obvious. A doctor abhors the degree of anything which hurts body, health or society.

An interesting variation of half sickness is vagotonia and its opposite state, over-tone of the sympathetic nervous system, sympatheticonia. There are two opposing sets of involuntary nervous fibers going to the internal organs. One set of these nerves stimulate some of the organs to increase their function whilst it checks the function of the other organs to which it goes. The other set of these nerves go to the same organs but have opposite effect upon the functioning of these organs. Usually the two systems are in pretty good balance, sometimes one set predominating a bit, sometimes the other predominating depending on the time of day or upon activity or opportunity or emotions or environment. Whichever predominates influences the mind the more. Sometimes in a shower at night we get up to close the windows, and sometimes we say to ourselves (not aloud lest the mate hear it and know we are awake) that maybe it won't rain hard enough to rain in and that it is all right to stay abed. Sometimes take a chance, sometimes conservative. The relation to safety risk and to accident is obvious.

However, in some persons, even in the fluctuation of the strength of these two opposing sets of nerves, one set always predominates more or less but predominates. In other persons the other set has a varying degree of superiority. We differ so. Some are always pessimistic, crave 9 cups of coffee a day to keep going and are benefited by the coffee, chill easily, have low blood pressure, are abrupt often, and may be reckless. Other persons get palpitation or insomnia from coffee, have fair skins, get alarmed and are kind and may be tearful. How can we classify them? I dare not. Someone classified these two extremes as perennial front seat drivers and perennial back seat drivers. The most of us, in good nervous balance, can comfortably alternate in riding in front and back seats.

T. T. T.

The three Ts, Tumor, Toxic states, and Trauma, are the only three physical conditions affecting the mind which may overtake anyone at anytime of life independent of his care in safeguarding his health and hygiene. Tumor, as used here includes brain abscess and meningitis and inflammation of the brain. Toxic states are poisoning from either external sources (gas, alcohol, lead, etc.) or from internal sources (typhoid fever, delirium, chorea (St. Vitus dance), thyroid poisoning, food or vitamin deficiencies, etc.). Trauma is head injury, usually with unconsciousness, irrespective of whether or not there is skull fracture. Its sequels are memory failure, head pains and head sensations, bad judgment, coarseness and fatigability.

Relation of Age

Age affects mentality. Children think as children, even if they have the knowledge of their elders. Youths are acquisitive and curious; in age they become conservative, or if abnormal, they become spendthrifts or misers. The healthy, somewhat educated, young American boy of 17½ to 23 is so alert and energetic that although in peril, he causes but few accidents because his apperception is so keen and his reflex time is so fast. He has courage and is not falsely modest about it. Older, he strikes a plateau, where health and emotions color his life. Still older, his environment and public regard affect him more.

Grief

Human nature is not built to adjust to sudden increases. What a flurry and hubbub is made over the marrying into the family of a new daughter. And when a new son is born! Great emotional excitement attends the arrival of a new car

or the moving into a newly built and owned house. How comically awkward the newly rich are.

Human nature is poorly built to adjust to sudden decreases. What secret grief is created by the going away of a daughter recently married. Terrific pain attends the realization that a loving couple unfortunately must be childless hereafter. The loss of property by fire, theft, accident, or business reverses is almost overwhelming. The impoverished are more pathetic than the poor.

Grief for those gone from us for the rest of our lives is prostrating. The lovelier they were and the more beloved they were, the more keenly they are missed here. If the one for whom we grieve stood in one of the seven or eight closest of human relationships, father, mother, brother, sister, son, daughter, husband, wife, or betrothed, then grief is indeed intense. Extreme grief is either for the loss of a son when approaching manhood or for a lover taken away just before marriage.

There is no one normal reaction to death; there may be many normal reactions. There are many different abnormal reactions or attitudes. Each individual reacts differently. Only those over seventy-four years of age, accustomed to decreases and shrinking in everything, are not upset by death of relatives or friends.

In the human mind there is some vague and close relationship between death and sacrifice, especially voluntary sacrifice which is not a selfish escape.

There is a dignity and a nobility in dying for one's God or country. Right men embrace the opportunity to risk it. There is also a worthiness in dying by sacrifice for the helpless and innocent, such as trying to save a child who has fallen from a bridge. The survivors are proud of them as heroes.

But every human mind since the time of Abraham revolts against the wastage of human life when the victim has not volunteered to risk his life. When humans are sacrificed needlessly, there remains no pride to salve that grief, only sickening baffling anger that it occurred.

In the human mind, ancient and modern, there is a deep-seated belief that there is a Divinity and that there is an immortality, incomprehensible and undemonstrable as it may be. Among my acquaintances among American, American-born psychiatrists there is the simple firm conviction that there is a God, and there is an hereafter. These wise men know better than to try to think much about it and its many questions, maybe because they realize more than others that there are many hard questions unanswerable by human intellects. If anything, they keep their thinking vague, and tend to believe that probably the virtues and potential best spirituality of each soul survives somehow.

Faith, faith based upon previous demonstrations, is necessary in anticipating the reactions of life. Without faith, we might as well as quit. With faith, life and living are practicable. The simpler the faith, the better. Those who grieve need the comfort of a lifetime of faith. They do not help matters by asking questions nor by seeking answers. It is sufficient to believe that there is a God who understands both life and death, who controls the past, present, and future, all according to rules of which we today here know only a part.

What those who mourn may well do is to memorialize their beloved. They may dedicate themselves to carry on some characteristic of his life-work. Or they may keep his memory green in their own hearts and in the hearts of others. But whatever they do, they must keep active about it, tenderly but actively investing part of themselves in their dedication. Meanwhile, without quarreling with Fate, await reunion beyond imagination.

And toward one's own death the sanest attitude to take is that of a child going to sleep and who, trusting, hears the voice of love and superior guidance say, "It will be all right." Then the voice inaudibly whispers to itself, "Somehow."

Death

Accidental death may or may not be painless, and is hideous. Non-violent death is painless.

Normally it is a gradual concentric narrowing of the field of consciousness and a gradual dimming of perceptions, a blurring. Consciousness and perception clarify and wane, without terror and without memory and without ability to force oneself to think. Emotions filter through and are mutually exchanged, but ideas do not get through. The mind seems free, interested but acquiescent without protest. A bit of revival of life is sweet, less is calm.

A comparison is when one sits facing west in the last car of a safe train going east through a series of tunnels at sunrise. The hills are gray green, with fog in the valleys. Suddenly the train plunges into a short tunnel.

The field of conscious visual perception is restricted to the entrance of the tunnel, practically a circle with glistening rails like beams of light from the center of the circle to our eyes. Fogs and most hills are lost to sight, only the sky and a few hill tops are seen. The circle grows smaller. There is some fogging by billowing smoke clouds, but a few hill tops appear in brighter green, in softer green as smoke intervenes, in brighter green between billows. The circle gets smaller. Then the tunnel ends, and the world of sky and green hills with their lights and shadows and the valleys lost in fog appear as before. One sighs a bit, is calm knowing it was safe, and one was interested. We rush on. Another tunnel, longer. The same feelings and perceptions. Out again. Calm interest, security, no apprehension nor distress. In and out, in and out. Then without warning and without any different start, without knowledge that it is the last tunnel, consciousness is restricted to the circle of what is just before our eyes, to what is most welcome and familiar. Colors dim with the billowing darkness and the circle gets smaller. Colors dim and forms dim and the circle gets smaller. Colors and form become indistinguishable but there remains a pinpoint of light. It gently goes out as the train goes around a curve toward an unforeseeable destination. THEN, suddenly and without warning appears a new world, a new country, all bathed in golden light, no foggy valleys, a different terrain, and *journey's end*.

Conclusion

What conclusion can you draw? Certainly not to practice medicine on everyone who may precipitate an accident. You must make great allowances for variation in health. You may place more emphasis upon hygiene and happiness and outdoor living if you would increase public safety.

FRIDAY MORNING SESSION

October 6, 1933

LECTURE IV

Social Psychology and Safety

The relation of members of the group to the individual and the relation of the individual to the group. Training in complying with group standards, especially safety standards. Individual variations, many forms from many causes. Understanding oneself and others enhances individual and group successes.

Greater Need for Safety

Certain safety practices and safeguards have become outmoded. What was adequate one year may not be adequate a few years later due to other changes apparently unrelated but actually affecting them. For example, when Auto Highway U. S. 12 was built a few years ago through Michigan, it was a fine highway for the traffic then, considering the width of the trucks and busses and the speed of the traffic. Now it is too narrow and its curves are regarded as dangerously sharp.

Human evolution and life is rapid in so far as the improving of the environment but human evolution is historically slow in the development and acceptance of new ideas.

It takes three generations for a people to accept new made laws or cultural characteristics. For example, the advantages and the propriety of no slavery, or drive on the right side of the road, or daylight savings, or temperance, or the advantage of a public school system, or safety. After the people accept a new idea into their culture, the idea must be taught to every incoming generation and the adults must be reminded as needed from time to time.

We will have to do with larger numbers of men as employment increases, and included will be large numbers of men who are not now in the habits of hard work and mental alertness, and we will also have to do with new men not heretofore employed nor trained, and with increasing alcoholism and with men burdened with worry.

Among the new men there will be two groups, both extremists though of opposite extremes. One group will be those who are indifferent or are hostile to the plan of taking on in employment large numbers of men now not employed, and the other group will be certain psychopathic individuals and faddists and persons who have grown old without knowing it and who take a "what's the use" attitude towards safety teaching and safety practices. We should pay little heed to either of these two extreme groups but concentrate on the middle 70 per cent of persons who are called normal.

The apprenticing of new young workmen to foremen or to workmen known to have a good safety record has been mentioned. It is also important to apprentice in the unique ways of an industry mature and trained workmen who have heretofore worked in some other industry or factory, railroad or quarry. Their ability to fit in with the safety practices in the new place should not be taken for granted. If the workman has a record of having been employed in a great many places, then you had better see that his local training is particularly well done. There may be something the matter with him.

Since health and hygiene are so important in safety work, it is advisable to see that when they are apprenticed they are placed under foremen or workmen who are healthy and live normal hygienic lives.

Social Instability

The scientist anticipates that both group psychology and social psychology will show a lot of *damned good sense* and a lot of *damned nonsense* in men in all walks of life.

He further anticipates that there will be more violent but briefer oscillations of the following: of wars and peace, of booms and panics, of following experiences of the past versus trying of new experiments. Train your men to save some of their money to survive the next panic, because it will be sharp and severe, even though it only lasts a very short time. Your executives and your workmen should realize that right now world-wide international peace is very unstable, and they should be prepared for both war-time industry and peace-time industry although it is not likely that any of the next few wars will involve the United States. Japan wants India more than it wants Mexico or the West Coast.

There is nothing necessarily wrong with any new idea any more than there is anything necessarily right about it. It is just a new idea no matter who propounds it. New ideas which fail are bitterly expensive in every way. The true worth of a people lies in the people themselves and not in their governments.

Racial Culture

An individual in all probability can best fit in with the culture of his own breed or race. This is true as a generalization even though he be reared in the foster home of another race. Only the unstable members can easily accept the religion and the philosophy and habits of a widely divergent race. In fact, racial characteristics are presentations of the personal characteristics of any race under consideration. Where except Scotland could stern Presbyterianism be evolved? Mercy is the keynote of the Irish religion, as it is of the Irish persons, in much the same way that masochistic or self-cruelty is a characteristic of both the Pueblo Indians and of their tribal religion. The British show dignity both in their religion and in themselves. The Italians feature the strict code.

In industry, it is well to have Montenegrins work together in one group and Sicilians in another. It is easier for them to comprehend and live within the *unwritten* laws of the group than it would be for aliens. They might all acquiesce in the written laws but group traditions are stronger. "This railroad employs no engineers who drink."

Not all races nor mixed breeds can do well in our mixed American industrial and social systems, but almost every race or mixed breed can do his best when he is with others of his own kind.

Here it may be said, rather parenthetically, that there are some persons who, because of race or health or previous accident, can do their best only in a supervised environment and also only at a slow pace in life.

Team Work

There are three degrees of team work. One is obedience, namely the giving and obeying of orders, with extra reward or extra punishment (lack of reward or deprivation) for doing exceptionally well or exceptionally poorly. None of us ever totally outgrows obedience, and this applies at home as well as elsewhere.

A higher degree of team work is discipline, namely the setting of an example for the disciples or followers and the following of an example set.

There is a higher form known as indoctrination, where without orders given or examples set persons do the right thing from a point of view of team work or joint efforts towards success. This is possible only with higher grade minds who have conferred and conferred with each other discussing all manner of future probabilities so that when a new occasion arises each one knows what to do and what to expect of the others.

Duty to Anticipate

Because there may be social changes as well as environmental changes, there has arisen the doctrine known as the "*Duty to Anticipate*" that whatever change is inevitable will happen to me, and that which is liable to happen is apt to happen to me."

A person is negligent if he fails or breaches in his duty to anticipate—a person uses due care if he does anticipate and prepares for contingencies.

This is not only good sense and adaptability, but it is the law. We are still evolving common law, that is, creating law by pronouncements by the courts resulting from the customs of the people, but as all human rights as well as duties are correlative, we are rapidly increasing laws by legislative statute, statutory law.

The duty of a pedestrian to look is a common law duty; the duty of the automobile driver to slow down when approaching a crossing and anticipate that there may be some pedestrians moving with the green lights who will not yet have finished crossing the street is a statutory duty.

It is easy to exercise the duty to anticipate when what the future may or will bring is pleasant and hard when it will be unpleasant. Just because it is hard and unpleasant does not relieve the individual in the least from his duty to anticipate.

Associating

Men associate together because they are more alike than unlike. Groups and grouping have some interesting traits, knowledge of which gives power to influence them toward a specific goal—here, safety. This natural tendency to associate furnishes a lever to change men from without, by handling them en masse, in so far as they share traits alike.

Loneliness, weakness and defenselessness, are the heritage of the individual man. It is a bargain to lose them and to gain the comfort of intercommunication, strength and security, by yielding some of one's individuality. The socialized man is what he is because of his heritage to be *that way*. The impulse to yell "Fire" and to try to save some one else is stronger than the impulse to run alone. Individual will is not as strong as the tendency to act as others act and feel as they feel and believe as they believe. The penalty for dissimilarity is that the group excludes the individualist or else he must desert to make his weak way alone. One must conform, or one may perish. Conformance pays.

Groups, to increase or to maintain strength and to replace vacancies, inevitably welcome new members. Therefore it is silly to be shy about joining any group or to feel one is intruding.

In the life history, a child conforms, by imitation, to the home and neighborhood pattern and demands. As an adolescent, he may oppose some of the demands

*Credit for this point is due to the author's brother, Attorney A. R. Hulbert, of Chicago.

put upon him. When a post-adolescent, he may rebel and liberate himself. When a young man, of the age when he seeks employment, he has attained the idea that it is best to conform to the group and its standards. He seeks initiation: "Tell me, tell me how, show me." By conforming, he accepts the merits and the rewards of society, ignores its inconsistencies and contradictions and shortcomings and its expense to him and its limitations of him, and enjoys the opportunities offered him to excel and he achieves mental comfort of being freed from perplexities and risks and temptations inherent to the individual man. When he reaches mid-life, he assumes to enforce group conformity upon the younger members.

It is comfortable to belong to a group doing the "right" thing; it is more comforting than being solitary even if engaged in doing the same thing.

When with a group, one feels warm physically; emotionally too. We use such phrases as "warm friendship," glowing with pride."

The human soul is lonesome, lonesome for companionship and hungry for affection or regard or esteem.

Within a group one may offer and receive friendship; one may talk and listen; one may admire and earn admiration; one may assist or be assisted in work; one may plan with hope of fruition; one may share emotions; one may lower sword and shield to relax, to play, and to rest and refresh himself.

Soon, one strikes a happy medium of dislike of being conspicuous and of being too inconspicuous. Still more he dislikes in others their becoming conspicuous by being different. "Although we all know better than we do, and adhere to a higher code than we attain," we disapprove of those who are too conspicuous because of deviation from accepted standards of conduct and of those who are so inconspicuous as to be shirkers. Disapproval to the extent of calling names, even disapproval to the extent of hostility. For them scorn and ridicule, for us good will and happiness and shared team work.

Within the group, the group mind craves leadership. Within the group, I said. The leader must be easily and always identifiable as a member of the group. The group expects and demands that leaders be of good repute, otherwise they will not follow, but will cast out the ex-leader as an alien who by some mishapenstance gained entrance and fellowship. Failure is more forgivable than deviation. Disagreeability is disloyalty to the group, for the components of the group must agree if the group has the strength and pleasure of concerted action.

Certainly, a disagreeable foreman or one of bad reputation can not be of value in handling and training new men.

What a newcomer needs, is a combination of instructor-idol-advocate. Advocate? Some one must help us keep out of trouble and help us out when we get into trouble. Some one must handle the men, while the men handle the work.

Instructor? The human mind craves certainty. The new employees think, "Tell us just what you want us to do, and we'll do it." Old men are men of inelastic minds and can not accept new ideas. In general, folks tend to do what is generally done, if they know it is expected of them, whether it be a chore or pleasant. When the instructor says, "If I do it this way," then mistakes and the repetition of mistakes are avoided. Slipshod methods, even at first, must not be permitted. Habits start too easily to permit the start of bad habits of work. Good habits are better than good thinking. Instruction should be in training habits, in achieving skill in automatically doing things right.

The master of an apprentice smooths the way from the very first. He welcomes, he explains, he makes the newcomer feel at home. Unfamiliarity, which by causing nervousness, might inaugurate a career of poor workmanship, is replaced by interdependence. Reassurance when burdened and commendation when earned must precede criticism, when deserved.

Personal interest is heartening. Why be tongue-tied on everything but the most serious? Communion or community of interest in outside interests, firmly establishes the group bonds. Are not pleasures meant to be shared?

People have too few pleasant interests, or else people take too little pleasure in their interests.

Within the group, there is a craving which should be met to engage in a variety of physical activities. Dancing, bowling, hiking, riding (horses, not cars), golf, ball games, rowing or swimming, even fighting side by side, these and many other similar group activities make the individuals healthier and make the group healthier. Neglect of safety then becomes treason to the group. Everyone wants to be "safe" for the group's sake as well as for his own sake.

Education

There are many types of education. There is the formal schooling. Home training is education. Training with other groups such as the Y. M. C. A. or a musical organization or swimming classes is really education, although usually so pleasant it seems disguised. Playmates are educators and, gentlemen, I insist that workmates are educators. There is a malign type of education, gutter language, and what is still worse, the evil education of willful seducers. There are two forms of miseducation. One is from miscomprehensions, that is partly comprehending and partly getting things distorted. There is also the education one gives oneself of imagining things that never occur. Adult education is our chief problem and I think we should regard it as formal education of persons not enrolled when we deal with the public at large and with persons enrolled when they are in employment.

Impersonal orders are better accepted than orders given by persons without prestige. An impersonal order is a red, yellow, and green stop and go sign. A woman is more apt to obey them than she would obey her husband if he should tell her as they come to the curb that it was not safe for her to start across as apparently she was intending to do. Husbands have not prestige. A traffic officer, whom socially she might regard beneath her dignity to heed were he not in uniform, could tell her to stand back and she would because of the prestige of the force behind him and would be heedful of his order. One great advantage of the impersonal order is that people cannot talk back. Women like one more, be it one more word, the so-called last word, or be it one more kiss, assuming that either of these things happened to be in order. One form of impersonal order is the posting in a shop of an order issued by the operating vice-president whose office is in New York. The men cannot talk back to him like they could to the foreman if the foreman gave the same order on his own initiative.

The ideal educator in safety is the slightly gray man who is known as Uncle to a group of adolescents, even though he may have a few grandchildren. He is heeded when he speaks and his listeners await further instruction rather than engage in argument with him. Usually he is both very impressive and he is obviously unselfish and benign. He may be in addition also clever and possibly even witty.

I do not for a moment wish to say that there is no benefit in conversation or discussion. Intercommunications have enormous value. There are times when edu-

cation must be abrupt. For quick comprehension a terse order may be best.

An alderman has been defined as someone who is very generous with other persons' money. There are times when we cannot be generous with other persons' time. In case of impending accident, there frequently is not a moment to spare to explain why a certain thing should be done and there may just be time to say that something must be done instantly.

Approbation

People crave approbation and will go as far as necessary to secure it. The workman who is "in duteh" at the factory may be expected to join some group elsewhere who will approve of him, and it does not matter much to him whether it is a radical group or a conservative or study group.

People want approval which is public and obvious. Unfortunately there is an irregular line of demarcation of what a man may say to show his good fortune. By our funny conventional codes only certain boasts and certain griefs may be told. You may talk about how fast your horse or your dog can run, but it is not considered genteel to talk how fast your car can go. You may talk about your wife's lemon pie, but not about her goodness. You may talk about your golf score but not about your bank score (but some of us have about neither of these). You may talk about your son's strength and your daughter's beauty, but not conversely. You may talk about your garden but not about your activities in the Church. And so our saints are not commonly recognized, nor are worthy traits commonly discussed.

You all recall the service chevrons placed on the forearm of the uniform of our soldiers and sailors indicating that they had had so much service during the war. Those who were fortunate enough to wear them wore them with enormous pride and distinction and hoped for more. Would it not be equally sensible and practical for a man to be awarded a letter "S" to wear on his right cuff after he had had a clear safety record for a fixed period of time; his right cuff would remind him to keep his right hand, his useful hand, safely engaged. The idea has possibilities of evolution, namely a gold letter "S" if he has a year's clear record and an old English style "S" if he has two years' clear record, etc. This would be public signification of our approbation for his interest and practice in safety. I admit that that idea of distinction appeals to his self interest. It is proper because that self interest is equally interest in public welfare as well.

It would be fine if someone could figure out some way of expressing public disapproval for being actively, not passively, involved in an accident. It would be fine if good automobile drivers had some way of properly expressing disapproval of bad drivers who are so frequently encountered on every highway. Maybe the gasoline companies will issue free postcards possibly picturing the morgue and on which one could write the time and place and circumstance to remind the offender and mail them to the Secretary of State giving the automobile license number and he could forward them. Some way, probably not this way, needs to be evolved. Public disapproval is a stronger whip towards keeping people in line of good actions, including safety actions, than the whip of the police and the judicial system, which should be the second line of trenches.

Selfishness and wickedness and group misconduct are like term insurance. They are good while they last, but are not good in the long run. Service and proper actions bring repeated dividends. Therefore, it is helpful in every group effort for the group to participate in some common wholesome group activity or diversion. Annual picnics of the employees at a factory are not only jolly affairs, but

each person present feels that he is there not only by the sufferance of those who hire and fire, but he is there because the other employees like him. He well knows that unsafe workmen are not well liked workmen.

Conduct

Persons who take their conduct as a matter of course because they are conformists do not let their minds wander when at work as do persons who engage in deviated conduct and who tend to be distracted to thinking either about the possible results of previous mistakes or the excitement of planning new ones.

A person who desires to differ as far as possible from ordinary standards has not a good future. Nature is almost ruthless in seeing to it that extremes perish. We should assist this process when the deviation of conduct becomes a social matter. Persons who are recklessly cruel because of selfishness need to be sent to the frontier or to a mule ranch, or, in court, should be given short shrift and maximum terms.

Some parents are too authoritative. Actually they are bullies. Their children are apt to be social misfits unless they are saved by a more ancient good family inheritance. Sometimes parents are discourteous to each other to the point of quarreling before the children. When children hear parents say they hate each other, such children cannot grow up to love both parents but they hate one and possibly both. Then they begin to hate all persons in authority and later our social system. They defy as worthless ordinary social customs and are not amenable to newer social thinking such as safety thinking. Smart parents use courtesy with each other even though there be iron hands within their velvet gloves.

One should not apparently indicate tacit approval by silence when by expressing a disapproval one can help another to live in accordance with social and industrial standards. Under conduct possibly one may classify an attitude of agreeability. Anyone who has a permanent position should be agreeable if he hopes to keep it. If, however, there is a reasonable expectancy of advancement, then emphasis should be placed on preparation for that rather than agreeability where he now is.

Norms for Work

According to the laws of human nature, a man should be occupied, should be working at something whenever there is light enough to work, and for women whenever they are awake. It is better to be occupied than unoccupied. It is better to be occupied with others in a group during daylight hours than to be alone. The time to work alone is before the others get up, and persons who are able to use the early morning hours for self-advancement have the greatest hope for success.

During the day it is better for the individual man to have his mind in contact with others than it is to be isolated. Exclusive pride causes the personality to become a hollow shell.

Advancement

Sometimes we employ as a young workman one with a precocious or unusually highly developed mind. He should not be advanced too rapidly, nor should he skip certain promotional steps. He needs understanding and this understanding is best gained by experience so that he can understand those persons who eventually will be under him.

Under-privileged persons, as well as persons of a most superior family, should not be indulged but they should each be treated as very natural persons. Otherwise

they may fail to develop responsibility to discipline and later on may fail in self-discipline. We are here concerned with safety discipline and safety rules but the same applies in other lines of activity as well. For example, the son of the president of a company was pampered from the time he first went to work for the firm. He took a hurried apprenticeship in all departments. Later he succeeded his father. The first time he and his company met hard times he suicided. It is best for us to treat persons as natural persons and not as exceptional ones.

Persons, however, should treat *themselves* as individuals. Frail workmen endowed with more energy than endurance may destroy themselves by over-activity brought on by engaging in rivalry.

Ideas Persist

This safety movement has a tremendous virility and will be extended far beyond ordinary expectations. One of America's most famous anthropologists had occasion in 1893 to study the culture and characteristics of the children in a certain school district in Brooklyn. He found them to be short, round head, dark hair, with a prominent upper lip and a full lower lip and blue eyes, playing Irish games, using Irish oaths, and swearing by the Irish saints—Irish children showing Irish culture. In 1923 circumstances took him back to this same district and he restudied the children he found there and their culture. He found them to be short children, with round heads, dark hair rather glistening, two large full lips, and dark eyes. In other words, Italian children, playing Irish games, using Irish oaths, and swearing by the Irish saints. The melting pot melts. The Irish had moved out but left their culture behind to those who had infiltrated into this zone. IDEAS PERSIST.

Conclusion

Most man-made problems can be solved by the human mind by clarity of thought, but not if the variables of desire-fear are added factors in the equation. Safety is a soluble problem under inspired leadership plus enormous energy constantly spent.

I want to say that I appreciate the opportunity to be here and I appreciate the attitude of the audience, so attentive and interested and cooperative, more than I can express. It has been a great pleasure to address you.

(Editor's Note: Because of the interest aroused by these lectures it is possible some members of the Council may want to secure the services of Dr. Hulbert. He may be reached through the National Safety Council, 20 North Wacker Drive, Chicago.)

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Accident Prevention Equipment Manufacturers' Section

Officers 1932-33

General Chairman—R. T. SOLESTEN, Elliott Service Co., New York City.
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FREDERICK WAHLERT, Podmosan Safety Equipment Corp., Brooklyn, N. Y.
E. L. WHEELER, F. H. Wheeler Manufacturing Co., Chicago, Ill.

BUSINESS SESSION

October 2, 1933

The business session of the Accident Prevention Equipment Manufacturers' Section was held on Monday evening, October 2 during the Congress, at which the report of General Chairman R. T. Solesten was presented, covering the activities of the section committees during the year. The report of the Nominating Committee was then presented, and officers were elected as follows:

General Chairman—Buell W. Nutt, Safety Equipment Service Co., Cleveland, O.
Vice-Chairman—I. W. Millard, Industrial Gloves Corp., Danville, Ill.
Secretary—George S. Shull, Safety First Supply Co., Pittsburgh, Pa.
Treasurer—J. J. Bowker, Mine Safety Appliances Co., Pittsburgh, Pa.
Executive Committee—
E. W. Bullard, E. D. Bullard Co., San Francisco, Calif.

Frederick Wahlert, Pulmosan Safety Equipment Corp., Brooklyn, N. Y.
Charles H. Gallaway, American Optical Co., Southbridge, Mass.

Accident Prevention Equipment Manufacturers

Who Made Exhibits at the Twenty-Second Annual Safety Congress
and Exposition, Stevens Hotel, Chicago, Illinois,
October 2-6, 1933.

American Air Filter Company, Louisville, Kentucky
Air filters and dust collecting equipment.

American Ladder Company, Chicago, Illinois
Safety ladders.

American-LaFrance & Foamite Industries, Elmira, New York
Fire protection equipment.

American Optical Company, Southbridge, Massachusetts
Industrial eye protection.

Ampen Metal, Inc., Milwaukee, Wisconsin
Non-sparking tools.

Bauer & Black, Chicago, Illinois
Surgical dressings and first aid kits.

Robert A. Bernhard, Rochester, New York
Saf-T-Top ampoules and Saf-fast adhesive.

R. H. Burke Company, Chicago, Illinois
Safety belts, straps, buckets, and tool guards.

E. D. Bullard Company, San Francisco, California
Safety equipment for mines and industry.

Burroughs Wellcome & Co. (U. S. A.) Inc., New York City
First aid and medical equipment and surgical dressings.

Chicago Eye Shield Company, Chicago, Illinois
Head and eye protection equipment.

Chippewa Shoe Manufacturing Company, Inc., Chippewa Falls, Wisconsin
Gardtoe and Cushion-Air safety shoes.

C-O Two Fire Equipment Company, Newark, New Jersey
Automatic and Manual carbon dioxide fire extinguishing systems.

Davis Emergency Equipment Co., Inc., New York City
First aid, gas masks and safety equipment.

Dudley Lock Corporation, Chicago, Illinois
Combination locks, key locks and builders hardware.

Eagle Signal Corporation, Moline, Illinois
Traffic signal equipment and industrial timing equipment.

Economy Electric Lantern Company, Chicago, Illinois
Safety ecollite electric hand lanterns.

Elliott Service Company, New York City
Foremanship bulletins: quality, waste and safety education displays.

Holcomb Safety Garment Company, Chicago, Illinois
Industrial safety clothing.

Hynson, Westcott & Dunning, Baltimore, Maryland
Mercurochrome.

Illustrated Current News, Inc., New Haven, Connecticut
Current event pictures for bulletin boards.

Indian Motorcycle Company, Springfield, Massachusetts
Police motorcycles and equipment.

International Shoe Company, St. Louis, Missouri
Safety shoes.

Justrite Manufacturing Company, Chicago, Illinois
Approved oily waste and safety cans.

Junkin Safety Appliance Company, Louisville, Kentucky
Junkin safety guards for punch presses.

Walter Kilde & Company, Inc., New York City
Lux carbon dioxide type fire extinguishing equipment.

Lakewood Engineering Company, Columbus, Ohio
Traffic signs.

Lehigh Safety Shoe Co., Inc., Allentown, Pennsylvania
Leather and rubber safety footwear.

Lima Cord Sole & Heel Company, Lima, Ohio
Gro-Cord and Raw-Cord non-slip soles and heels.

Liquid Carbonic Company, Chicago, Illinois
Infestation control devices.

The Machined Steel Casting Company, Alliance, Ohio
Rotary safety highway guard.

The Merdis Corporation, Chicago, Illinois
Utlite flares.

Metropolitan Life Insurance Company, New York City
Insurance.

Milburn Company, Detroit, Michigan
Dermatological creams.

Mine Safety Appliances Company, Pittsburgh, Pennsylvania
Equipment for mine and industrial safety.

National Safety Council, Chicago, Illinois
Poster, Library and Education Division.

Olympic Glove Company, New York City
Gloves for industrial use.

Pangborn Corporation, Hagerstown, Maryland
Blast cleaning and dust collecting equipment.

The Patent Scaffolding Company, Chicago, Illinois
Gold Medal ladders and scaffolds.

Portable Lamp and Equipment Company, Pittsburgh, Pennsylvania
Electric mine lamps and safety equipment.

The Protectoseal Company, Chicago, Illinois
Flame arrestors, tank fittings, safety cans, bench fans, etc.

Pulmosan Safety Equipment Corporation, Brooklyn, New York
Respiratory protection and general industrial safety appliances.

Pyrene Manufacturing Company, Newark, New Jersey
Hand fire extinguishers, chemical engines on wheels, phenene hopper, continuous foam generator; phenene systems.

Safety Equipment Service Company, Cleveland, Ohio
Drednaught goggles and general safety equipment.

Safety First Shoe Company, Holliston, Massachusetts
Safety First shoes.

W. H. Salisbury & Co., Inc., Chicago, Illinois
Linemen's rubber protective devices.

Shepherd Safety Shoe Corporation, Chicago, Illinois
Safety shoes, oxfords and boots.

The W. W. Sly Company, Cleveland, Ohio
Sly dust collecting systems and Sly Purair helmet.

F. J. Stahmer Shoe Company, Davenport, Iowa
Davenport wooden sole footwear.

Standard Safety Equipment Company, Chicago, Illinois
General safety equipment.

Stonehouse Signs, Inc., Denver, Colorado
Accident prevention signs made of steel.

Surtly Manufacturing Company, Inc., Chicago, Illinois
Safety guards for all kinds of machinery.

The John S. Tilley Ladders Company, Inc., Watervliet, New York
Ladders.

Tuthill Spring Company, Chicago, Illinois
Tuthill highway guard.

Universal Atlas Cement Company, Chicago, Illinois
Atlas white portland cement for traffic markers.

Wilson Products, Inc., Reading, Pennsylvania
Personal protective devices for head, eyes, nose and throat.

Wilmot Castle Company, Rochester, New York
Sterilizing apparatus for first aid rooms, hospitals, doctors, dentists and laboratories.

Wil-X-Mfg Corporation, Brooklyn, New York
Wilbur fire extinguisher.

TWENTY-SECOND ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



Aeronautical Section

Officers 1932-33

Chairman—LESTER D. SEYMOUR, American Airways, Inc., Chicago.
Vice-Chairman—CAPTAIN E. V. RICKENBACKER, North American Aviation Corp.,
New York City.
Secretary—W. DEAN KEEFER, National Safety Council, Chicago.

THURSDAY MORNING SESSION

October 5, 1933

The session of the Aeronautical Section was called to order by Lew R. Palmer, conservation engineer, The Equitable Life Assurance Society, New York City, who welcomed the delegates in the name of the Executive Committee of the National Safety Council, and then introduced Paul A. Wright, American Airways, Inc., Chicago, who presided. Chairman Wright briefly outlined the program prepared for the meeting and then introduced the first speaker.

Safety in Air Transport

By W. A. PATTERSON

President, United Air Lines, Chicago

The speaker said in part: The new dependability and expansion of air transportation has come simultaneously with added dependability of flight. Safety in the air has come from a background of experience, plus improved airplanes and engines, new and important scientific aids to aerial navigation, improved servicing plants, extensive ground facilities and a firm attitude of responsible air lines that safety first must be the controlling factor at all times.

Let me, for example, describe one of the new Boeing all-metal multi-motored monoplanes, which have a top speed of 182 miles an hour and cruise 171 miles an hour, yet land at the low speed of 58 miles an hour, because the designers gave them a low-wing loading. They are powered with two 550 horse-power supercharged wasp motors, and should one motor cut out or lose its full power, this airplane can maintain its altitude on one motor and continue its flight as long as the gasoline holds out.

At the factory in Seattle there is a large sign in every room—"Don't Cover Up Any Mistakes", which is typical of the safety first atmosphere which prevails in the well established airplane factory.

The first steps in the plane's manufacture are a complete stress analysis and review of technical information supplied by the manufacturer. These are made by the Department of Commerce, whose inspectors watch every step in the plane's construction. Upon its completion, static tests are made. This is placing a load on the different parts such as the wings, tail surfaces, ribs, ailerons, and control systems to determine the strength factors. The control systems are static tested to load 20 per cent greater than the surface design load.

The new all metal transports typify the strength of the modern day airplane. For instance, the outer wing panels of the new transports, which were required to withstand a load of something over 39,500 pounds, actually withstood a load of 60,720 pounds. In other words, they stood up under a load of more than 30 tons. The landing gear of the plane actually is designed to withstand a load of 32¼ tons, although the gross weight of the plane is only something over six tons.

The next step is a complete engineering inspection made by an engineering inspector who looks over every item of the plane. Before the plane is given Department of Commerce approval, test pilots and government inspectors learn all the characteristics of the ship and put it into maneuvers to determine its inherent stability and its durability factors. Among other things, a plane must glide at a speed not less than 120 per cent or more than 140 per cent of its calculated stalling speed to insure safe landings by gliding, even with a loss of certain controls.

The plane is required to take off fully loaded within 1,000 feet and without the aid of the wind, and it is required to climb at least eight times its calculated stalling speed, or not less than 300 feet per minute. The landing speed of a plane carrying passengers should not be over 65 miles per hour. Multi-motored planes are required to maintain level flight with their gross weight at a minimum of 2,000 feet, even with one engine not in operation. It is further required that the plane be able to maneuver in banks and turns against the engine which is running. In other words, if the engine on the right side cuts out and pulls the plane to the left the pilot must be able to bank the plane to the right.

Even after the plane is approved and put into service the Department of Commerce follows through with regular inspections. If the plane is a commercial carrier operating on a scheduled route, it is still under the jurisdiction of the Department of Commerce after it goes into operation. The government sees that the planes are properly maintained, that the pilots are qualified for all types of flying, and they keep a most thorough check on all operating practices. In the operation of the airplanes the same rigid standards of safety govern.

Another constructive side of the picture is the progress made to increase the dependability of air transportation. The operators have benefited immeasurably from the participation of the aeronautical branch of the Department of Commerce and the United States Weather Bureau. High standards of equipment and operating practices were formulated and the responsible operators are anxious to adhere to these standards. The element of uncertainty has been substantially minimized through development and adoption of aids to navigation, weather observing and reporting, airway developing and lighting and radio telephone.

One of the most outstanding aids is the radio telephone voice communication system between planes in flight and ground stations, virtually the block system of the air.

Around this radio telephone system, developed five years ago for aircraft use, have been created several other radio aids. There is the directive radio beam of the Department of Commerce for identifying the true course of airways during conditions of low visibility. There is the airport localizer beam for bringing pilots directly over airports which are obscured by clouds. There has been developed lately a landing beam designed to make it possible to land an airplane when the airport is obscured by fog.

Safety Methods at the Chicago Municipal Airport

By J. N. BECKER

Chief Radio Operator, Bureau of Parks, Recreation and Aviation Department of Public Works, City of Chicago

The speaker said in part: The Chicago Municipal Airport has more airplane traffic than any other airport in the world. There were 30,326 landings and 30,321 take-offs during the year 1932, or approximately 164 movements per day. These planes land and take off from cinder runways formed in the shape of the English Union Jack, thereby permitting movement to practically every point of the compass. The surface of the runways, as well as the surrounding country, is perfectly level, and frequent grading keeps the runways in good condition. An extensive drainage system extending under the field prevents water from collecting.

A large wind tee, or weather vane, which is lighted at night, shows the direction of the wind. When the velocity of the wind exceeds 20 miles per hour, the color of these lights changes from green to white. In addition to this wind indicator, there are a number of wind cones, the familiar tubular bags seen over airports. All obstructions such as buildings, radio masts and electric light and telephone poles are lighted at night with red lights. To further insure correct location and direction of landing and take-off, large neon arrows 15 feet long by 8 feet wide are being installed on each runway. At night two 5 million candle power flood lights are used to illuminate the fields for landing. These lights are in such a position at opposite sides of the field that either may be used so as not to throw the light into the face of the landing pilot. These lights are so powerful that a newspaper can be read at a distance of half a mile. There are also two 3-million candle power beacons. The main beacon throws a white beam and the auxiliary beacon a green beam; they revolve six times per minute and are visible for 40 miles.

Besides these general methods of traffic flow control there are two individual methods, namely, signal lights and radio, which are manipulated by an operator in the traffic control tower. These signal control lights of 500 watt power are mounted on a rotatable shaft in such a manner that a beam of light, either red or green, may be projected to any portion of the field. These lights are used at the take-off only, the green indicating that it is safe to take off and the red light that it is hazardous. Planes without radio as well as those so equipped are permitted to take off or ordered to remain stationary in this manner. The radio consists of a 15 watt, pistol control, voice modulated transmitter on 278 kilocycles and six short wave receivers. All transport planes use a long wave receiver for following their radio beacons which is tuned to the control tower transmitter when within ten miles of the airport.

The receivers in the control tower are tuned to the frequencies of all planes in the vicinity of the airport as well as those en route to Chicago. Prior to take-off two-way communication is tested between the plane and the control tower and the plane

is informed of the wind direction and velocity and which runway is being used. When it approaches the runway for take-off, permission is given to take off if there are no planes landing and the runways are clear, otherwise it is ordered to stop to await clearance of the runway. After the plane is in the air it is informed of the planes in the vicinity of the airport, especially those in its own immediate vicinity. In addition, the location is given of a plane which it may pass en route. When planes are en route to the airport a watch is maintained on their frequencies and a progress report is kept, on which are noted the positions over which the plane reports. By this means an accurate knowledge is had of all arriving planes and when they are within a ten mile radius they are contacted and given the wind direction, velocity and runway being used, also the location of other planes approaching and leaving the field. Contact is then continued and the progress of other planes is communicated. When the time for landing approaches permission is given if conditions are favorable, otherwise an order is given to circle the field in such a manner as to avoid other aircraft and to permit a landing as soon as possible.

Although most of the planes used on this field are radio equipped, there are still some, such as local sightseers and itinerants, which are not. Every effort is being made to induce the owners of these planes to properly equip them, and the percentage of non-equipped planes is becoming constantly lower, as it is evident to the owners that radio promotes safety and thereby adds an inducement for passenger patronage.

We are proud of the airplane traffic control on our airport as it has proved successful over a period of six years during which time not one person has been seriously injured.

*Long paper
Ch. 845
(3.18.22)*

Personnel in Aviation

By DR. HERBERT B. WRIGHT

American Airways, Inc., Cleveland, Ohio

The speaker said in part: Aviation transportation companies are peculiarly dependent upon their flying personnel for the efficient operation of their air transport systems.

The majority of men who are hired as co-pilots have been trained in the army or the navy flying schools. These men have received a college education, have been chosen for physical and mental qualifications from a group of several thousand applicants, and have spent from two to three years in concentrated training in the theory and practice of aeronautics. After a strenuous physical examination and a very careful perusal of his record and experience, the pilot may then be hired as a co-pilot for one of the large companies. It will be at least a year, and perhaps two years, before he will have acquired enough actual flying experience on the airlines to be promoted to the position of first pilot. By this time he will have had at least 1,200 flying hours; he will have undergone constant scrutiny and observation by his fellow pilots and officials; will have been examined every six weeks or oftener by a flight surgeon, and will, in general, have passed the most critical and exhaustive pre-employment tests that are known to exist in any industry.

To make certain that these important people keep themselves in the highest state of mental and physical efficiency many of the large air transport companies give their flying personnel a periodic physical examination every six weeks. These examinations are given by physicians trained in aeronautical work and are in addition to the

examinations required twice a year by the government. The eye examination requires that the pilot not only have normal visual acuity but that his judgment of distance be accurate, there must be no strain due to faulty balance of the muscles which move the eye, no night blindness or color blindness can exist, and a test is given to make sure that when looking at an object straight ahead the eyes are capable of seeing objects to either side, out of the "corner of the eye." The functions of the organs of the ears which have to do with equilibrium are tested, and the hearing must be efficient in the use of the radio telephone and other auditory instruments. The general physical examinations include diligent search for disease of the tonsils, teeth, heart, lungs, abdominal organs and nervous system. If noted early the defects may well be corrected and the frequency of the examinations prevents abnormal physical conditions from gaining much headway before their presence is detected and corrective measures instituted.

The examination takes another constructive angle when we inquire into the amount of physical exercise and athletic recreation obtained by the men. We are constantly busy persuading them to allot a reasonable amount of time for athletic recreation. We insist that they obtain at least four to six hours of physical exercise each week. Strenuous games are not encouraged, for after all this is a sedentary occupation, and it is not necessary to keep these men in strict athletic training. Care must be taken that the wrong types of exercise are not used. For example, games which tend to cause eye strain, such as ping pong played for several hours when the lighting conditions produce much glare, are distinctly harmful and unnecessarily tiring to the eyes.

The subject of fatigue among the flying personnel is an important one when the factor of safety is being considered. The importance of estimating fatigue in this field can well be realized, and we are only sorry that we must say "estimate" for there is no quick and simple test which will give us this highly desired information. Fatigue in pilots is more nervous than muscular. It is well known among psychologists and physiologists that detectable changes due to fatigue occur in the body. In the study of fatigue in pilots the question of the number of hours a month the pilot is efficiently able to fly has become an increasingly important problem. We are in favor of a pilot flying a run moderate in length, rather than one eight or nine hundred miles long. The shorter run enables him to spend most of the leisure time at home where conditions are the best for rest and recreation, and a run of this kind does not entail nearly the amount of exhaustion and worry over weather conditions which is such a real problem on the longer trips.

In the not far distant future we are going to have to decide at about what age the pilot becomes too old to properly carry out his duties. This must necessarily vary greatly in individual cases. We already have had men who quit flying the lines at 40 years of age because they found that the pace was becoming too fast for them.

The newest profession for women is that of air hostess or stewardess on the large air lines. These young ladies are carefully selected from the ranks of trained nurses for the reason that the nurse has had a rigorous institutional training and is accustomed to discipline. She is also accustomed to dealing with people in a sympathetic manner and is the most capable class of person available for the job. Her duties involve taking complete charge of the passengers while they are in the airplanes, and vary from serving lunches to taking part in conversation on subjects of current interest. She is charged with two important functions in increasing the passenger's safety during the trip. The first is to see that whenever the plane lands or takes off the safety belt which holds the passenger in the seat is properly buckled in place. In the

event of rough air, a rough landing or an accident, serious injury to a passenger is rare when the safety belt is properly fastened.

Her second duty toward preventing accidents is to explain to the passenger the methods of taking care of the ears. The drum of the ear extends across the external canal so as to completely close it off. It communicates from the inside with the top of the nose and throat by means of a continuation of this canal which is called the eustachian tube. In rapidly descending from high altitudes the air pressure against the outer surface of the drum rapidly increases, and unless this is equalized from the inside by an equal increase in pressure through the eustachian tube, the drum will be considerably retracted and may even rupture. The eustachian tube is kept open by a frequent swallowing motion or by moving the lower jaw forward on the upper jaw. It is for this reason that passengers are always awakened some minutes before a landing is to be made and cautioned as to the care of their ears. Neglect of this little maneuver will cause intense pain in the ears if the descent of the plane is at all rapid.

Weather

By WILLIS RAY GREGG

Principal Meteorologist in Charge, U. S. Weather Bureau, Washington, D. C.

The speaker said in part: Since safe flying depends so largely on weather, it is necessary that a weather service be organized and maintained which shall reduce the hazards to a minimum. Let us reasonably summarize what is being done along this line. Experience of the last few years points to the following as the all essential features of a weather service that should yield the maximum assistance in maintaining schedules, consistent with absolute safety:

1. Observations that are accurate and truly representative from a flying standpoint, of the section in which they are made.
2. Observations at sufficiently frequent intervals and from a sufficient number of places to provide adequate information regarding changes that are taking place along all sections of the route.
3. Prompt receipt of the reports at important centers where they can be made available to all who need them.
4. Forecasts as accurate as it is humanly possible to make them.
5. Research.

Since observations form the basis of all meteorological work, it is essential that they be of a sufficient order of accuracy to serve adequately the purpose for which they are made. Observations include a variety of what are known as "weather elements", some of which can be measured with a high degree of precision, whereas others, under certain conditions, can at best be given only approximately. Thus, pressure, temperature, dew point, and wind can be observed within close limits, and these data are of a character that requires accuracy since they constitute a large part of the basis of forecasts. On the other hand, such weather elements as ceiling and visibility, also remarks on miscellaneous phenomena such as thunder storms, squalls, etc., are not susceptible of as high an order of accuracy.

This whole matter of accuracy in the observational work forms the foundation of the entire structure. Without dependable data the whole service necessarily breaks down.

The number of observing stations and the frequency of reports from them should be such as to provide at all times a comprehensive picture of conditions along and

near the various airways. The frequency of reports required for safe operations varies chiefly with the season, and also with the prevailing general conditions. The policy now in effect provides for regular hourly reports from all terminal airports and from selected intermediate stations on airways where flying activities are conducted on the 24-hourly basis.

Communications, to a considerable extent, may be regarded as "the back bone" of the service. A pilot wants to know what the weather along his route is *now*. This cannot be accomplished exactly, since the mere mechanical transmission of reports from a number of places requires some time. However, through the utilization of modern improved methods of communication the time has been reduced to a minimum. The responsibility of providing an adequate communication system has been assigned to the Aeronautic branch of the Department of Commerce.

The pilot about to start on a trip, as already stated, wants to know what the weather is now at points along his route, particularly at his destination. But he is interested in much more than that. What he needs above all else to know are the changes that will take place during his flight. Accurate forecast, therefore, constitutes the chief end and aim of the whole service.

The airways are well covered with observing stations. These are of great importance in forecasting, but they are not sufficient. They must be supplemented by reports from various points off the airways, in order that all may be charted on suitable map bases, thus presenting a synoptic picture, which forms the underlying basis of all forecasting. The charts, which are the working tools of the forecaster, include a variety of surface and upper air data which make possible the identification of air masses of decidedly different thermodynamic structure. It is along the border-line between these antagonistic air masses that weather, that is new weather, often-times hazardous weather, is formed.

Aviation Radio Communication

By H. N. WILLETS

Aeronautical Radio Engineer, Western Electric Company, New York City

The speaker said in part: As speedier schemes of transportation have developed there has been a paralleling demand for communication. The relation between speed and reliability of communication is in proportion to the speed of the transportation facilities with which it is identified. Therefore, with the expanding network of airlines there arose a need for communication service which would be in keeping with high speeds of the flying units.

It is a dull, bleak day, raining perhaps, with low clouds in the sky. You have a reservation on a plane leaving for a distant city. You call the airport to ascertain whether the plane will leave due to the weather. You are informed that the plane will leave on schedule. You take off and your plane climbs upward and passes through the layer of clouds and rain and in a short time you find yourself flying above this layer of rain clouds, the ground totally obscured. The sun is bright and the warmth very welcome from the bleakness on the ground below. Possibly when you have arrived at your destination you have passed out of the storm area, for as it frequently happens, if the storm area is extensive, somewhere along your flight the pilot, with what seems to be an uncanny instinct, points the plane to the ground, to leave the sun behind, the plane is enshrouded by the clouds and as you emerge from beneath you find the airport directly under you.

Two separate and distinct radio services assured the pilot of reaching his destination safely. Previously, when flying above the clouds, the pilot flew by compass, had to correct for wind, drifts, etc., and at best could only estimate about where he was in relation to the ground. Furthermore, he did not know the conditions under the clouds over which he was flying; perhaps a squall of unusual violence lay directly beneath him. These obstacles to the safety of the air traveler no longer exist.

In 1928 the Department of Commerce installed along some of the more important airways, at 200 mile intervals, radio stations. These stations perform two functions: they establish a radio path along the airway and also at periodic intervals broadcast the weather information along the route. Therefore, if the plane has a radio receiver it can ascertain its course and also know the weather conditions along the route. The scheme is quite simple and involves no additional strain on the pilot. This radio beacon path established along the airways may be likened to a beam of light emanating from the radio station. In this case it is a radio beam. When the pilot is in the beam or on his course he hears in his headset a long dash or the letter "T." He knows, even though the ground is totally obscured, that he is above the airway. Should he veer to one side, this long dash breaks up into a dot-dash or "A", and should he veer to the other side the long dash breaks up into a dash-dot or a long "N". Knowing the side of the course on which each of these signals appear, the pilot is then able to know on which he is off his course and will change his direction until the long dash indicates he is again above the airway. To inform the pilot of his progress along the airway, there are miniature beacon stations between the main beacons just described, and as he hears these local stations he is thus able to definitely locate himself.

The second factor which assured you a safe journey over the inclement weather beneath was the two-way radio telephone system. Briefly, this involves a transmitter and receiver on the plane and a transmitter and receiver at points along the airway. While the previous system described, that of the beacon service, is provided by the government, the same as light-houses are provided along the coast, the two-way telephone system is installed and operated by the Air Transport Companies. It might be likened to the automatic block signal system of the railroad. By means of the two-way telephone system the pilot may, at any time during his flight, pick up his microphone and call one of his ground stations. He will report his position, describe weather conditions along that portion of the route, etc. This may govern the schedule of other planes approaching that section of the airways in which he is now flying. He may converse with another plane flying in the same section of the airway, particularly at night in order to check respective altitudes to eliminate any possibility of collision. From the ground he receives instructions as to where to land, wind direction, visibility and the condition of the field.

Report of Nominating Committee

The report of the Nominating Committee was presented and officers for the section were elected as follows:

Chairman, Lester D. Seymour, President, American Airways, Inc., Chicago, Illinois.
Vice-Chairman, Captain E. V. Rickenbacker, North American Aviation, Inc., New York City.

Secretary, W. Dean Keefer, Director, Industrial Safety Division, National Safety Council, Chicago, Illinois.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



American Society of Safety Engineers—Engineering Section

Officers 1932-33

General Chairman—H. S. SMITH, Union Carbide & Carbon Corp., New York City.

Vice-Chairman—S. E. WHITING, Liberty Mutual Insurance Co., Boston.

Vice-Chairman—E. S. BRAUMONT, Peoples Gas Light & Coke Co., Chicago.

Secretary—W. DEAN KEEFER, National Safety Council, Chicago.

Members at Large—

CYRIL AINSWORTH, American Standards Assn., New York City.

C. B. AUER, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

J. I. BANASH, Consulting Engineer, Chicago.

E. W. BECK, United States Rubber Co., New York City.

E. F. BLANK, Jones & Laughlin Steel Corp., Pittsburgh, Pa.

W. GRAHAM COLE, Metropolitan Life Insurance Co., New York City.

J. E. CULLINEX, Bethlehem Steel Co., Bethlehem, Pa.

R. E. DONOVAN, Standard Oil Co. of Calif., San Francisco.

W. M. GRAFF, National Bureau of Casualty and Surety Underwriters, New York City.

HARRY GUILBERT, Pullman Co., Chicago.

A. S. JOHNSON, American Mutual Liability Insurance Co., Boston.

M. G. LLOYD, United States Bureau of Standards, Washington, D. C.

R. McA. KEOWN, Industrial Commission of Wisconsin, Madison, Wis.

R. B. McCULLOCH, Bureau of Safety, Chicago.

E. E. PLACE, American Mutual Liability Insurance Co., Boston.

J. A. OARTEL, Carnegie Steel Co., Pittsburgh, Pa.

A. S. REGULA, Industrial Relations Counselors, Inc., New York City.

G. E. SANFORD, General Electric Co., Schenectady, N. Y.

W. R. SMITH, United Engineers & Constructors Inc., Newark, N. J.

R. F. THALNER, Buick Motor Co., Flint, Mich.

WEDNESDAY LUNCHEON SESSION

October 4, 1933

The annual meeting of the ASSE-Engineering Section of the National Safety Council followed a luncheon and convened with H. S. Smith, General Chairman, presiding.

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1933 4.19.
Report of the General Chairman

By H. S. SMITH

Union Carbide and Carbon Corporation, New York City

It is my understanding that each member present has before him preprint of the reports of all of our standing committees. Under the circumstances, we therefore will not ask the chairmen of these committees to present these reports in detail. Nevertheless, as the retiring chairman of the ASSE-Engineering Section, I find it my duty and distinct pleasure to comment briefly on these reports and emphasize some of the outstanding facts contained therein.

Research, Standards and Codes: The report of our Steering Committee on Research, Standards and Codes, J. E. Culliney, Chairman, reflects a considerable portion of the broad field of activities in which our society has been interested. We have 27 active research committees, 22 of which are amending their final reports from time to time, and the remaining 5 of which have not yet published final reports.

In the safety code field, the American Standards Association has committees on 74 safety codes. We are represented on 55 of these committees. Of these 74 safety codes, 51 have been approved and published. The ASSE-Engineering Section is sponsor or joint sponsor for 15 safety codes, 10 of which have been approved, and work on the remaining 5 is well under way.

Under the supervision of our Steering Committee on Research, Standards and Codes, the ASSE-Engineering Section has this year undertaken a new activity in the formulation of a series of Industrial Data Sheets. The first Data sheet was published in the October issue of the NATIONAL SAFETY NEWS, and extra reprints will be available upon request. Other drafts are well on the way toward completion, and the series will be extended almost indefinitely.

Fortunately, the personnel of our Committee on Research, Standards and Codes is the same as that of the Engineering Committee of the National Safety Council itself. In this way, the engineering work of the National Safety Council and all of its sections is well co-ordinated and supervised. The Safe Practices Conference Committee is primarily a committee of the National Safety Council, but inasmuch as practically all members of this committee are ASSE-Engineering Section men, it can truthfully be said that the work on Safe Practices Pamphlets is virtually an activity of the ASSE-Engineering Section.

Regional Safety Conferences: It is indicated in the report of our Committee on Regional Safety Conferences, E. S. Beaumont, Chairman, that regional conferences have as heretofore been held at various points throughout the country, ranging from Maine to Texas, and from New York to California. The number held in the past

year has been fewer than in some years, but the quality has been maintained and the attendance has been very encouraging. Most of these meetings are devoted to what may be called educational work; the technical and engineering aspects of accident prevention play a minor role. This is probably a desirable condition, but our members should be alert to see that the engineering phases of this work are not neglected in regional safety conferences, and that suitable topics are placed upon the programs to help the safety engineer, as well as the foreman and plant superintendent.

The Greater New York Safety Conference held by our Metropolitan chapter was outstanding from an attendance, organization, and general success point of view, and credit is due our Metropolitan chapter for this accomplishment.

Let me also call attention to the Farm Safety Session which was held in connection with the Rock River Valley Safety Conference, which assembled this year at Fort Atkinson, Wisconsin. The ASSE-Engineering Section can be justifiably proud of this, the first Farm Safety Session ever to be convened.

Chapters: Our four chapter located respectively in Boston, New York City, Northern New Jersey and Western Pennsylvania have all continued to function during the past year. These chapters represent a very important phase of our work, and members in other districts should consider the possibility of starting new chapters in their own localities. Your officers are convinced that it is unwise to start new chapters where they will not have adequate support, due either to a deficiency in numbers or in active interest. Where this interest exists or can be developed, however, it is highly advantageous to the local members to organize in this way so they will have facilities for coming together oftener than once a year to discuss their own individual problems.

Engineering Colleges: Our Committee on Accident Prevention in Engineering Colleges, R. McA. Keown, Chairman, has accomplished good work this year. The problem before this committee is a continuous one which will involve steady work for a series of years, and I feel that ground is being steadily gained in our effort to secure greater attention for safety engineering in technical schools. It is generally agreed that we are to look for results through the consideration of safety in established courses, rather than by the inauguration of separate courses in safety engineering.

Statistics: Our Committee on Statistics, C. B. Boulet, Chairman, has also done excellent work during the year. Statistics are gathered over an ever increasing field and by the use of more uniform methods, so that all reports are comparable.

Co-operation With Other Engineering Societies: A short but satisfactory report comes from our Committee on Co-operation with Other Engineering Societies, Lew R. Palmer, Chairman. Our outstanding accomplishment in this field was a luncheon meeting which we sponsored jointly with the Engineering Division of the Chicago Safety Council during Engineering Week at A Century of Progress in Chicago.

Membership: Harry Guilbert, Chairman of our Membership Committee, reports that we now have 1,009 members, of which 653 are full members, 354 associate members, and 2 junior members. This represents a net loss of 12, as compared with our membership of last year.

Conclusion: Our society and the National Safety Council as a whole have passed through several difficult years which have reflected the business depression felt so keenly by our industries throughout the world. Regardless of commercial depression, however, safety work must be carried on. The conservation of human life is just as important during times of slack work as it is in boom years, and our work is now more essential than ever before because it is anticipated that the NRA will bring back to work thousands of men who have lost considerable portions of their old skill and stamina. The mental hazards of their jobs are also increased because of worries due to idleness, reduced income, and pressing financial obligations. Many industrialists are asking "What is to be done to keep our accident records down to the low figures of 1931 and 1932?" Certainly such conditions and questions constitute a challenge which cannot be ignored and which definitely calls for the very best that is in each individual safety man, as well as for co-operative effort through new as well as old and established channels of the ASSIE-Engineering Section.

Note: Reports of sub-committees and of chapters are not published in these transactions, but copies are available upon request to Council headquarters.

Reporters Acc. & Health Hazardous Legar 7/1/33 - Chas. Francis Long filed: 756

Report of the Nominating Committee

Mr. Keown presented the report of the nominating committee, the personnel of which included R. McA. Keown, Chairman, Harry Guilbert, Cyril Ainsworth and E. J. Culliney. The following officers were elected for the coming year:

General Chairman—S. E. Whiting, Liberty Mutual Insurance Company, Boston, Mass.

Vice-Chairman—E. F. Blank, Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

Vice-Chairman—A. S. Regula, Industrial Relations Counselors, Inc., New York City.

Secretary—W. Dean Keefer, National Safety Council, Chicago.

Members of executive committee for three years:

W. S. Paine, Aetna Life Insurance Company, Hartford, Conn.

C. B. Boulet, Wisconsin Public Service Corporation, Milwaukee, Wis.

C. W. Smith, Standard Oil Co. (Ind.), Chicago.

A. J. McMaster, president and technical director, General Motors Laboratories, Inc., Chicago, then presented a demonstration and illustrated address on "The Electric Eye—A New Tool For Safety."

The following subject sessions of the Congress were sponsored by the ASSIE-Engineering Section:

Accident Records

Hoisting Chains

The Safe Use of Chemicals In Industry

Handling Materials

Safety Organization and Program

The Safe Use of Electricity In Industry

Falls of Persons

The Dust Problem In Industry

Maintaining Interest In Safety

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Automotive and Machine Shop Section

Officers 1932-33

General Chairman—M. J. MCCARTHY, Fisher Body Corp., Detroit.

Vice-Chairman—DR. JAMES H. GREENE, Studebaker Corp., South Bend, Ind.

Secretary—K. A. CALLAN, Kelsey-Hayes Wheel Corp., Detroit.

News Letter Editor—NILS JUELL, Hayes Body Corp., Grand Rapids, Mich.

Chairman Program Committee—HOYT L. FRASER, Detroit Steel Products Co., Detroit.

Chairman Statistics Committee—C. W. BISHOP, Locomotive Manufacturing Co., Williamsport, Pa.

Chairman Engineering Committee—V. H. KUPFERER, Studebaker Corp., South Bend, Ind.

Chairman Slides and Safety Films Committee—MARVIN A. HEIDT, Budd Wheel Corp., Detroit.

Chairman Membership Committee—M. A. KROGER, General Motors Corp., Detroit.

Chairman Publicity Committee—W. A. BECHILL, Chrysler Corp., Detroit.

Chairman Health Committee—DR. A. F. LECKLIDER, Fisher Body Corp., Detroit.

Members at Large—

L. E. AVERILL, C. H. Dockson Co., Detroit.

C. M. DOTTERER, Detroit.

R. A. SHAW, The Murray Corporation of America, Detroit.

R. F. THALNER, Buick Motor Co., Flint, Mich.

WEDNESDAY MORNING SESSION

October 4, 1933

The Automotive and Machine Shop Section convened with General Chairman M. J. McCarthy, Fisher Body Corporation, Detroit, presiding. Upon calling the session to order, J. I. Banash, president of the National Safety Council, took the chair, welcomed the delegates, and introduced as presiding officer, J. C. Wilson, vice-president in charge of safety, Lumbermens Mutual Casualty Company of Chicago, who acted as chairman throughout the sessions.

Safe Construction, Installation and Operation of Grinding Wheels

By A. ROUSSEAU

Engineer, Norton Company, Worcester, Mass.

The speaker said in part: It is important that everyone concerned with the use of grinding wheels have a good general knowledge of the characteristics of the wheels they are using. A basic understanding of the fundamental rules for mounting and operating grinding wheels is also important and some knowledge of the general rules covering grinding wheel protective devices is essential. The subject has been very well covered in the Safety Code for the Use, Care and Protection of Abrasive Wheels approved by the American Standards Association.

Relatively few grinding wheel accidents are due to defective wheels. Some undoubtedly are due to the use of incorrect wheels for the work in hand, but accidents attributable to defects in the wheel itself or to improper construction of the wheel are extremely rare. Many accidents are undoubtedly due to a lack of knowledge of the great difference in the strength and physical characteristics of the several types of wheels in common use, or to the general assumption that a "grinding wheel is merely a grinding wheel" and should therefore be capable of being handled or treated just like any other grinding wheel. Perhaps few people realize the tremendous difference in strength properties between wheels of various practical grades and types. Many may be surprised to learn that certain wheels used daily in a certain plant may possess only one-tenth of the strength of other wheels being used in the same plant.

The first natural question for a safety man, who is not familiar with grinding, to ask would be "why not use the strongest types of wheels for all classes of grinding? If safety is a paramount consideration why not use only such wheels as cannot be broken under the conditions which are likely to be encountered?" It would, of course, be possible to make grinding wheels which it would be almost impossible to break even under the most severe conditions imaginable. However, such wheels would not be practicable excepting for a very limited range of work. The character of the work to be done determines the type and grade and consequently the strength of the wheel which must be used. Thus, the factor of safety on some grinding operations is high while in others it is relatively low. In some cases it is even necessary to sacrifice maximum efficiency by using lower speeds in order to maintain an adequate factor of safety.

Because the manufacture and grading of grinding wheels is not yet standardized amongst the various wheel manufacturers, the user must depend upon the wheel maker for advice as to the type of wheels which should be used, and the speed at which they should be operated. It is the usual custom for the wheel manufacturer to show the maximum operating speed on tags or labels accompanying the wheels, and this speed should never be exceeded. To do so might in some cases prove serious, because on some classes of wheels the factor of safety has already been established at a minimum by the wheel manufacturer.

The safe installation of grinding wheels involves not only proper skill and judgment but suitable equipment as well. While most grinding machines are equipped with suitable arbor, flanges, sleeves, chucks or other devices, some machines are found, even new ones, where the arbor or flanges are of inadequate size, or the chuck or other mounting device is not suitable to safely mount the size and type of wheel which the machine is intended to carry. More frequently, however, cases are encountered

where the user mounts, or tries to mount, on a certain machine, a wheel of different design or size than that which was intended by the designers or builders of the machine. For example, it is not at all uncommon for a wheel maker to receive orders for wheels with holes so much smaller than they should be that the orders are held up until this dimension can be verified. This type of error is not difficult to detect: but there is no way for the wheel maker to tell from the wheel order whether the flanges are large enough or in fact if the user intends to use flanges at all.

Thus it will be seen that every man who is responsible in any way for the installation or mounting of grinding wheels should have at least a basic knowledge of the type, design and proportion of the equipment which should be used as well as the care that must be exercised in handling and mounting the wheels. A complete treatise on the subject of mounting of grinding wheels is given in the Safety Code. It is urgently recommended that everyone who in anyway has anything to do with the mounting of wheels, should secure a copy of the Code and familiarize themselves with those sections which are applicable to their work. Here, however, are a few general rules:

1. Be sure that the wheel you are about to mount is the right kind of wheel to use. This refers to size and shape, type of bond and grade.
2. Inspect the wheel carefully to be sure that it is sound and that it has not been damaged since leaving the manufacturer.
3. Make sure that the speed of the machine is not higher than the operating speed recommended by the wheel manufacturer as shown on the tag or blotter which came with the wheel.
4. If the wheel is mounted between flanges (and a large percentage of wheels are) check the size of the flanges to determine if they are large enough. If the machine is provided with a hood and the wheels are mounted between straight flanges, these should not be less than one-third the diameter of the wheel. If no hood is provided and the wheels are mounted between tapered flanges these should not be smaller than the diameter of the wheel minus six inches. In either case both flanges must be of equal diameter. The flanges should also be in good condition so that they run true and bear evenly all around. The inner flange should preferably be secured to the shaft while the outer flange should be an easy sliding fit.
5. Unless the flanges are faced with lead or babbitt or other yielding metal, some sort of resilient gasket, such as leather, rubber or blotting paper, should be used between the flanges and the wheel.
6. In handling the wheel, placing it on the arbor, and tightening the nut, bolts or screws, remember that the wheel is breakable. If it is vitrified or silicate, the bond is very much like glass or porcelain. Treat it as such. Even though the wheels are rubber, bakelite or shellac remember that they, too, can be broken, even though not quite so easily. Remember, too, that these types of wheels usually operate at higher speeds and consequently, if breakage should occur the resultant damage is apt to be proportionately greater.

The matter of protection devices is also quite important. While it is true that if the correct wheel is properly mounted and not in any way abused, there would be no danger of breakage, yet these things are so subject to error of judgment or omission that breakages are apt to happen even in the best regulated establishments. As all wheels operate at relatively high speeds in ordinary use, the consequences in case of breakage are apt to be very serious, and it is recommended that a suitable protection device of some type be used at all times. The only exceptions to this rule indicated

in the Safety Code are (1) "Wheels used for internal grinding" and (2) "Wheels three inches or less in diameter running at a peripheral speed not exceeding 3000 feet per minute."

Complete specifications for the proper construction of several types of protection devices to take care of all of the usual types of wheels encountered are given in the Safety Code. This includes hoods which are the most common, protection flanges for use with tapered wheels, and chucks and bands which are used with cup or cylinder wheels. Those responsible for the installation or mounting of wheels should also assume the responsibility of seeing that the proper safety device is used. In most cases it is necessary to remove all or part of the guards and it is extremely important that these be properly and completely replaced. The strength of most types of guards is dependent upon all bolts and screws being in position.

The installation of guards, with the exception of the tapered flange type, is quite separate from the proper mounting of the wheel and should not be confused with it. The fact that the wheel is properly mounted does not obviate the necessity for properly installing the guard. By the same token, the knowledge that a standard guard is going to be used does not eliminate the necessity for care in mounting. We always hope that the protective features of the guard will never be called upon to work, and if no errors are made in the mounting or use of the wheels, they seldom will be.

There is surprisingly little to be said in connection with the actual operation of wheels. More accidents are due to improper mounting or incorrect selection of wheels than to faulty operations. Operating speed is of course of great importance but this has already been touched on. The speed recommended by the wheel maker should not be exceeded.

Care must also be exercised to avoid side pressure, especially on wheels of thin cross-section. Bumping the wheel into the work, or the work into the wheel, is apt to prove disastrous. Catching of the work or other objects between the wheel and the work-rest or other rigid part of the machine is the cause of a good many breakages. This danger can be minimized by keeping the work-rest at all times adjusted close to the wheel. Bear in mind that the rotation of the wheel, even at normal speed, imposes certain stresses on the wheel, and therefore less extraneous force is required to break it while in operation than while at rest. On any operation which tends to generate considerable heat, care must be exercised to avoid increasing the temperature of the grinding surface too suddenly. This is particularly important when starting work in the morning, especially if the grinding room is cold at night, or starting work on a new wheel which has just been taken from a cold stock room. Continuous contact of work with wheel, where pressures are heavy and area of contact great, naturally generates more heat than when the contact is interrupted. Also hard and dense wheels generate more heat than softer and more open structured wheels, and this should be borne in mind in selecting the wheel for the work or in adjusting the work to the available wheel. It is false economy and sometimes dangerous to use grades which are hard in an endeavor to make wheels last longer.

Report of the Nominating Committee

The report of the Nominating Committee was presented by R. A. Shaw, Murray Corporation of America, Detroit, and officers for the section were elected as follows:
General Chairman—M. J. McCarthy, Fisher Body Corp., Detroit, Mich.
Vice-Chairman—K. A. Callan, Budd Wheel Co., Detroit, Mich.
Secretary—Marvin A. Heidt, Budd Wheel Co., Detroit, Mich.

News Letter Editor—E. C. Walker, Dodge Brothers Corp., Detroit, Mich.
Engineering Committee Chairman—W. W. Janzer, Seaman Body Corp., Milwaukee, Wis.
Health Committee Chairman—Dr. A. F. Lecklider, Fisher Body Corp., Detroit, Mich.
Membership Committee Chairman—Nils Juell, Hayes Body Corp., Grand Rapids, Mich.
Poster, Slides and Safety Kinks Committee Chairman—M. A. Kroger, Chevrolet Forge Division, General Motors Corp., Detroit, Mich.
Program Committee Chairman—M. A. Clark, United States Rubber Co., Detroit, Mich.
Publicity Committee Chairman—W. A. Bechill, Chrysler Corporation, Detroit, Mich.
Statistics Committee Chairman—C. W. Bishop, Lycoming Manufacturing Co., Williamsport, Pa.
Members at Large—
 L. E. Averill, C. H. Dockson Co., Detroit, Mich.
 Hoyt L. Fracher, Detroit Steel Products Co., Detroit, Mich.
 R. F. Thaler, Buick Motor Co., Flint, Mich.
 R. A. Shaw, The Murray Corporation of America, Detroit, Mich.
 Carl L. Storck, Buick Motor Co., Flint, Mich.

Safety in Machine Shops Under 1933 Conditions

By HARRY L. SAIN

Division of Safety & Hygiene, Industrial Commission of Ohio, Columbus, Ohio

The speaker said in part: The first point I would like to make is, that safety in the machine shop is no different than safety in woodworking shops, foundries, or any other type of industry. However, I do think safety in any type of industry in 1933 is by far a more difficult and an entirely different problem to handle than any of us living today have ever experienced.

We are dealing with an entirely different man than we had to deal with in 1913 or 1923 or 1929. Not only has the average workman been made a pessimist, and if I dare say it, a Bolshevik, in the past three years due to his inability to get employment, but I can point out to you good and capable men, educated men, men of judgment and sagacity, who have in the past held executive positions, but who have just about lost faith in our industrial and business structure.

Some of our thrifty workmen have had dreams of giving their children the type of education to which they are rightfully entitled. Many of our workmen have been paying on a house in fond hopes of lifting the debt and some day enjoying the supreme happiness of a comfortable and independent old age. Yet today they find our city, county and state educational machines, our building and loan and banking machines, and our industrial machines running like an eight-cylinder car which is only lifting on about two cylinders and with three flat tires with no spare.

Now, what has all this done to the minds of our workers? Up to 1929 or 1930, progressive industries made safety records that were far beyond any of our expectations; accidents in many of our industries went down to an unbelievable minimum. Much of this, of course, was due to better guarding of machinery and practiced safety devices. But one thing of still greater importance was the attitude of minds that progressive industries developed in their employees—the attitude that takes no chances

and thinks before it acts. What has happened to these safe attitudes? Men have congregated on corners and in waiting rooms adjoining employment offices and have exchanged ideas, and I am sorry to say that in many cases they were not treated with the common courtesy to which any worker is entitled by some of these employment managers. The worker, through all these disappointments, has had his confidence in industry shattered. Some of these workmen have even envied some of their fellow workers who were drawing compensation due to a back ailment or perhaps to some minor injuries suffered during previous employment.

I am afraid the seeds of safety that have been planted in our machine shops in the past two or three decades in many cases have perished because we have failed to cultivate them. As these millions of unemployed workers gradually return to work the plant executive will find himself faced with quite a different type of mind, and much of the hard work and watchfulness that in the past produced such good results in safety, in place of being curtailed, will of necessity have to be stepped up if we are going to hold any appreciable percent of the ground we had gained in our accident prevention work of the past two or three decades.

I would like to tell you of many conversations I hear about men who have been unemployed for several years and who now get employment at a very low wage, and how they are planning, through some hook or crook, to fake a back injury or strain so that they can get on compensation. Others who have been unfortunate enough in the past to get a hernia while not employed by an insured company are trying to slip into a plant where no physical examination is required so they can shift the responsibility on the insured company. We have, in fact, through our inability to provide employment, made parasites out of many of our good workers; we have forced them to learn how to live without working; we have caused them to form the habit of loafing.

It is apparent that in any type of organization, whether it be military, religious, fraternal, commercial or industrial, the attitude of the man at the top is reflected throughout the organization. The greatest results in accident prevention under 1933 conditions will be measured almost entirely by management's ability to develop in the minds of the workers a mental attitude toward working safely. The big job before us is first to gain back their lost confidence, and then develop once more their lost safety-consciousness—that mental attitude toward danger or the hazards about the job that will enable them to act subconsciously, but instantly and correctly, to protect themselves against accidents.

I am sure you will agree that the greatest hidden asset in industry today is the good-will of its employees. Our big problem in accident prevention for 1933 is not so much a mechanical problem as it is a human engineering problem. Is it any more important to organize our operations to save material scraps than it is to organize our operations to save human scraps? The personal safety of all our workers should be of first importance. Industry has spent thousands of dollars in research work and hours of time in a concentrated effort to bring materials, machines and methods of production up to the highest degree of efficiency. This has been especially true of our manufacturing plants up to this most unusual 1933 condition. Now the question is, are we going to allow all this hard working effort to go back thirty years? All of us must awaken to the fact that we are facing a serious problem and in order to prevent accidents we must organize a safety department with the same degree of efficiency as we do an engineering department, a material control department, a machine department, inspection or any other department.

Under the NIRA all industries in the same classification must pay the same minimum wage, the hours of work are set in a certain sense, and selling prices as a result of these restrictions must necessarily be within a very close proximity of each other. Therefore, the company that has the smallest expense as a result of accident will have a far better chance of selling their product at a profit. This, it cannot be denied was an unheard of problem previous to 1933.

These are days when accident prevention cannot be carried on from remote control. You will admit that no eminent general was ever a headquarters lizard, and by the same token no safety director or executive can successfully handle his job while sitting in his office.

Just as long as the attitude exists in an industrial establishment that accidents are caused by the carelessness of workers and this is accepted as a reason for the accident, then accidents will continue to happen in our industrial establishments. But when management takes the attitude that accidents in any particular department are a reflection on the ability of the supervisor of that department, and the ability of that supervisor is judged on this factor, as well as others, then progress can be made. Let us look at accident prevention entirely apart from the amount of suffering entailed in industrial accidents and look at it solely from the business viewpoint. No industry can be considered efficient when there are a number of injuries resulting from its operation. The waste of time, the shattering of morale, the cost of such accidents, are all a burden no efficient industry can afford. It is worthy of note that those industries which are operated on the most efficient basis are the ones that are doing the most along the lines of accident prevention. I think it is not going too far to say that a high accident record is evidence of inefficiency, and good management should take this point of view at this time.

Some Requirements of Effective Plant Organization

By MERLE C. HALE

Director, Personnel & Industrial Relations, General Motors Corp., Detroit

The speaker said in part: The mechanical and scientific developments that have gone hand in hand with the discovery of how to use coal and petroleum for power have, almost over night, created an entirely new type of physical world. But human nature has changed very little and there has been no corresponding metamorphosis in our plan of human relations. These physical, mechanical and electrical developments have accentuated the extent to which the individual is dependent upon his fellow man. The problem is further complicated by the rapid growth in the size of our industrial organizations.

Under the plan of owner-managership, which was the general order of things until recently, there was apparently no need for social legislation. This was due, at least in part, to the high degree of human understanding which formerly existed between the owner-manager, his employees and his customers. Conversely, some of our present difficulties are due to the lack of understanding which now exists between the executives of our large industrial corporations and their employees and customers.

In considering this problem, I have been struck with the analogy between the flow of ideas through an organization and the flow of an electric current through a circuit.

One of the simplest forms of electric circuit is a small electric light directly attached to a single dry battery. There is little resistance in such a circuit. This is somewhat analogous to the owner-manager who deals directly with his employees and customers.

At the other extreme, we have our present super-power network with powerful dynamos supplying energy to thousands of lights many miles distant from the source. This is analogous to the present large industrial company with a general manager controlling the activities of customers and employees far-removed from his influence. Great strides have been made in electrical engineering. The resistance between the dynamo and the light has been reduced and the modern dynamo generates an extremely high potential. By reason of this, a satisfactory proportion of the energy developed by the dynamo is converted into useful work.

But what about the big business? Although we have some very high powered industrial leaders, there is a limit to the potentialities of a human being. Furthermore, it would seem that there are many opportunities for reducing the resistance which now exists in the various layers of organization—or should I call them layers of insulation—that separate the working man from the big boss. It is this problem of organization insulation that I want to deal with specifically.

Our research laboratories have developed some very interesting gadgets by means of which it is possible to carry this electrical analogy somewhat further.

Let us try to visualize our industrial organization or company as it looks to the average employee. To him the company is represented by a single man, the foreman, and so on up through the organization. The foreman, himself, looks up to the general manager, and the general manager looks up to the plant superintendent, the plant superintendent on up to the works manager, and above him is the general manager. Now, that foreman is just an ordinary foreman, the kind you have in your factory and the kind we have in ours—sort of a slate-like individual, not particularly brilliant, yet a pretty good sort of man. And similarly, we have an ordinary general foreman, an ordinary plant superintendent, and an ordinary works manager.

But after all, what is it that makes an organization go? What is it that gets the work done and pays the dividends? It is direction or guidance, and this must emanate from the general manager. But no matter what personally may originate, nothing will happen from a production standpoint unless his ideas and his instructions finally percolate down through the various levels of organization to the employee group, the people in overalls who actually do the work. Most people refer to these as "levels of organization." I call them levels of insulation and, after all, that is what they are. One, two, three, four levels of insulations.

I thought it would be interesting to try to measure the conductivity of this ordinary every-day-sort of an organization. To do this, I had our research laboratories develop what they call an "oder meter." Let me explain that an "oder" is a unit measurement of an idea. It is an abbreviation of the phrase "originally developed effective remedy."

Now, to get back to the problem of measuring the conductivity of this organization. This particular general manager is a very high powered executive, and under usual conditions can develop a 10,000 oder idea, and believe me, gentlemen, a 10,000 oder idea is some ideal! What is the line loss and how many oders finally get down to the employee group where something can be done about it? Let us look at the oder meter. A 10,000 oder idea started up at the top with the general manager and tried to percolate down through the organization. Only 20 per cent of the 10,000 oder idea finally gets down to the man in overalls where it will do some good. If a power company tried to operate on an 80 per cent line loss basis, it would be licked before it started, but still this is just the ordinary, usual type of organization—80 per cent line loss. Some line loss! Insulation, yes, four layers of insulation, but very little conductivity.

But what about the conductivity in the other direction? To what extent do the ideas of the workmen finally percolate up through to the general manager? They might have an idea about a safety device or some way to cut costs, or a better kind of material. If the general manager is going to set policies, lay out plans or make important decisions, he should know something about what is going on in the employee group.

Of course, you can't expect these birds down in the employee group to have 10,000 oder ideas. They will do well to generate 1,000 oder ideas. Let's measure the conductivity up from the employee group to the general manager. One hundred oders get through. This time a 90 per cent line loss in getting up from the employee group to the general manager. One out of ten ideas finally finds its way up to the man who is in a position to put the idea into operation, but nine out of the ten ideas are lost in passing up through these layers of insulation. Again I say an electric light company trying to operate with a 90 per cent loss would be out of business before they could get their first dynamo running. Still, this is typical of modern industry.

If we consider the foregoing as generally typical, the real problem is to explore the various ways in which the conductivity of the organization can be improved.

First, let us consider the possibility of putting in another circuit between the management and the employees which might parallel the regular circuit down through the levels of organization. Strangely enough, the most effective means of by-passing the regular organization is employee representation. Accordingly, we will drop employee representation into this organization picture and measure its effect on the conductivity of the organization.

We have improved the downward conductivity 50 per cent. Now we only lose 70 per cent of the effectiveness. But what power company would operate on a 70 per cent line loss basis and what organization can afford a loss of 70 per cent of the general manager's ideas before they finally get down to this group that makes the products?

Of course, employee representation cannot take the place of the regular line organization but it does provide the general manager with a very effective means of finding out what is going on in the minds of the workmen. It should increase the upward conductivity materially. And it does, for by our oder meter, we find that the upward conductivity has been increased 400 per cent; however, only one out of two good ideas occurring to the employee group finally finds its way to the general manager.

Apparently we haven't the answer yet. Employee representation has improved the conductivity materially but we only have a 30 per cent conductivity in one direction and a 50 per cent conductivity in the other. That is not enough.

To answer this problem, we should perhaps go back to our electrical analogy. If we are to reduce the resistance of a circuit, we must be sure that every contact is tight. We must solder the joints, we must make these joints conductors. We cannot allow them to be air-gap insulators.

Our problem, then, is one of improving the conductivity through each layer of organization. This is a problem of education. A problem of making each supervisor appreciate the importance of interpreting the company to the men and of interpreting the men to the company. He must become a conductor and not an insulator.

There are various means of doing this educational job. One of the commonest and one of the most successful is through foremen training. Let us take this slate foreman and train him, let's copper-plate him—let's make him a conductor of ideas.

You will remember that with a slate foreman we had only a 30 per cent downward

conductivity. Now, with a trained (copper-plated) foreman we have a 40 per cent downward conductivity. Evidently we are on the right track, so let us continue with the general foreman.

Of course, the problem of educating a general foreman is more difficult. He usually considers himself beyond the schooling age, but management, with the assistance of a good personnel man, can find ways and means to educate even a general foreman. When we substitute a copper-plated general foreman for a slate general foreman we get further improvement in conductivity. Now we only have a 45 per cent loss.

If this educational process is worth while with the foreman and the general foreman, why not try it on the plant superintendent and the works manager? Management should find ways and means to impress upon them their responsibility for interpreting the company to the men below them and of interpreting the wishes and the problems of the men below them to the management.

So, if we substitute a copper-plated superintendent and a copper-plated works manager for the untrained slate executives, we get a conductivity of about 75 per cent, which we might regard as a practical ideal. I am sure that any general manager would feel quite contented if three-quarters of his ideas finally found their way to the workmen.

But what about the conductivity in the other direction? If these men have been properly trained, not only in interpreting the company to the man but in interpreting the men to the company, we should have an improvement in the upward conductivity. This has been accomplished. Now three-quarters of the ideas originating in the working force find their way to the front office.

In the foregoing, I have tried to bring out into the limelight, by means of this electrical analogy, one of the most serious problems confronting big business today. It is my personal opinion that the solution of this problem, which is the development of a better understanding between management and the employees, will sooner or later be recognized as a major objective and when recognized will go far in bringing about satisfactory industrial relations.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Cement Section

Officers 1932-33

Acting Chairman—DAVID ADAM, Lawrence Portland Cement Co., Northampton, Pa.
Secretary—A. J. B. CURTIS, Portland Cement Assn., Chicago.

Nexus Letter Editor—JACK DEMPSTER, Canada Cement Co. Ltd., Port Colborne, Ont., Canada.

Chairman Poster Committee—A. R. COUCHMAN, North American Cement Corp., Martinsburg, W. Va.

Chairman Program Committee—J. B. ZOOK, Great Lakes Portland Cement Corp., Buffalo, N. Y.

Chairman Membership Committee—H. A. RENINGER, Lehigh Portland Cement Co., Allentown, Pa.

Chairman Engineering Committee—FREDERICK B. HUNT, Nazareth Cement Co., Nazareth, Pa.

Members at Large—

CHARLES P. BENNER, Lehigh Portland Cement Co., Allentown, Pa.

W. W. HAMILTON, Alpha Portland Cement Co., Easton, Pa.

W. M. POWELL, Medusa Portland Cement Co., Cleveland, O.

TUESDAY MORNING SESSION

October 3, 1933

The first session of the Cement Section was called to order by R. B. Fortuin, Pennsylvania-Dixie Cement Corporation, Nazareth, Pa., past chairman of the section. Mr. Fortuin introduced J. B. Zook, Great Lakes Portland Cement Corporation, Buffalo, N. Y., Chairman of the Section Program Committee, who presided. Mr. Zook read an inspiring letter from David Adam, Lawrence Portland Cement Company, Northampton, Pa., Acting General Chairman of the Section, and then called for the report of the nominating committee.

This report was presented by Gordon C. Huth, Universal Atlas Cement Co., and officers were elected as follows:

General Chairman—J. B. Zook, Great Lakes Portland Cement Corp., Buffalo, N. Y.

Vice-Chairman—W. W. Hamilton, Alpha Portland Cement Co., Easton, Pa.

Secretary—A. J. R. Curtis, Portland Cement Association, Chicago, Ill.

Nexus Letter Editor—Jack Dempster, Canada Cement Co., Port Colborne, Ont., Can.

Engineering Committee Chairman—Frederick B. Hunt, Nazareth Portland Cement Co., Nazareth, Pa.

Membership Committee Chairman—H. A. Reninger, Lehigh Portland Cement Co., Allentown, Pa.

Poster Committee Chairman—M. P. Greer, Marquette Cement Manufacturing Co., Cape Girardeau, Mo.

Program Committee Chairman—D. B. Coleman, Missouri Portland Cement Co., St. Louis, Mo.

Members at Large—

R. B. Fortuin, Pennsylvania-Dixie Cement Corp., Nazareth, Pa.

Edward H. Parry, Glens Falls Portland Cement Co., Glens Falls, N. Y.

E. Posselt, International Cement Corp., New York, N. Y.

C. E. Kalston, Pittsburgh Plate Glass Co., Pittsburgh, Pa.

F. E. Town, Manitowoc Portland Cement Co., Manitowoc, Wis.

H. Vanderwerp, Medusa Portland Cement Co., Cleveland, Ohio.

Orig paper
Cent 324a
Safety Progress in the Cement Industry

By A. J. R. CURTIS

Assistant to General Manager, Portland Cement Association, Chicago

The speaker said in part: Nothing has given me greater satisfaction than the way in which our Cement Mill Safety Organizations have continued to carry on lately in the face of tremendous odds. However, curtailed operations and reduced personnel have brought us to the point where safety organizations are seriously disrupted in many plants.

Keep close to your men. At least one workman is involved first-handed in every accident. Strengthen your contacts with them by means of social as well as educational means. You can get closer to men by providing brief, kindly advice, interspersed with coffee or cider and doughnuts or a few cigars, than by inviting them to occupy uncomfortable benches while the speaker offers a long-winded sermon. Many plant safety meetings have been discontinued. The men miss them and would derive unusual advantage from them at this time.

Emphasize the welfare angle in your meetings.

So far as possible, call on every man to help in some capacity in connection with safety and welfare work. Successive meetings might well be in charge of different departments.

The General Safety Committee might be amplified considerably by the appointment of small groups or sub-committees to handle divisions of the work such as the following: plant inspection, accident investigation, first aid training, safety bulletin boards, fire prevention, sanitation, sick investigation and report, helping hand (charity), programs for safety meetings, publicity and social.

In more prosperous times public men frequently have been invited to the plant and have provided beneficial outlet to the employees on subjects involving general economy, the cement industry, and patriotic national subjects. The morale of the men could be benefitted greatly today by providing them with more enlightenment and food for thought during these bewildering times.

During the first eight months of 1932, cement mills reporting to the Portland Cement Association suffered 99 accidents causing loss of time or more serious conse-

quences; 93 of these involved only loss of time, while 6 were fatal. During that year these mills operated on a basis of about 30 per cent capacity.

During eight months of 1933 this same group of mills suffered 87 recordable accidents, 80 of which caused loss of time and 7 were fatal. This year these mills have operated on the basis of about 23 per cent capacity. Had operations been at 30 per cent capacity in 1933, and the accidents per barrel increased in proportion, there would have been 104 lost-time accidents and 9 fatalities, an increase of over 12 per cent for lost time and 50 per cent for fatal accidents.

During eight months of 1932 the outside departments—quarry, clay, field, railroad and yards groups—suffered 30 lost-time accidents against a probable 29 for the corresponding period of 1933, had exposure been equal. But comparing with the one fatal recorded against the outside departments during two-thirds of 1932, are three fatal accidents against the same departments for the same period of 1933.

Inside departments, particularly the crushing and burning groups, made a much poorer record than last year although packing and power departments have done better this year than last. During the first eight months of 1932 the inside departments suffered 49 lost-time accidents, against 60 which they should have had this year had the exposure been equal. Fatal accidents in the inside group are running about the same as last year.

What shall we say for this record? Let us read the handwriting on the wall and begin now, definitely and forcefully, to drive these figures down to lower and more reasonable levels.

Orig paper
Cent 633
Cement
Safeguarding the Health of the Cement Worker

By DR. C. H. OGDEN

Surgeon, Illinois Steel Company, Chicago

The speaker said in part: The requirements of an efficient health program should include: (1) Sickness and accident prevention; (2) Physical examinations; (3) Care of the injured; and (4) Consultative advice and health education.

The preventive measures are sanitary, including plant and personal hygiene and the prevention of disease hazards, both occupational and contagious. In instances where the state and county facilities would overlap and duplicate those within the plant, such as water analysis, vaccinations, tuberculosis, typhoid and malaria control, the result can be accomplished through co-operation with these services.

The provision of showers, lockers, the temperature regulation of drinking water, and the checking of those physical conditions which might cause accidents and disease hazards, must originate within the plant.

Cement dust on chemical analysis shows 15 to 20 per cent silica, which, when separated into the silicate and free silica or silica dioxide by petrographic analysis, shows only one per cent free silica, and dust originating in the raw material departments six to seven per cent free silica. That the chemical action of particles of free silica under 10 microns in diameter and not their abrasive action is the cause of fibrotic silicosis or pneumoconiosis, is generally accepted. The United States Public Health Service, as a result of studies begun in 1923, and still being made by Dr. Russell and others, concludes that a dust concentration of 10 to 20 million particles per cubic foot containing 35 per cent free silica, could be tolerated without danger to the worker.

Also, "exposure to dust generated in the manufacture of Portland cement is not provocative of tuberculosis, nor is it a factor in the reactivation of the arrested disease."

Also, that the respiratory problem in the cement plant that was surveyed, and probably others of the same dust concentrations, is apparently confined to disease of the nasal fossae, acute bronchitis and diseases of the pharynx and tonsils. The preventive measures recommended include: (1) prevention of generation where possible; (2) ventilation at point of origin; (3) prevention of careless exposure; and (4) isolation of the hazard from other activities.

The prevention of dermatitis in the cement industry is one of insuring personal hygiene, particularly in view of the fact that 80 per cent of these conditions occur during the hot weather, also in changing the occupation of those having a predisposition of eczema, or those who have acquired a hypersensitiveness.

Physical examinations made at time of employment should be complete, including blood pressure, urinalysis and special examination and laboratory tests where indicated, and should include history of previous illness, injuries or operations. This examination should insure the placing of the employee at an occupation commensurate with his health, vision and his relation to his fellow workmen. Periodic re-examinations should be made of those employees having physical findings which might result in incapacity, remedial defects, contagious infections, and those over at least fifty years of age. It should be the purpose of these later examinations to replace in a more suitable occupation where indicated.

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THURSDAY MORNING SESSION

October 5, 1933

What a Safety Program Has Meant to Our Company

By WM. H. BAKER

Safety Engineer, J. E. Baker Company, York, Pa.

The speaker said in part: One day in April, 1928, Mr. T. J. Quigley, of the Pennsylvania State Department of Labor and Industry, called on our president and called his attention to our accident record for the three previous years. This record showed six fatal accidents in 1925, one in 1926, and in 1927 three fatal accidents and 261 lost-time accidents. He told our president that accidents do not happen but are caused. And he explained that if he, as president of the company, had an earnest desire and willingness in his heart to save human suffering among his employees, he could reduce accidents in number and severity. The first step, he told him, must be taken by the captain of industry, whose leadership must be inspiring and commanding.

Shortly thereafter our president gave a dinner to which he invited his general manager, general superintendent, plant superintendents, and foremen, the party in all composing some sixty men. Mr. Quigley was there and explained in detail how to organize an accident prevention program. Our president said that he had adopted "Safety First" as our company slogan. He said he would back them up in their efforts to prevent accidents, but that after all he could do little unless all those present would co-operate in helping to make the unsafe places safe, and by impressing upon the minds of their men that it is the everlasting practice of safety that counts.

A few months after our safety committees were functioning, an inspection committee was appointed at each plant to inspect that plant regularly and to report its findings at each monthly safety meeting. This committee reports dangerous places to be repaired, careless practices to be eliminated, and suggestions for signs to be installed. It is then the superintendent's duty to have the repairs made. If repair work is held up due to lack of material, the following sign is posted above the hazardous place: "Danger, This Place is Not Safe." This sign is not removed until the dangerous place is made safe. Our inspection committees also visit and inspect each other's plants. This arouses competition and enables us to have closer inspections and helps us to find many hazards that could have been otherwise overlooked.

Our president demands that all plant safety minutes, inspection reports, lost-time and no-lost-time accident reports, and all minor or major injury reports, be marked for his personal attention. After he has finished with them they are given to the safety engineer.

A few years after we had been endeavoring to promote safety the foremen started to hold weekly safety meetings, at which time each foreman explained accident prevention methods to his men. These weekly meetings have proved very valuable, because they enable the safety engineer to receive suggestions from the men through the foremen. One of the valuable suggestions that a foreman received from one of his men was that he use slips of paper to be passed out daily during the months of January, April, July and October, of every year. These slips read as follows:

"Remember, we need the help of everyone in preventing accidents.

"Did you get hurt today?

"My suggestion for safety is as follows: (And here there are several blank lines).
Sign here."

You can readily see that this helped us greatly to find hazards, because it made every workman feel that he had an important duty to perform in preventing accidents. It impressed upon his mind that the company not only wanted his help but had to have his full co-operation in the safety work. All suggestions that our men give their foremen at these meetings are sent to the safety engineer.

We impress upon the minds of all foremen and workmen that there are approximately seven no-lost-time accidents to every lost-time accident. The accident investigation committee investigates all no-lost-time accidents as well as the lost-time accidents. They fill out a report outlining methods of how to prevent a similar accident from occurring again. This report is also sent to the safety engineer.

Safety signs and slogans are an excellent way of indicating to all men how to prevent accidents. We made and installed 1,030 safety signs at our plants during the last few years. We placed a motto sign at the entrance of every plant which is changed monthly and has created a lot of interest among the men. One reads: "Careless Men Detour Here."

We also instruct our men in first aid. There are first aid teams in all the quarries, which are instructed by men who have received national first aid certificates. Classes meet weekly for ten weeks. Every department is represented by one member of the first aid team. This member carries first aid material to render treatment.

When a new man comes to our plant for work we send him to the doctor's office with our timekeeper who personally sees him receive a very thorough physical examination. After the examination he returns to the plant and is given a book containing our safety rules and is given 24 hours to study them. After this time he reports for work. Before he is permitted to work he is instructed by a designated person that

safety means freedom from danger, and that in the safety first slogan "first" means in preference to anything else. He also makes it plain in a nice way that if this man wants to work for our company he must become safety-conscious. Then the new man is sent to the foreman, who is recognized as a lieutenant in industry. He instructs the new man exactly how to work in a safe way. He tells him "your work is only as safe as you make it." We teach each foreman to be a good leader by setting a good example to his men so that he can tell them, "Do as I do and not only as I say." No matter how closely the new man has observed his instructions, he will likely make mistakes when he tries to work the first time by himself. The foreman is then to correct any mistakes that the man may make, as it is far better for the foreman to watch the learner and correct his mistakes than to leave him alone to continue making mistakes, which often cause accidents. Last, but not least, the foreman teaches the new man to keep his wits as well as his tools sharpened. The foreman is then to follow through by returning several times to see that the new man is working according to instructions. We believe this type of training helps the new man to form a favorable opinion of the company and we know that his attitude will govern his habits. We know that men who exercise careless habits are chance-takers who disappear permanently, and we know that careful men make efficient and permanent employees.

We have been successful in saving human life and reducing the number of injuries and misfortunes that accidents bring. Our record in 1925 showed that 6 men were killed, and we received reports of 13 lost-time accidents that occurred in one day. We paid \$26,632.00 in compensation alone during 1926, which was the year we started paying for the above mentioned accidents. In 1927 we had 261 lost-time accidents; but in 1932 we had only 5 lost-time accidents, and for this last year we paid \$3,936.00 in compensation and other safety first program expenditures. We were able to make this improvement because every man in our organization believed in safety to the extent that he put every ounce of energy he had into making our plants a safe place to work.

Safety and the Man

By C. E. RALSTON

Safety Director, Pittsburgh Plate Glass Company, Pittsburgh, Pa.

The speaker said in part: We cannot have safety without the man and we will not have the man very long without safety. In looking back over many years of experience we can recall numerous difficult problems, in some of which the man himself was the most difficult problem, and it was only after a careful analysis of him and a careful handling of him, that safety development finally started.

First must come our organization plan. Then we must have our educational plan. After that will come our protective measures or methods. And then, we get that which we were striving for, our safety atmosphere, and in no other way can we put it across.

I recall one of my early experiences in the plate glass industry. One man stands out there prominently, a man who had been a general foreman for thirty-eight years, a man of the hard-boiled type. He was cold-blooded, not interested in a thing, not interested in his fellow man, a typical slave driver. When we started to organize that plant for safety he resisted all our efforts and it was a long time before he would even call his men together for an organization meeting. But after spending a great

deal of time with this man, he did come through in wonderful shape, which is illustrated by an incident that occurred about six months later.

This foreman had sent in a requisition the night before to the employment office for ten men, and in the group that were sent to him this particular very cold morning was one man who had been up against it pretty hard. Bob sized up the man, and said, "Buddy, you will either have to get shoes that fit this job or you will have to get a job that fits those shoes."

The man said to him: "I am a stranger here, I have just come to town. I had heard how your company looks after its people and I want to work for you."

Bob answered, "Do you mean to stick?" And when the fellow answered "Yes, I want to stay," Bob, out of his own pocket, gave him some money, told him to go up town and get some shoes and come back and go to work. That man is still with us, a valuable employee.

We had made it plain to Bob that it was necessary to so plan his work that unfortunate occurrences could not happen. We do not call them "accidents" in our organization; we call them injuries; and our reason for that is that the word "accident" has no place in this game. It does not appear on our records or in our literature. You can find a reason for practically everything that is occurring today, and when your men understand that and begin to analyze their occurrences, their conditions, their methods, and their purposes from a constructive viewpoint, then you are going to eliminate those things and you will have a much stronger organization in every sense of the word.

I had an interesting opportunity to develop that line of reasoning early in the war while on duty on the west coast. Prior to that time not a single vessel, so far as records show, had ever been constructed without the loss of life. Also, prior to that day, it required a period of two years to construct one of our destroyers. But we had a remarkable man in our organization, Capt. Henry Gleason, who doped it out that by constructing certain parts of the ship separately, they could be assembled in a record-breaking manner and eliminate much time.

The keel of that vessel was laid one morning at seven o'clock with quite a ceremony, because back of this whole drive we were hoping to break the morale of the people on the other side. At the end of eight days, however, we realized that our plans were all wet and that the job could be performed in a still shorter period of time. In fact, ten days were taken off, and twenty-six days was the challenge period. Later, when Capt. Gleason was called to Washington for a conference, the men were so inspired with a desire to make his plans come out successfully that they doubled up and worked like demons. To make a long story short, at eight o'clock on the evening of the sixteenth day after the laying of the keel, we launched that U. S. Destroyer, with more work completed than had ever been done before, because the effort was to make a real job of it.

She went into dry dock a little later for her camouflage. Then we had our first injury, a pipefitter knocked a wrench down a ventilator and struck a painter; and three days later a machinist knocked over another painter. We lost 42 days out of 10,700 and some odd man-days on the construction of a ship from her keel to her commissioning, with only two comparatively minor injuries. Those men had been working through with the thought that to do it right, it must be done safely. The men understood the plan and they were willing to work that plan because of the challenge that was before them.

And I am free to say that there is not a man in industry today (except a very rare

case) that will not accept a challenge of that character, or of any other character along similar lines, when he understands the game. They will work and they will put it over.

In our own plants in the last ten years, there has been a reduction in lost-time injuries from 1,366 in 1922 to 72 lost-time injuries in 1932, or a 95 per cent reduction. In 1932, cuts caused only 9 injuries, (and this in a plate glass plant) and there were no eye cases and no fatalities.

Planning the work—you can call it what you will, it is education, it is nothing else—and with that planning you are developing in the minds of those men a condition that some people might describe as discipline.

I had an experience a number of years ago in Jersey in one of the old plants there. We had spent some time in organizing this plant for safety, getting their committees to function and to understand what it was all about. One morning the superintendent of the plant went out to look over the premises, and as he came by one large tank he noticed a crew working aloft. They were working on a swinging stage, apparently perfectly conducted with respect to the hand-rails, toeboards and everything of that kind, but we had asked them to adopt in their organization plans one stipulation in connection with working in that manner; it was that no man should work aloft without a life line. The man on this stage was not so equipped. The superintendent noticed this the very first thing, and called to the man to come down and get his life line. The man resisted, however, contending that he was perfectly safe; but the superintendent said, "All right, you may be just as safe, but you know what the rules are: you know that we want those things worn and used." Reluctantly, the man climbed to the top of the tank, got in the elevator and went down to his tool chest, got his life line and his life belt and put them on.

A short time after the man resumed his position, he called to the helper below to lower him down another ring, three and one half feet. Then the thing happened that we had often feared might happen; man failure entered into the picture. The man who was handling those hand lines, with a human life depending entirely upon him, instead of slacking off that line slowly, letting the stages down gradually, he gave the line a flip, expecting to take up the slack in his hands; but he did not hold it, the line burned through his hands, and as a result we had a man hanging in mid-air, the scaffold swung away from below him, and the only thing that kept him aloft was that five-eighths inch line and his life belt. Underneath him were several valve stems projecting from the side of the tank, any one of which would have penetrated his body had he dropped upon them.

When that man was lowered from his perilous position, it took him about half an hour to recover his composure, and he looked up at his superintendent and was man enough to come through with it. He said, "Charlie, I know I was wrong now. You won't catch me that way again."

The closing feature of the program was an interesting talk on the subject "Why Safety Pays," by J. B. John, president, Medusa Portland Cement Co., Cleveland, Ohio. Mr. John, unfortunately, did not have a prepared address but spoke extemporaneously. He traced the progress of safety in the cement industry from its beginning years ago up to the present time. He recalled how the man who took a chance was once considered a hero, etc. He stressed the necessity for getting ready for better times and the personal attention that must be given to employees. He closed his talk with a discussion of how safety pays an inestimable sum both to employer and to employee.

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TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



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MONDAY AFTERNOON SESSION

October 2, 1933

The opening session of the Chemical Section was called to order by the General Chairman, John Roach, Deputy Commissioner of Labor, Trenton, N. J., who presided. After welcoming the delegates, the chairman presented a brief résumé of the activities of the Section during the past year. He said in part:

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"I feel that in spite of the bitter depression that has cast a blight upon industrial America, we have many reasons for confidence and congratulation due to the steadiness with which our membership has continued its onward course in safety activities. The fact that we have lost so few members during this trying period is convincing proof of the sincerity of purpose of those who compose the Chemical Section. We are holding our own and maintaining a very good record during these trying times."

*Cery paper
Ch 424a*

Is The Chemical Industry Making Progress?

By IRA V. KEPNER

Safety Director, Pennsylvania Salt Manufacturing Co., Monroeville, Mich.

The speaker said in part: A review of the accident experience in chemical industry, covering the past six years, shows a pronounced reduction in the frequency of disabling injuries, but a marked increase in the severity of injuries since 1929.

During the year 1930, 211 chemical plants reported their accident experience to the Statistics Committee of the Council; during 1931, 238 plants reported; and during 1932, 266 plants reported. The number of reporting units this year was the greatest in the history of the Chemical Section, but the hours of exposure are somewhat lower than in 1931. The change noted in accident experience of the industry from 1930 to 1932 inclusive, however, is more reliable than in earlier years because it is based on the records of more companies.

These reporting chemical plants, during 1931, with a little more than 181,000,000 man-hours of exposure, had a frequency rate of 12.65. During 1932, with reporting companies having an exposure of 175,000,000 man-hours, the frequency rate was reduced to 10.53—a 14 per cent reduction over 1931. During 1932, however, we had the worst experience of recent years in the severity of accidents. The severity rate for 1931 was 1.84, and for 1932 it was 1.92—an increase of 16 per cent over 1931. A pronounced increase in the number of fatalities accounts for this unfavorable 1932 severity rate.

During 1932 all reporting chemical plants were divided into three classifications, those with comparatively low, those with middle class, and those with the highest rates. The group with the lowest frequency rate had a 71,185,000 man-hour exposure; 213 injuries, 64,348 days of lost time, a frequency rate of 2.99, and a severity rate of .90. The next group with a middle frequency had 58,640,000 hours of exposure; 588 injuries, 111,178 days of lost time, a frequency rate of 9.61 and a severity rate of 1.91. The group with the highest frequency had a man-hour exposure of 45,659,000 hours; 1,071 injuries, 166,455 days of lost time, and a frequency rate of 23.46 and a severity rate of 3.51. The best plants have an average frequency rate of 2.99—31 per cent below the next group; and they also have an average severity rate 53 per cent lower than the next best group.

These results seem to indicate that to obtain a given reduction in severity a large reduction must be made in frequency. In other words, the plants that have succeeded in greatly reducing the number of their injuries have also reduced the time loss from accidents, but not to so great a degree. It seems that prevention efforts have been more successful against minor accidents than major accidents. However, the wide differences in individual rates in the various chemical groups show opportunities for better safety records. During the year 1932 large plants had the best frequency records, but the small plants excelled in severity records. A frequency rate

in large plants was 11.36, and the severity rate 2.19; in small plants, the frequency rate was 16.66, and the severity rate 1.30.

If in going over your accident records you find your frequency and severity rates show a tendency to increase, or indicate no progress during the past few years, a thorough inspection and investigation of plant hazards should certainly be made; and this is especially true at this time since the New Deal is in force, and a new set of NRA conditions prevail.

Inspection and Repair of Stainless Steel Equipment

By C. E. PLUMMER

Director, Chemical and Metallurgical Engineering, Robert W. Hunt Co., Chicago

The speaker said in part: Selecting the proper materials for the construction of stainless steel equipment is one of the important duties of the engineer. In order to select correctly a stainless steel for a particular application, a knowledge of the most commonly used stainless steels and their properties is essential. Such preliminary information may be obtained from a study of: (1) published lists of materials; (2) data supplied by the manufacturers; (3) tables showing the physical and chemical properties of stainless steels; and (4) books on the subject of corrosion-resistant alloys.

But, because of the many trade names and apparently large number of alloys, this preliminary study is often perplexing to one not a trained metallurgist. The problem of selection is greatly simplified, however, by the fact that, because of similar characteristics, stainless steels may be divided into three main groups: martensitic, ferritic, and austenitic. Hence, two-thirds of the work may be eliminated by first selecting the proper group rather than attempting to choose a specific alloy. The proper group may be determined by selecting specimens from each, and testing them under actual operating conditions. Laboratory tests can be employed as an alternative, but are not recommended because of the uncertainty of adequately duplicating actual conditions. Some of the characteristics of each of the three groups are as follows:

Group I—Martensitic Steels—These steels are composed principally of chromium iron and carbon. They air harden intensely, are magnetic, and are subject to heat treatment like carbon steels. Typical combinations are 4 to 6 per cent chromium, and 12 to 15 per cent chromium, both with low carbon.

Type—4 to 6 per cent Chromium, Low Carbon:

The 4 to 6 per cent chromium alloy, used extensively in the oil industry may be obtained in plates, sheets, squares, octagons, flats, strips, tubes, wire, forgings, blanks, ingots, castings, etc.

In the fully annealed condition this steel is stronger than soft steel with the same carbon content. Addition of $\frac{1}{2}$ per cent molybdenum or one per cent tungsten gives a stronger steel at elevated temperatures.

Type—12 to 15 per cent Chromium, Low Carbon:

The 12 to 15 per cent chromium steel is stronger than soft steel, takes a good polish, and in this condition resists atmospheric corrosion indefinitely. It is not apparently affected by fruit juices and resists oxidation at temperatures up to 1400 degrees F. It is a fair stainless steel where strength, toughness and high impact value are required. To obtain the best properties this steel should be heat treated. Like the 4 to

6 per cent chromium steel it air hardens. Applications are golf club heads, valve parts, automobile parts, etc.

Group II—Ferritic Steels—These steels are composed of chromium and iron with the chromium in excess of 18 per cent. They are non-hardening, and in the annealed condition are relatively strong and ductile.

Type—18 to 23 per cent Chromium, Low Carbon:

The 18 to 23 per cent chromium steel combines ease of fabrication with better corrosion resistant properties than the 12 to 15 per cent chromium steel. Chromium steels with chromium content higher than 18 per cent will not air harden, provided the carbon is low. This analysis finds application in nitric acid equipment, condensers and evaporator, fans and blower, and plays an important part in chemical plant equipment.

Type—26 to 30 per cent Chromium, Low Carbon:

The 26 to 30 per cent chromium steel shows remarkable resistance to many corrosive influences, including nitric acid and acid mine waters. Because of its resistance to oxidation at temperatures up to 2000 degrees F. it finds application in furnace parts, supports, rabble arms on roasting furnaces, etc., when brittleness is not a factor.

At elevated temperatures the higher chromium steels are susceptible to grain growth which cannot be prevented or corrected by heat treatment. When these steels are heated for a long period at about 800 to 1000 degrees F. and cooled slowly, they become brittle when cold. This brittleness is only partly relieved when the metal is reheated.

Steels containing 16 to 30 per cent chromium show considerable weakness if a notch or a change in dimension is present. This should be taken into consideration when bolts are used. The chromium alloys are used at elevated temperatures where sulphur is present in large amounts.

The addition of two per cent nickel gives a steel that is not so brittle when cold.

Group III—Austenitic Steels—Nickel is added to chromium-iron alloys to produce a steel of suitable austenitic type, possessing toughness, ductility, non-hardening properties by heat treatment, and high resistance to impact. The nickel also increases resistance to scaling at high temperatures, reduces grain growth, and at the same time lessens embrittlement after long service. These steels are non-magnetic. Like other alloys, proper processing is necessary to put the metal in its best corrosion resistant condition. In contrast to ordinary iron and steel, these austenitic steels are softened by cooling quickly from above their critical range.

Four characteristic chromium nickel steels have been selected for discussion here:

Type—18 per cent Chromium, 8 per cent Nickel:

Since this analysis takes a high polish, will resist indefinitely the attack of atmospheric air or a weak organic acids, it is used extensively for equipment in food manufacturing and processing, creameries, fruit and vegetable canneries, meat packing plants, refrigerator linings and trim, soda fountains, chemical plant equipment, etc. This alloy is easily fabricated, provided proper precautions are taken.

Much has been written concerning the failure of welded stainless, due to intercrystalline corrosion. When this alloy is heated in the range of 800 to 1500 degrees F., carbides are precipitated which, probably due to an electric potential difference, results in corrosion at the grain boundaries. Elements such as columbium, titanium, vanadium and molybdenum have been added in an attempt to prevent intercrystalline corrosion. A theoretical discussion of the subject is beyond the scope of this article. Welds should be heat treated to put the metal in its best condition for resistance to corrosion.

There are many applications where heat treating after welding and the use of modified analyses are not necessary, but where corrosive conditions are severe heat treatment is absolutely essential. Many failures have been observed in the paper pulp industry due to corrosion by sulphite liquors where there was no heat treatment after welding.

Type—24 per cent Chromium, 12 per cent Nickel:

This steel is used for its strength value and oxidation resistance at elevated temperatures. Because of its higher chromium content, it is more resistant to sulphur atmospheres at high temperatures than an alloy containing 15 per cent chromium and 35 per cent nickel.

Type—21 per cent Chromium, 22 per cent Nickel:

This analysis combines strength at 1500 to 1600 degrees F. with excellent resistance to oxidation.

Type—15 per cent Chromium, 35 per cent Nickel:

Since this steel can be forged or rolled only with considerable difficulty, it is used mostly in the cast condition where both high strength and corrosion resistance at elevated temperatures are desired. This steel is not recommended for use at elevated temperatures in the presence of sulphur, since the lower chromium and higher nickel result in breakdown due to attack of the sulphur at the grain boundaries.

Although there are many alloys, classified as corrosion and heat resistant, this article has been limited to stainless steels where the iron content is 50 per cent or more. The heat resistant alloy is a field by itself.

Many times the steel manufacturer's request for information about the use of stainless steel is misunderstood. However it is to the benefit of all, but particularly to the user, that the steel manufacturer be informed of the use to which the material is to be put so that he can follow its course with the ultimate use in mind.

Inspection of Raw Materials—By raw materials, of course, are meant plates, strips, forgings, castings or other shapes from which are fabricated equipment or structures.

The inspection of such material follows the same principles, for the most part, as the inspection of ordinary carbon steel. However, due to its greater cost, the extreme care with which the material must be produced, and the importance of the effect produced by the various alloying elements, as well as the treatment in shaping, inspection must be more diligent and critical than would be required for ordinary steel.

The chemical composition is of utmost importance if the desired properties are to be attained. Therefore, check analyses are advisable so that inspector and buyer may both be satisfied that the alloying elements are present in the specified amounts, and that in general the material conforms to specifications.

Particular attention should be paid to the chromium content, the nickel content, or any other alloying element desired. At the same time the carbon and sulphur content should be watched so that they do not exceed prescribed limits.

Because the effect of too high or too low a temperature would prove detrimental to the ultimate efficient and safe use of any equipment, it is essential after the rolling or working of the alloy into the proper shape that the heat treatment of such shapes be carefully conducted. The only means of determining the correctness of the heat treatment is for the inspector actually to witness this operation and check both the time and the temperature used. Actual witnessing of the heat treatment should be supplemented by corrosion tests on test pieces.

As in ordinary steel, the finished material in the shape of bars, plates, etc., should be thoroughly checked for surface defects, such as laminations, seams, cracks, blisters,

blow holes, pipes, etc. Since the making of alloy steel is a more delicate operation than the making of ordinary steel, the chances of mishaps and consequent defects are also greater. Finally, if there is to be a further finishing operation involving the use of heat, as in the manufacture of rivets, this too should be witnessed by the inspector to make sure that the proper temperatures are maintained.

Inspection of Fabrication—The fabrication of the raw material into such equipment as tanks, pressure vessels, pumps, centrifugal machines or soda fountains likewise requires competent inspection to insure safe and satisfactory performance.

The range of products into which the raw materials may be fabricated is vast, and since the particular method of inspection in each case must vary in detail, no attempt will be made to set forth each condition. It will be sufficient to outline rather briefly some of the major considerations which should guide the inspector.

If the stainless steel is to be fabricated into tanks or equipment of similar nature requiring fitting of parts and subsequent riveting or welding, it will be the inspector's duty to check the laying out of the component parts. He must make sure that they fit absolutely, that edges are planed and not bevel-sheared, that rivet holes (if needed) are sub-drilled and reamed rather than punched.

If the equipment is to be welded, additional precautions are necessary. Corrosion or embrittlement must be guarded against, and in addition the type or class of parent metal will be an important factor in the particular method used. Various welding methods are used today, such as the metallic arc, carbon arc, resistance, seam or butt, spot, line, atomic hydrogen, alternating current arc, and oxyacetylene. If the metallic arc welding method is used, reverse polarity is recommended, the work being the negative and the welding rod the positive.

Before welding, the inspector should be sure that the parts are clean, since grease may cause pits or hard spots. The selection of the welding rod is very important: coated rods are recommended for metallic arc welding, and uncoated for oxyacetylene welding. The gage of the material influences the method used. For economic reasons one method may have an advantage over another. There are so many influencing factors that the selection of the welding method should be left to the advice of an expert. It is axiomatic, of course, that before any welding is done the inspector will want to make sure that the fabricator can produce satisfactory welding work. It is imperative that every precaution be taken.

As a check on welding, the X-ray is recommended as an ideal method of non-destructive inspection of the finished product. This is particularly desirable where pressures or stresses are to be resisted, or where corrosive substances are encountered.

After welding, annealing is generally required to remove embrittlement and prevent corrosion at or near the weld. Both would weaken the equipment and lead ultimately to its destruction. The proper temperature for annealing is necessary, and it is the inspector's duty to see that these temperatures are maintained. Thus, austenitic steels will require a temperature of 1850 to 2000 degrees F., the 4 to 6 per cent chromium steels 1550 to 1600 degrees F., the 12 to 15 per cent chromium steels 1450 to 1500 degrees F. Since the 24 to 30 per cent chromium steels are non-hardening, annealing after welding is not required. The atmosphere should be slightly reducing. The rate of cooling also differs: in the austenitic groups rapid cooling is desirable, while in the chromium-iron alloys the temperature should be lowered slowly at a rate not exceeding 50 degrees F. per hour.

The shearing of austenitic alloys differs from ordinary steel in that more power must be used, and the material must be cut completely through. The principal con-

sideration in this operation is to guard against work-hardening of the metal, which may be deleterious to its use and certainly increases the fabrication cost.

In blanking and punching austenitic alloys more power must be used than for mild steel. A necessary precaution is to keep a neat clearance between the punch and the die. Too great a clearance will cause the material to work-harden.

Machining of austenitic steels is best accomplished at a speed about one-half that used for mild steel. A tool with design similar to that used in machining dead soft brass is recommended. Austenitic steels have been machined successfully in automatic machines when they have a brinell hardness between 200 and 240.

Forming and drawing require heavier lubricant, slower press speeds, and greater clearances between punch and die than with mild steel.

Drilling, as mentioned, should be done by a high-speed tool, adequately backed up. Sawing requires high-speed hacksaw blades with wavy teeth.

The types 4 to 6 per cent chromium and 13 to 15 per cent chromium have been found to machine better when they have a brinell hardness of approximately 220. Slightly lower speeds are recommended. In machining types 15 to 18 per cent chromium and 24 to 30 per cent chromium, a tool similar in design to that used on semi-hard brass is recommended. When used on automatic screw machines, manufacturers can furnish special free-machining grades.

Austenitic, martensitic and ferritic steels may be cold or hot riveted. If hot riveted, the temperature of such rivets should be 1900 to 2100 degrees F. for austenitic (finishing above 1600 degrees F.); martensitic steels 1450 degrees or less; ferritic 1500 degrees F. The temperature of the rivet furnaces should be thermostatically controlled. Electric furnaces are preferable.

Brazing is not recommended for these types of steel. Its tendency is to decrease corrosion resistance.

Stainless steels can be soldered provided the metal is properly treated. Unoxidized muriatic acid is recommended as a flux. Because of lower thermal conductivity a larger iron is needed. Care should be taken not to have the iron too hot as embrittlement may be the consequence. To prevent buckling, chill plates may be used, and with the austenitic group these should be of copper. Another precaution is to wash with ammonia water after soldering to inhibit further action.

Rightly fabricated and intelligently used, stainless steels are safe and satisfactory. If rules are not observed in fabrication or use, a dangerous situation will exist. Equipment will be called upon for functions for which it is no longer fitted. As a consequence, the safety factor of such equipment is unknowingly exceeded and perhaps life is endangered.

A few of the more common causes of failure of stainless steel equipment are:

- Improper selection of stainless steel
- Inadequate inspection during fabrication
- Failure to heat treat after welding
- Material of too thin gage
- Galvanic action resulting from dissimilar metals in contact in an electrolyte
- Mechanical failures.

Many failures are attributed to abuse in service. If thin gage material is used, accidental piercing of the equipment may make repair necessary. If repairs must be made by riveting or welding, the precautions set forth under "Fabrication" should be observed. Careful consideration should be given to the selection of the method of welding, both from the standpoint of corrosion resistance and economy. The location

of the weld is important. It should be placed so that any breathing action or motion of equipment will not place the stresses at the weld, but at a place where the material is less liable to failure.

Safety In Synthetic Ammonia Plants

By E. C. CURTIS

Assistant General Superintendent, Niagara Operations, Mathieson Alkali Works, Inc., Niagara Falls, N. Y.

The speaker said in part: Commercial scale high pressure operations are less than fifteen years old in this country, but in this comparatively short time a very adequate technique of design and operation has been developed. I shall limit myself to a discussion of safety in synthetic ammonia plants because it is in that industry that all my own experience has been gained.

The rate of reaction of the gaseous mixtures with steels is very much influenced by the temperature, ammonia content, and the composition and physical condition of the steel. The effects are of three sorts, decarburization, nitriding and fissuring.

All three of the effects mentioned, decarburization, nitriding and fissuring, alter the physical character of the steel for the worse. The first decreases strength, the second increases strength but decreases ductility, while the third results in a loss of both strength and ductility. The net result is inability to sustain bending stress or suddenly applied loads—a condition approaching brittleness in extreme cases. Steels now obtainable resist ammonia synthesis conditions very much better than those available ten years or more ago.

The transportation of hydrogen in low pressure pipe lines and its storage give rise to some special hazards which should be noted. Hydrogen-air mixtures are explosive between 4 per cent hydrogen and 75 per cent hydrogen roughly. Wherever a flammable gas is handled there is always a possibility of admixture with air in pipe lines or holders. The obvious way to prevent trouble is to avoid explosive mixtures and to this end we employ on our hydrogen lines air alarms which operate by thermal conductivity to warn us that air is being admixed with the hydrogen. A red light and a gong give visual and audible warning before the percentage of air gets anywhere near the danger point. Fortunately about 25 per cent of air must be present before the mixture becomes explosive.

When hydrogen containing lines or equipment are worked on, certain precautions must be taken before the work starts. It is insufficient to close a valve or insert a blank somewhere in the line. It must be *completely disconnected* from the source of hydrogen and then flushed out with some inert gas such as nitrogen. It is equally important that the line or equipment be carefully inspected before turning in the hydrogen to be sure that it has been properly "buttoned up."

Explosion arresters in the form of metal gauze installed in pipe lines are rather extensively used at our plant. For small pipes, 2 inches diameter or less, single or double flat screens are used. For the larger pipe sizes double cone screens of 40 mesh gauze are used. The long axis of the cone is twice the pipe diameter and the apex of the cone is pointed toward the probable source of ignition. The cones are crimped and laced with wire, not soldered.

Relief valves for high pressures which will open at constant pressure and reseal repeatedly without leakage present some special design problems. To illustrate, the usual type of bevel seat valve designed to blow at 4600 lbs. and to pass the full

capacity of one of our compressors will have a seat with a $\frac{1}{4}$ inch small diameter, $\frac{3}{4}$ inch large diameter and a 45 degrees bevel. When the valve is newly ground and tested the pressure may be sealed close to either the $\frac{1}{4}$ inch or the $\frac{3}{4}$ inch diameter. Subsequent blowing of the valve may wear the seat so that the seal is at a different diameter. The quantity of oil on the seat may also change the sealing point. Calculation of the area exposed to pressure when the seal is at different points will show that the total load tending to open the valve may vary several hundred pounds in the 4500 lb. range. The foregoing is, of course, merely our theoretical explanation of observed irregularities in the operation of this type of valve.

With any type of valve it will be found advisable to filter the gas which passes through it for the removal of oil and particles of pipe scale.

Another device very useful to the operating man is the frangible disc relief valve. The essential part of this valve is the differential piston, the smaller end of which acts as a punch to shear a thin sheet of phosphor-bronze. The larger end of the piston rests upon a disc of $\frac{1}{64}$ inch sheet lead which seals off the pressure and acts as a gasket for the piston holder. The nut which bears on the piston holder or guide, serves also as a die on which the punch shears the bronze disc and at the same time it must center the piston perfectly with its die by means of the counterbore. It will be readily appreciated that accurate machine work is required here but the results amply repay us for the time and effort expended.

Probably the most important application of safety valves is for low pressure equipment which must be in direct connection through piping with high pressure equipment. Such a situation is practically unavoidable where there is a continuous production of liquid ammonia at several hundred atmospheres pressure which must be drawn off continuously into low pressure storage tanks built for working pressures up to 300 lbs. Our storage tanks are normally operated at less than 225 lbs. pressure. The tanks are protected by two standard 3 inch ammonia spring type relief valves set to blow at 300 lbs. These large valves are designed to relieve pressure fast enough to protect the tank under all conceivable conditions. As warning reliefs we have on each tank a $\frac{1}{2}$ inch spring type valve and one of the frangible disc reliefs previously described. Both these are set to blow at 260 lbs. Operation of the small valves gives warning that something is wrong and gives sufficient time to correct the trouble before the 3 inch valves blow at 300 lbs.

Inspection and test of safety valves at regular intervals is of the utmost importance in any plant where they are used. Unless regularly inspected and tested, safety valves are worse than useless. They give a false feeling of security and safety. At our plant we list all these valves on cards. When tests are made the entry is made on the card which is filed under a tickler system. About one minute with this file tells the supervisor whether all tests due in any month were made.

A somewhat similar system takes care of any hydrostatic tests which must be made on equipment. Such tests are made according to the usual standard of $1\frac{1}{2}$ times the working pressure although in many cases we go to three times the working pressure depending mainly on whether the equipment operates at normal temperatures or at high temperatures. Pieces under test are always carefully sand-bagged for protection in case of rupture.

Pipe lines which carry anhydrous ammonia are hazardous to open because of the possibility of liquid ammonia being trapped in pockets. Pressure may be bled off these lines but even so they should be opened cautiously and only by workmen with goggles or, better, a face mask which covers the face completely. Constant super-

vision is required to ensure observance of this rule but sooner or later it will pay by saving an eye.

Aqua ammonia tanks must carry both pressure and vacuum relief valves. Tanks just emptied of aqua ammonia but full of ammonia gas are quickly collapsed when water or weak aqua is pumped into them. A vacuum is created by rapid solution of the gas. Vacuum reliefs must be of ample capacity. I have seen at least one tank collapsed even though it had a vacuum relief, because the valve opening was too small.

Production of aqua ammonia directly from synthetic and anhydrous ammonia is accompanied by another hazard which must be guarded against. The high pressure at which the anhydrous is produced causes a considerable volume of hydrogen to go into solution in the liquid ammonia. Most of this passes out of solution in the anhydrous storage tanks where the pressure is 200 lbs. or less. Some, however, remains in solution and is released when the anhydrous is dissolved in water. Dangerous mixtures of hydrogen air and ammonia gas may result unless precautions are taken.

Corrosion of equipment by cooling water gives rise to dangers which are not necessarily peculiar to high pressure operations but which are rendered more acute by the pressures used. The water of the Niagara River is quite corrosive. Compressor intercoolers, for instance, are quite rapidly attacked. Continual cleaning and renewal of tubes is necessary to prevent leaks of flammable hydrogen gas. Danger of igniting the gas is the principal hazard here because leaks due to corrosion do not usually show up as a violent rupture.

Electrical equipment is an ever present source of ignition of flammable gases. The best maintenance possible does very little to mitigate this hazard. The only sure way to prevent disaster is to prevent leaks and this means constant inspection and *thinking ahead* to possible occurrences with a view to heading them off.

One other hazard is more or less peculiar to high pressure plants. The tube of Bourdon Tube type gauges sometimes bursts. Most of these gauges have a blow-out disc in the back but with high pressures this is not very good insurance that the glass will not be blown into the face of an observer. A shield of heavy wired glass may be used in front of the gauge or, if this is not convenient, then celluloid may be substituted for the glass in the gauge. A shut-off valve should be provided at some distance from the gauge so that the gas flow can be shut off if the tube bursts. I have seen a gauge produce a pin-wheel of flame six feet in diameter when it burst and the gas became ignited by an electric bulb which was shattered by the bursting gauge.

As every safety engineer knows, the maximum degree of safety may be designed into a plant and no expense or technical ability spared to build the safest possible equipment but this same plant may show an extremely poor safety record unless the operating personnel are very carefully trained to work safely. Nowhere is this more true than in high pressure plants. The most complete system of safeguards, alarms and automatic equipment may be installed but accidents will happen frequently unless there is a studied effort on the part of the supervision to develop a training system for operators that will ensure only *thoughtful* action. Most of the accidents and near accidents that I have seen in ammonia plants happened because someone acted thoughtlessly, that is, without first trying to foresee the consequences of his action. It may be objected that some situations require speedy and automatic action with no time for thought. That is true but in nearly all cases of this kind the situation can be foreseen by the supervision and the necessary reaction so thoroughly taught to the

men that they do the right things. The necessary thinking has been done before the emergency arises. If there are any secrets about how to prevent accidents in any industry that is surely one of the most important.

WEDNESDAY MORNING SESSION

October 4, 1933

Application of Automatic and Remote Control to Chemical Operations From a Safety Standpoint

By J. V. ALFRIEND, JR.

General Engineer, Westinghouse Electric & Manufacturing Co.,
East Pittsburgh, Pa.

The speaker said in part: Probably the most spectacular hazard in the chemical industry is the explosion of gases ignited by electric sparks. One such explosion can wreck a plant and kill or maim dozens of men. The production of films, cellophane, alcohol and petroleum derivatives are typical processes where motor drivers must operate in explosive gas mixtures. To remove this hazard the explosion resisting motor was developed. Such a motor must be enclosed to prevent the ignition of a gas mixture outside the case from an explosion inside the case. Three constructions are available: totally enclosed; totally enclosed fan cooled; and totally enclosed pipe ventilated. The first is practical in small and slow speed ratings but becomes prohibitive in cost in medium sizes and impossible to build in the larger ratings. The last is applicable in relatively few cases and then only when few units are installed.

The fan-cooled construction is practicable for medium size motors of 2 h.p. up to 300 h.p. Built in accordance with the specifications of the National Board of Fire Underwriters and approved by them for Class 1, Group D atmospheres, this motor insures adequate protection under all conditions coming under that classification.

This motor in a most desirable form is called the heat exchanger or dual ventilated construction. By circulating the internal air through ducts in the frame adjacent to ducts for the external air the motor heat is disposed of without large temperature gradients and with complete elimination of hot spots.

The gases escaping after an explosion within the motor must escape through the bearings or through the ground metal fit of the brackets to the frame. The cooling thus obtained has been proved by actual tests in the Underwriters' Laboratories to prevent ignition of the atmosphere outside of the motor.

Probably the second most common hazard is that due to fires originating from the operation of circuit interrupting devices. Since the discovery of the De-ion principle of current interruption my company has been rapidly developing air circuit breakers to apply to all feeder and power circuits and to eliminate the hazards of the older types of construction.

The number of electrocutions in chemical plants from operators and laborers coming in contact with live circuits is beyond estimation. This type of hazard falls into two classes. (1) Accidental contact with known live circuits. (2) The contact with supposedly dead circuits.

The first form of hazard is entirely eliminated by the use of "dead front" control

*Orig. paper
F503
Chemicals*

and switchboards. All power circuits are behind the board—all operating handles are "dead." Not even deliberate suicide is possible from the front of the board.

The supposedly "dead" circuit may be protected against by one of the forms of metal clad switchgear known as "lift up" or "roll out." In the former the circuit breaker is lowered from engagement with stationary contacts (only possible with the circuit breaker in the open position) and the unit removed from its compartment where it may be worked on with all possible safety. No one can close these disconnects while the operator is working on the breaker for the disconnects are the terminals of the breaker.

The "roll out" equipment is similar except that as the term implies the movement of the unit to disengage the stationary contacts is horizontal instead of vertical.

The most fool proof equipment that the manufacturer can devise can be made a death trap by thoughtless or careless installation.

Many a control board has been installed on the rotational centerline of the driving or driven equipment or where a broken belt might kill or injure the operator. Operating and control stations should be placed in the most secure of positions considering the mechanical, electrical and fire hazard. In other words, the control equipment should be located at a place where men in danger will naturally run to rather than run from. This is made possible only with electrically operated devices such as circuit breakers and contactors. Main circuits must be kept close to the equipment but control circuits for the operation of these devices may be conveniently and economically run almost anywhere. The use of a multiplicity of stop stations is most advantageous.

A foot or body operated emergency stop pushbutton should be located at a machine which is liable to entangle an operator's hands. A second stop station should be close by the machine but safe from it. A third stop station should be located at the supervisor's desk which should be protected from the operating room by safety glass. Here also should be located an emergency switch to shut down the entire plant.

In rare instances it is necessary to place the entire control in a room separate from and protected from the hazards of the operating room. Such a control station must have a clear view of every operating equipment and must be capable of complete control of each individual item.

Many hazards exist which are not subject to elimination by the selection of suitable equipment or by the most careful installation. In our transformer test department we were menaced by the danger of men falling off the top of transformers when making connections for a test. Safety belts could not be used. The same problem may be met with in many plants in the care and maintenance of any large transformer, tank or bin.

We solved the problem by building a portable sectionalized fence. The posts are held to the transformer by means of the cover bolts and the short sections supported by L-shaped bolts in the post. By making the sections of one standard short length the economy of duplication is obtained and the assembled fence fits any shape of transformer sufficiently well to prevent an accident.

We cannot prevent a man from deliberately walking into danger nor can sufficient guards always be employed to save fingers, hands or arms. But we can disconnect power and apply brakes when a man approaches or enters the danger zone. The photo tube or electric eye has made this possible and the development of the phototroller has made it practical. The phototroller is a standard device for the control of electric circuits at the demand of a beam of light. So long as the photo tube is

illuminated nothing happens. The instant anything intervenes between the light source and the tube, cutting off the illumination, the photo tube plate current changes and the circuit operates to open circuit breakers or motor starters, to apply brakes or to sound warning signals.

Safety's Ally—Improving the Human Feature by Teaching the Employee the Elements of His Job

By C. S. CHING

Director, Industrial and Public Relations, U. S. Rubber Co., New York City

The speaker said in part: I think it would be advisable to break down the course of the employee's existence into three separate phases: (1) his pre-employment experience; (2) his interview and placement on the job; and (3) teaching the job.

I think the first opportunity for teaching the elements of any job is in the public school. We realize and pay tribute to the schools for the early attempts in teaching safety, in which movement they were almost pioneers. The safety teaching there, however, has been almost entirely confined to safety on the highway and the movement of human beings from place to place.

Probably the most immediately important part of training in the elements of the job can be done directly in the employment office before the individual actually sees the job on which he has to work. In some industries, our own in particular, after the employee or a small group of employees have been signed up and passed physical examination, they are given quite a lucid explanation of the immediate hazards in the plant and particularly on the jobs to which they are assigned. We do this quite practically by segregating as far as possible the groups assigned to similar jobs. For instance, when we hire a mixed group including a number of tire builders, we would place the tire builders in one group, the mill men in another group, and those handling chemicals, etc., in another group; and the employment manager, who is a very active member of our Safety Council, and who is also an engineer, explains to each individual group the hazards of their particular job.

In explaining to the individual or the group the hazards of the job, the employment manager goes through the various motions of the job to indicate exactly where the more prominent hazards are located. For instance, in cutting rubber on the mill, he demonstrates the actual use of the knife, having one in his desk for that purpose; he shows the sweep of the arm; the possibility of the knife being pushed back from the rubber between the thumb and index finger which would cause a severe laceration. He shows by the movement of his body the best method of lifting a reasonably heavy weight of crude material, etc. Of course, it is absolutely impossible for him to get down to minute details, but having watched the performance time and again, I feel reasonably sure the majority of our workers enter the plant with at least a comprehensive picture of the general approach to their particular jobs.

The third phase, training on the job, has always been a matter of dispute. There are those who favor vestibule training and others who can only adhere to the trial and error or pick up rudiments by observing others, or by placing the skilled man alongside the new man. However, I insist that the teacher, whoever he might be, foreman, supervisor, instructor, or fellow-workman, must himself recognize and be appreciative of the hazard of each element before he can point it out to the new man.

This is not as difficult as it might seem at first glance, but its rapid success depends primarily upon: (1) the close co-operation of the safety supervisor and the instructor, whatever his position might be; and (2) the receptiveness of the employee.

The second feature has already been enlarged upon by the description of the job by the employment manager. The first, however, is a long process, because, you will realize as I do, that in spite of any slogans that may be created, or in spite of the soundness and logic of the whole situation, foremen have been and will continue to be primarily interested in quality and quantity production. I do not believe that constant lecturing on slogans or safety meetings will have as much effect upon the foremen's analysis from a safety point of view as will the constant and close approach to the foremen on the part of the safety supervisor or whoever is charged with the safety centralization within a given organization.

And I feel, therefore, that until every new employee, in being taught the elements of his job, is first taught the safe methods in detail by repeated performance, rather than the necessity for production and increased earnings, we will have failed in our job as safety men; we will retard the flow of production through our plants and will still continue the high cost of the loss of limb and the suffering of human beings.

I think it is entirely possible that in foremanship training or development altogether too much time has been devoted to educating the foreman on some of the high phases of his job, particularly costs, maintenance and so-called executive ability, and too little to the very elementary phases of the jobs which he controls. There seems to be an excellent field for each foreman to handle his assistants and for each divisional manager to handle his foremen by conference method in breaking down absolutely every operating job the foreman is responsible for; and I believe that quite a simple plan could be made very effective by taking every machine, every job, and every activity in a small unit and analyze it in a conference.

Nomination and Election of Officers

The report of the Nominating Committee was presented and the following section officers were elected to serve during the coming year:

- General Chairman*—John Roach, Deputy Commissioner of Labor, Trenton, N. J.
Vice-Chairman in Charge of Program—A. L. Armstrong, Eastman Kodak Co., Rochester, N. Y.
Vice-Chairman in Charge of Engineering—G. H. Miller, E. I. duPont de Nemours & Co., Wilmington, Del.
Secretary—Ralph O. Keefer, Aluminum Co. of America, Massena, N. Y.
News Letter Editor—John Moroney, Aluminum Co. of America, Massena, N. Y.
Occupational Disease Committee Chairman—Dr. Leonard Greenburg, Yale Medical School, New Haven, Conn.
Membership and Publicity Committee Chairman—S. D. Kirkpatrick, Chemical and Metallurgical Engineering, New York City.
Statistics Committee Chairman—Ira V. Kepner, Pennsylvania Salt Manufacturing Co., Menominee, Mich.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Construction Section

Officers 1932-33

- General Chairman*—JOHN RUSSELL, JR., United Engineers & Constructors Inc., Newark, N. J.
Vice-Chairman—W. G. WHEELER, Building Trades Employers' Assn., New York City.
Secretary—RALPH A. MACMILLAN, The General Builders Association of Detroit, Detroit.
News Letter Editor—JAMES N. DOYLE, James N. Doyle Adjustment Bureau, Regd., Montreal, P. Q., Canada.
Chairman Poster Committee—R. J. REIGELUTH, C. W. Blakeslee & Sons, New Haven, Conn.
Chairman Membership Committee—EDGAR N. GILBERTSON, Barrett & Hulp, San Francisco.
Chairman Program Committee—W. A. DEARBORN, Lumbermens Mutual Casualty Co., Boston.
Chairman Publicity Committee—THOMAS W. WALTON, Henry W. Horst Co., Philadelphia.
Chairman Statistics Committee—J. C. FORSTER, The L. E. Myers Co., Chicago.
Chairman Engineering Committee—ROBERT MCKINLEY, General Accident Fire & Life Assurance Corp., Detroit.
Chairman Safety Kink & Film Strip Committee—MISS E. S. GIERE, McLaury Marble Corp., New York City.
Members at Large—
 W. F. AUSTIN, Detroit.
 C. H. BLACK, Stone & Webster Engineering Corp., Boston.
 W. R. RICHARDS, Jefferson Park, Alexandria, Va.
 GEORGE WIDUA, 6349 S. Sacramento Ave., Chicago.

MONDAY AFTERNOON SESSION

October 2, 1933

The opening session of the Construction Section was called to order by Harry Guilbert, The Pullman Company, Chicago, Ill., who welcomed the delegates in the name of the Executive Committee of the National Safety Council. He then introduced General Chairman John Russell, Jr., United Engineers and Constructors, Inc., Newark.

N. J., who presided. In his "Resumé of the Year's Activities," the general chairman praised the work of all the section's committees and pointed out that each of them had accomplished valuable work during the year. It is an honor, he said, to be selected as Chairman of an active committee of the Construction Section.

The chairman then introduced the first speaker:

Statistics of the Construction Industry and What They Show

By J. C. FORESTER

Vice-President and Treasurer, The L. E. Myers Company, Chicago

The speaker said in part: It is gratifying to note that the severity rate for 1932 showed the greatest decline since 1928, although the frequency rate remained practically the same.

Marble workers had the best severity rate, and were a close second to public utility contractors in frequency. Steel erection contractors stood at the foot of the list in respect to both severity and frequency. In view of the marked decreases in construction company payrolls, it is self evident that the pronounced decline in severity is creditable to old time employees. It is further evident that the slight decline in the frequency rates for the corresponding period corroborates the assertion that the old-timer reports his accidents, no matter how trivial they are.

Speaking of the old-timer, it is obvious that because of the general stagnation in construction activities during 1932, there were very few new employees taken on. The result bears out the contention that all new employees should be taught to be "old-timers" so far as concerns accident prevention.

This is an especially opportune time, while we yet have surplus energy and apparently are on the eve of a quick recovery in the building industry that will test capacity, to stress the necessity for devising plans and making active preparations for proper instruction in the fundamental principles of safety of the vast army of inexperienced and doubtless non-safety-minded men that will have to be employed to meet the demand of the new era.

Cutting Construction Costs

By H. W. UNDERHILL

The H. W. Underhill Construction Company, Wichita, Kansas

The speaker said in part: There is just one way for the contractors to get lower compensation insurance rates and that is by reducing the number of accidents on their jobs. It has been done in other industries and it can be done in the construction industry.

A certain manufacturing concern which operates two small plants hired a man as safety engineer a few years ago. This man went into the plants and had proper and recommended guards placed on all machinery. He carried out other recommendations designed to prevent accidents in the plant and then he started talking accident prevention to the employees. He showed them how accidents happened most frequently

and how to prevent them. He sent them bulletins on accident prevention. Today these two plants enjoy an especially low accident rate. As a matter of fact, the saving in this rate alone more than pays the safety engineer's salary and the cost of operating his department. In addition, the company saves an undetermined amount through keeping its men on their regular jobs. Every time a new man must be placed on a machine of any kind his inefficiency and inexperience costs the employer a considerable sum.

Every construction organization of any size should select from its organization one man to supervise its safety work. It will not be necessary for him to devote all of his time to this work. He should first be given an opportunity to make a thorough study of safety principles as they apply to the construction industry. From the National Safety Council and the insurance companies, he will be able to obtain information and help on how to prevent accidents on all kinds of construction work. Give this man an opportunity to put these safety principles into practice. It will mean an expenditure of a small amount of money for proper safeguards and devices on construction equipment and it will mean he will have to spend some time educating the workmen on every job in safety methods and practices. However, all of this can be accomplished at relatively small costs and the savings will more than offset these costs.

Nearly every operation in the construction industry from the lowest to the highest can be reduced in cost with safe surroundings, methods and training. Accident prevention and lowering maintenance, operating and upkeep costs require the same careful, conscientious and untiring effort of managers as well as employees. In making a study of the maintenance, upkeep and operating costs of construction motor trucks, it is learned without exception that a careful and safe driver is the most efficient one. Taking a fleet of eight trucks working under the same conditions, one will be surprised to learn that safe drivers cost 2.4 cents per truck mile for tires whereas other drivers cost 50 to over 100 per cent more per truck mile on tires alone, for the highest one costs a little over 5 cents per truck mile.

It is common knowledge that the greatest cause of construction accidents, in fact 25 per cent, or one in every four of such accidents, are due to workmen stepping on or striking against objects. Such accidents can usually be traced to poor housekeeping, careless storage of materials, tools and equipment, rubbish, etc. To reduce this large source of construction accidents and lower costs thereby, there are a few simple rules:

1. Insist on the co-operation of every workman in maintaining good housekeeping conditions. The result of this is that with a good clean job men can move around faster without stumbling over materials, tools and equipment. Operations can be speeded up and a definite reduction in cost obtained.
2. Arrange for the prompt removal of rubbish and waste material. Nothing slows up a job more than to have piles of rubbish and waste material everywhere to interfere and impede progress back and forth across the job.
3. All projecting nails should be removed, hammered in or bent over. Nail bearing materials should be piled neatly with nail points down, as protruding nails are the greatest single cause of injury to construction workmen. For example, in stripping forms, as fast as the form lumber comes down it should be promptly and neatly piled out of the way and then the men can complete the stripping in safety as long as such debris is taken away from them and kept out from under foot. By having an additional man cleaning up under each crew all of the time the entire operation will be so speeded up as not only to save the cost of this extra man but the resultant unit costs will be greatly lowered.

4. Eliminate protruding obstructions which workmen may strike against. Where this is impossible, post warning signs and paint the obstructions with bright colored paint. If you are going to speed up the tempo of the job and secure more results per hour for each man, the field must be cleared for quick operations back and forth. Some obstructions cannot be removed, and these should be marked so that quick detours are possible without slowing up the speed of the operation. Danger signs should be posted in passageways where there is insufficient overhead clearances. Runways and passageways should be kept free from loose materials and rubbish.

5. Adequate lighting, particularly where footings are uncertain or where there are dangerous projections, is important. As soon as a man is hurt on the job the news is instantly spread among all the workmen and they immediately slow up to prevent such an accident happening to them. The job cannot be kept in high gear if the men are thinking in terms of moving slowly and carefully.

6. Insist that all employees wear good heavy soled shoes. This is perhaps the easiest and simplest rule to support and the one that will be the most productive of results. In our own company we put on a "shoe examination" at payoff time with the warning that if they do not have heavy soles they do not need to come back Monday morning. If men are not afraid of stepping on something and injuring their feet, they will snap into the need that is required to reduce unit costs.

The cost of handling materials is one of the largest items on any piece of construction work and these costs can be lowered by safety rules such as the following:

1. Construct suitable toeboards around all floor openings and at the edges of the platforms, scaffolds and staging.
2. Caution workmen against placing tools, rivets, bolts or other materials at points from which they may be accidentally pushed or knocked off on somebody below.
3. Materials should never be dropped from overhead unless absolutely necessary. In such cases, make sure that any person below is warned.
4. Materials may be passed or carried from point to point and should never be thrown.
5. Never permit workmen to stand or walk beneath swinging loads.
6. Materials should be piled carefully so they cannot topple over.
7. Where it is necessary to stand bulky material, such as planks or forms on end, they should be placed so they cannot be blown over or upset.
8. Warn workmen against dislodging materials when taking supplies from piles or trucks.

Occupational Disease Hazard of Silicosis in Construction Operation and Its Prevention

By D. HARRINGTON

Chief, Health and Safety Branch, United States Bureau of Mines,
Washington, D. C.

The speaker said in part: This paper is based on approximately eight years of personal study of the effect of underground dusts on health and safety, supplemented by about twenty-five additional years of close attention to data and studies made by others. The subject will be handled from an engineering viewpoint rather than from that of the pathologist, the doctor, or the lawyer; and while this is unusual it should

be logical, as the real solution of a serious and widespread industrial health problem, brought about by breathing dust, is that of prevention of dust disease.

There appears to be warrant for the conclusion that any dust, or combination of dusts—whether of a coal or metal mine or a tunnel—which is insoluble or soluble with difficulty in the fluid- and tissues of the respiratory organs, is likely to be harmful ultimately to the health of underground workers, if it is present in the air in minute form and is breathed in large quantity over large portions of the working shift for any considerable number of months consecutively per year; some soluble dusts which occur in underground workings are also decidedly harmful. It appears that the quantity of dust in the air breathed more or less continuously, together with its lack of solubility or difficult solubility, governs the hygienic harmfulness of dust to workers much more than do the specific physical or chemical qualities of the dusts likely to be found in underground workings; this does not mean that air containing a large quantity of finely divided flint dust or similar hard, sharp, insoluble material is not likely to be more harmful than air containing a similar quantity of probably less inherently harmful dusts, such as very fine limestone, coal, or shale. Breathing comparatively small amounts of finely divided free silica or similar hard, sharp, insoluble, supposedly more dangerous type of dust is, however, likely to be much less harmful to health than breathing much larger amounts of less inherently harmful dust, such as that from coal, shale, hematite, ore, or limestone, or combinations of such dusts.

Physical examination of underground workers shows that men who work in very dusty places in coal mines have definite respiratory disease, whether the dust is from coal only or from a mixture of coal with rock or shale or clay. Men have worked in coal mines and have then gone to work in dusty metal mines or tunnels and have become affected by miners' consumption, or have worked in metal mines or tunnels and later have succumbed to respiratory disease after having worked in dusty places in coal mines. While dusts insoluble or difficultly soluble in the pores and tissues of the respiratory organs are chiefly responsible for respiratory disease in miners, there are certain soluble dusts of lead, arsenic, and other rocks or ores which are definitely poisonous or which result in material harm to the health of workers.

That the quantity of dust breathed is the important point in the harmfulness of dust is a certainty; yet to state what is that dangerous quantity or what is a safe limit is difficult, in fact, is impossible with our present facilities and knowledge. In South Africa an arbitrary limit of 5 mg., or 500,000,000 particles per cubic meter of air, was set. Their recent reports, however, give the average air dustiness of the working places as around or just over 1 mg. per cubic meter of air; there is probably not one dry mine or tunnel in the United States where the average air dustiness of working places is as low as 5 mg. per cubic meter of air (the South African standard) or 10 mg. per cubic meter of air (the standard set by Higgins and Lanza in their study of miners' consumption in the Joplin, Mo. district in 1915), and a recent state regulation restricts the number of dust particles to a maximum of 15,000,000 per cubic foot of air or about 530,000,000 per cubic meter. In general, the average air dustiness of working places of our dry metal mines runs above 20 mg. per cubic meter of air and many run above 50.

The outstanding remedy for the bad situation with respect to dust disease (in many localities a most distressing one) in underground workings is education—education of underground workers in the necessity of taking such precautions as are available; of employers in recognizing the seriousness of the situation and in providing devices and methods to reduce or prevent the incidence of disease and, if necessary, enforcing

their adoption on the workers; of the doctors in correctly diagnosing the disease, giving publicity to its prevalence, seriousness, preventive remedies, etc., and in death certificates religiously assigning dust disease as the cause where such is the case; and of the merchants, newspapers, and other influences in the community in trying to prevent the disease rather than in hiding its existence.

As specific remedial measures for metal mines and tunnels, the writer suggests the following: mechanical ventilation, with a definite person or persons in charge, should be adopted to force moving currents of air in every place where men work in order to remove dust, heat, and gases. The use of water should be enforced in all drillings, in the sprinkling of ore and rock piles, in the wetting of timbers, man and haulage ways, and in every place where dust may be found. Where possible, the blasting should all be done after a shift; where this cannot be done there should be an enforcement of strict regulations as to the wetting of the region of blasting both before and after firing the shots, as to the removal of all explosive fumes by adequate air currents, and as to the prevention of entrance into a blasted place until all dust, fumes, etc. have been removed. There should by all means be strict physical examination of underground workers before employment and at periods of not more than six months during the employment, with prompt removal from dangerously dusty work should unfavorable physical symptoms be found.

In our coal mines education is also badly needed.

The dust health problem of the contractor is likely to be somewhat different than that of the mine operator—yet some of the factors are fundamentally similar. There is no question that far too much stress has been laid on silica dust and silicosis when the emphasis should be placed on the very definite dangers to workers in breathing a large quantity of any and all kinds of finely divided dust which the worker accumulates or is likely to accumulate day by day in his system; the resultant respiratory disease should be termed pneumoconiosis or simply dust disease rather than silicosis or anthracosis, etc., since it is highly probable that no person has ever been incapacitated by the breathing of any single dust but rather by a combination of dusts.

While it appears that all dusts and combinations of dusts which are breathed into the respiratory passages in large quantities and over considerable time periods are likely to be harmful to health, unquestionably some dusts are relatively more harmful than others: some have effect in one manner, some in another; some dusts affect the lungs, some the bronchial apparatus, some the eyes, some the septum of the nose, some the stomach and some the skin; some individuals have considerable resistance to the harmful effect of breathing dust, others are readily susceptible to it; some nationalities are likely to succumb quickly to dust disease, and others are much better able to resist its inroads on health. Having breathed one kind of dust does not aid any human being to resist any other kind of dust; tuberculosis may accompany the other ills due to breathing of silica dust, but tuberculosis does not always accompany or result from breathing silica dust; tuberculosis may occur in connection with the breathing of coal dust or other dusts, though it is not so likely to be found in connection with coal and with some other types of dusts; silica as a rock, whether as free silica or as a silicate, is practically insoluble in water, but when in the form of very finely divided particles which float in air these very finely divided particles are readily soluble even in water; no human being knows what percentage of silica in a dust is likely to give silicosis, whether 5 per cent, 25 per cent, 50 per cent or more, and silicosis (so-called) is alleged to have been caused by breathing dust with as little as 3 per cent silica; no person knows what quantity of dust in air (silica or other dust) is likely to be dangerous though numerous arbitrary standards of air dustiness are

given to the public, these standards ranging from as low as 250,000 particles per cubic foot of air to 15,000,000 particles; present methods of determining air dustiness, whether by weight or by count of particles, are anything but accurate or dependable; while the x-ray is unquestionably useful in determining the condition of the respiratory passages as to dust harm, it is improbable that any person can from the x-ray alone determine whether the person x-rayed has silicosis, anthracosis, or any other specific type of dust disease; practically every human being breathes silica dust, as 50 or more per cent of the earth's crust with which we come in contact is siliceous and probably 15 or more per cent is free silica and all of us breathe dust from fields, roads, etc.; dusty air, with high temperatures (say, over 80 degrees Fahrenheit) and high humidity, is more likely to be harmful because of dust than air with less trying temperatures; dust laden air contaminated with gases, such as high carbon dioxide or high carbon monoxide, is more likely to give ill health from dust than would air free of high content of extraneous gases; dust disease may incapacitate its victim or may kill him in less than a year from the time he first works in the dusty place, but in general it takes a much longer period; it is said that any person may work in a dusty atmosphere for several years without apparent ill health, yet several years after leaving the dusty work, may succumb to dust disease; generally when a worker has become afflicted with dust disease, it is impossible to cure him so as to completely remove the ill effects, and this is aptly expressed by a doctor in "The American Stone Trade", August, 1933, as follows: "No treatment for the cure of silicosis is known. We can't make stiff tissues soft again. Prevention is the only resource." It is said that sickness causes at least eight times as much loss of time to workers as to industrial accidents and unquestionably one of the most prolific causes of sickness of industrial workers is the breathing of dust; dust disease unquestionably is the scourge of the industrial worker of today.

What can and should be done about it?

First of all, industry should recognize that any and all dusts breathed in large quantities for a long period are likely to be dangerous to the persons who breathe them; then available measures should be taken to prevent air dustiness, the most essential being:

1. Use water in drilling, or sprinkling surfaces, or in connection with processes.
2. Use the best possible ventilation to sweep away any fine dust which may get into the air where people work.
3. Install the best available equipment to prevent dust formation.
4. Have every person in the organization undergo a real physical examination before entering the organization and at stated intervals (not less than annually), with removal from dusty air as soon as symptoms develop in the respiratory tract.
5. All those really interested in the preservation of the health of workers should familiarize themselves with available data as to dust dangers; a limited bibliography.
6. While there is now an enormous amount of litigation as to dust disease chiefly of the misnomer "silicosis", knowledge of a definite, dependable, accurate character about dust disease is woefully lacking and there is probably no more fruitful field for concerted, unbiased, disinterested investigation than that in connection with the harmfulness from dust. Industrial organizations, co-operating with the state and the Federal government as well as other parties, should institute studies as to dust disease to have available authentic disinterested data for use not only in connection with the numerous court actions now pending, and likely to increase, but also as a solid background for state regulations and state laws which now are being framed without dependable data chiefly because no really dependable data are in existence.

Effective Safety Program for Contractors

By J. C. WILSON

Vice-President in Charge of Safety, Lumbermens Mutual Casualty Co., Chicago

The speaker said in part: Taken as an entire industry, there are few mechanical operations in the construction game—very few hazardous machines to be guarded. It is therefore plainly evident that accident prevention in this line is distinctly one which rests on the human element.

Our company has specialized in accident prevention and has had some success in assisting members of the "A. G. C." to reduce and prevent accidents. As a brief outline of an effective safety program for contractors, I would like to submit the following, developed through years of constant effort on this particular problem. We studied more than 1,000 construction accidents and found the outstanding causes to be: 25 per cent stepping on or striking against objects; 18 per cent handling objects; 15 per cent struck by falling objects; 13 per cent falls of persons; 10 per cent flying particles in eyes; and less than 5 per cent of all accidents studied could have been prevented through the use of additional mechanical safeguards. Thus 95 per cent could have been prevented by properly educating the workmen in safe practices, or in other words by insisting on obedience in necessary rules for their own safety.

With this as a foundation, we opened a campaign to educate the foremen so they in turn could train their workmen to guard against these causes—to watch constantly and to follow through on a program requiring full co-operation from everyone on the job.

We suggest holding a foreman responsible for his results including accidents. To this end, a report form has been prepared which supplements the regular accident report. It requires the foreman's personal investigation and his written statement covering what happened—why—how and what has been done to prevent another accident like it.

A safety committee should be formed as soon as the new job starts. The timekeeper is usually the secretary and the superintendent the chairman. As each type of work is added the foreman of that crew is made a member. This committee will have complete charge of accident prevention, and by constantly training the new men and always watching the work as it progresses should have no difficulty in avoiding accidents. A safety engineer will make regular inspections, review accidents and maintain interest in accident prevention.

The system of posting bulletins around the job—placing safety slogans inserts in pay envelopes—requiring each employee to study the rules—sending safety letters to the workmen's homes—all are a part of a general program and add to the results of intelligent supervision.

Much success has followed the use of charts which analyze the accidents reported over any given period of time—usually monthly where a large crew is working. These are divided by foremen and charted as to cause. They require full co-operation from the management as does any scheme in a safety program. With the contractor's help, a safety meeting is called and each superintendent, foreman, and straw boss is present to discuss each accident and to explain to the safety committee just what happened and why.

But—and here we put it up to you—if the meeting ends there and the big boss does nothing—as happens many times—the accidents will continue. If he takes proper action and follows up the foreman, he will soon have a good record and a safe job.

Following this procedure on a certain large job, with a force averaging about 450 employees, their lost time record by months was as follows: January, none; February, one; March, none; April, one; May, three; June, one; July, none; August, none; September, five; October, none; November, four; and December, one.

The complete co-operation prevailing between this firm and their insurance company, and in fact every one of the 450 workers all down the line, which made possible this record of but sixteen lost time accidents in the whole year; five months with no lost time accidents, and with four months with but one lost time accident; should clearly indicate that safety pays big dividends and saves construction costs.

WEDNESDAY MORNING SESSION

October 4, 1933

The chairman called for the report of the Nominating Committee, and this was presented by W. F. Tubering, Associated General Contractors of America, chairman of the committee, and officers were elected as follows:

General Chairman—John Russell, Jr., United Engineers & Constructors, Inc., 80 Park Place, Newark, N. J.

Vice-Chairman—W. G. Wheeler, Building Trades Employers Association, 2 Park Ave., New York, N. Y.

Vice-Chairman for Engineering Projects—P. R. Manetta, Jr., Thompson Sturrett Co., 250 Park Ave., New York, N. Y.

Vice-Chairman for Utility Construction—C. H. Black, Stone & Webster Engineering Corp., 49 Federal St., Boston, Mass.

Vice-Chairman for U. S. Engineering Department—Capt. Elliott Vandevanter, U. S. Engineer Office, 2830 Munitions Bldg., Washington, D. C.

Secretary—Robert McKinley, General Accident Fire & Life Assurance Corp., 469 Ledyard St., Detroit, Mich.

News Letter Editor—Edgar N. Goldstone, State Compensation Insurance Fund of Calif., San Francisco, Calif.

Engineering Committee Chairman—J. C. Forester, The L. E. Myers Co., 1314 Monadnock Bldg., Chicago, Ill.

Membership Committee Chairman—Norman Wellfogs, Booth & Flinn, Ltd., 1942 Forbes St., Pittsburgh, Pa.

Poster Committee Chairman—James N. Doyle, James N. Doyle, Adjustment Bureau, Reg'd, 353 St. Nicholas St., Montreal, Quebec, Can.

Program Committee Chairman—R. J. Reigeluth, C. W. Blakeslee & Sons, 58 Waverly St., New Haven, Conn.

Publicity Committee Chairman—Thomas W. Walton, Henry W. Horst Co., 1505 Race St., Philadelphia, Pa.

Statistics Committee Chairman—W. A. Snow, Associated General Contractors of America, Inc., 1329 E. Street, N. W., Washington, D. C.

Members at Large

W. F. Austin, 4649 Humboldt Ave., Detroit, Mich.

Miss E. S. Ghee, McLaury Marble Corp., Walnut Ave., and East 141st St., New York City.

W. R. Richards, Bureau of Contract Information, 729—15th St., N. W., Washington, D. C.

George Widna, Builders and Manufacturers Mutual Casualty Co., 120 S. LaSalle St., Chicago, Ill.

The Safety Program of the San Francisco Bay Bridges

By E. N. GOLDSTINE

Safety Engineer, State Compensation Insurance Fund of California,
San Francisco

The speaker said in part: An extraordinary effort is being made in the construction of the two San Francisco Bay bridges to assist the contractor in achieving the objectives that have been outlined. The State Compensation Insurance Fund of California, which provides the Workmen's Compensation Insurance coverage for most of the work insured, is working closely and harmoniously with the California Industrial Accident Commission, other insurance carriers, the bridge engineers, and all of the major contractors to eliminate accidents as much as it is possible to do so. Some of the measures adopted are here described.

The contractors are members of the Construction Section of the National Safety Council, and are displaying regularly by weekly changes from three to fifteen safety posters. Every employee has received an individual set of safety instructions. Any failure to observe them may result in dismissal. Every foreman has received an 18-page set of more comprehensive safety instructions. Every employee received every other week an employee publication prepared by the State Fund under the title of the "Bridge Builder," consisting of four or five pages. Its contents cover the nature of the work that is being done, description of the materials being used and how they are prepared, personal items about the men, safety cartoons, and one page on some aspect of accident prevention. At each location a supervisor of first aid employed by the contractors has been appointed. It is the part of his duty to see that first aid supplies are maintained; that all minor injuries are reported on a special form; that all cases requiring medical attention are thoroughly investigated and the facts recorded on a special investigation report; that safety posters are regularly displayed; that accident reports are promptly made out and sent in; inspections are to be made regularly, as well as being on the outlook constantly for any dangers that may be present; that safety suggestions are encouraged and heeded; that arrangements are made for any meetings with foremen or groups of employees.

Two of the contractors have had all key men in their organization present at a series of first aid talks, which was followed by a series of discussions on the experience of the respective organizations and what was to be done in the future. A third contractor has selected a dozen men to wear chromium plated safety badges and constitute a workmen's Safety Committee. They meet every week for half an hour for the same purpose. The first aid supplies have been carefully selected in the light of what would probably be needed for the work in hand. First aid stations equipped with stretchers and in one instance with a private ambulance have been set up. Safety contests have been held and prizes awarded. Comprehensive tabulations of accident experience have been prepared showing the number of days of lost time in various types of employment, by nature of injury, by body part injured, by general cause, by primary basic cause, by work groups, by days of the week, months of the year, and hours of the day. When they have an accident they know about it and come to the realization that it would be better not to have any more if they could possibly avoid it by reasonable foresight.

Safety Measures in the Construction of Municipal Facilities

By SAMUEL A. GREELEY

Pearse, Greeley & Hansen, Chicago

Unfortunately, since Mr. Greeley spoke extemporaneously from miscellaneous notes, no copy of his address is available. However, he particularly stressed the necessity of dealing with the general public in this type of construction, especially where the construction work consists of public highways and open cut sewers, which pass through various towns along the right-of-way. He pointed out the necessity of the proper storage of materials, the protection of trenches and machinery used on the operations, etc. In tunnel and open trench work he stated that probably the greatest hazard was that of cave-ins, being caused by poor shoring, rains, etc. He also brought out that the improper handling of explosives caused a great many accidents. Another hazard is the lack of specific requirements not being covered in the specifications by the engineers. He claimed that the specifications should be very clear in reference to accident prevention, this should be covered so that there can be no guesswork on the part of the contractor.

Sanitary requirements should also be clearly defined. He pointed out several instances in the past where jobs were seriously interrupted by disease and desertion. Personal hygiene is an important factor where camps are necessary. The men should be required to bathe frequently, be provided with changes of clothing, bunk houses should be kept clean, blankets and bedding should be aired frequently. Emphasizing the importance of sanitary and proper hygienic conditions, he pointed out on one job, where 2,500 employees were working, that in a period of one year they had only four cases of pneumonia.

Safe Practices in Construction Work

By R. J. REIGELUTH

C. W. Blakeslee & Sons, New Haven, Conn.

The speaker said in part: In 1929 our firm was faced with the problem of reducing accidents or bearing an increased cost of insurance. We made a study of our accidents and found ten major items of cost which are definitely caused by accidents.

1. There is the increase in cost of insurance owing to a higher rate imposed for bad experience.
2. There is an expense which results from the interference with production caused by an accident.
3. There is an expense following the accident owing to a demoralization of the esprit de corps. The resulting timidity and nervousness of employees who observed or knew about the accident slows up production.
4. There is also a definite cost in connection with the training of substitutes for the injured men.
5. Another item of cost is in connection with spoiled work. This is incident to almost every accident.
6. Frequently on serious accidents, the cause of the accident or the result of the accident is damage to equipment, which must be repaired before the work can continue.

7. If the equipment has not been damaged, it will at least have to stand idle while repairs are being made, either to the crew or to the work on which the equipment has been engaged.

8. If an organization is properly managed, it will not let any accident go by without investigation; therefore, the time of supervising and executive officers spent in investigating the accident are certainly items of cost.

9. The time lost by the injured for dressing, even when the accident is not serious, is an item of cost.

10. In connection with every accident of any serious nature, there is always considerable time lost by others in addition to the injured.

The idea prevalent among so many contractors that the cost of accidents does not seriously concern them because they are covered and protected by an insurance company, is palpably erroneous when you consider this list of ten items of costs which have to be borne definitely by the contractor.

We faced this situation squarely in our organization and found that the accidents we were carrying under self insurance on comparatively safe projects cost us \$4.08 per \$100 of payroll, whereas the insurance on hazardous jobs that we carried with the insurance company cost us only \$3.70 per \$100 of payroll. When we added to these insurance costs the other nine items of cost, we found that it was necessary that we find some way of securing safe practices and so lower our cost of protection. We were able to accomplish a move in this direction because our executives were roused to the seriousness of the situation.

We found that the first thing to do was to get our superintendents and foremen together. We held the meetings once a month and had our superintendents and foremen come in to attend them for an evening dinner. We brought them from their work, no matter where it was, in some cases it being necessary for them to travel all day to attend the meeting. We found, however, that the costs of the meetings were amply justified by the reduction in the cost of accidents.

At these meetings we read the record of accidents on each job, giving emphasis to the good records as well as the bad ones. We also had instruction talks on matters of vital interest to the men and items which had direct bearing on the question of safe practices. Our speakers included men from insurance companies, rope and cable manufacturers, and also some of our own organization. They talked on such subjects as rope, cable, chains, boilers, and methods, and exhibited broken tools and other factors entering into accidents which could easily be brought to the meetings. When we had carried the meetings to the point where the men became interested in safety, we gave them definite orders on the adoption of safe practices. We found that there was no particular advantage in appealing to them on the humanitarian side, but we did find that they would accept orders from us on the question of safety the same as they accepted orders on other features of the work. We placed the responsibility definitely on the foremen and superintendents.

We succeeded in carrying on for over a year without a single accident by our truck drivers. We operated four of our quarries for over two years without a single lost-time accident. In 1929 our construction branch of the business reported 4.52 lost hours for every thousand hours worked. In 1930 the ratio was 5.20, but in 1931 the results of our efforts began to be apparent when we lost .007 per thousand hours worked, and in 1932 our record in the construction field was even lower than that.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Delivery, Taxicab and Bus Section

Officers 1932-33

General Chairman—CARROLL V. WELLS, Pillsbury Flour Mills Co., Minneapolis, Minn.

Vice-Chairman for Delivery Fleets—F. E. TAMS, H. J. Heinz Co., Pittsburgh.

Vice-Chairman for Taxicab Fleets—S. S. GREENBERG, Maxwell-Davis, Inc., Hartford, Conn.

Vice-Chairman for Bus Fleets—ALEXANDER SHAPIRO, Washington Rapid Transit Co., Washington, D. C.

Secretary and News Letter Editor—RICHARD LEONARD, The Taxi Weekly, New York City.

Chairman Poster & Slide Committee—VICTOR I. NUTLEY, Northwest Casualty Co., Seattle.

Chairman Program Committee—C. G. HOWARD, Wicholdt Stores, Inc., Chicago.

Chairman Publicity Committee—CHAS. H. RUTH, Evening Star Newspaper Co., Washington, D. C.

Chairman Membership Committee—B. C. SKEEN, City Ice Co. of Kansas City, Kansas City, Mo.

Chairman Statistics Committee—A. E. LUNDSTADT, Bowman Dairy Co., Chicago.

Chairman Engineering Committee—WILLIAM E. SANFORD, The United Electric Light & Power Co., New York City.

Members at Large—

ROBERT CLAIR, Liberty Mutual Insurance Co., Boston.

H. L. CUMMINGS, Yellow Cab Co., Richmond, Va.

MARCUS A. DOW, Greyhound Management Co., Cleveland.

DALE HARMAN, Yellow Cab Co., Kansas City, Mo.

T. A. HOBROCKS, Minnesota Truck Owners' Assn., Minneapolis, Minn.

H. A. INNESS-BROWN, The Taxi Weekly, New York City.

T. R. JOHNSON, United Parcel Service of New York, New York City.

G. F. C. TAYLOR, Shell Eastern Petroleum Products, Inc., New York City.

J. J. ZEINER, New York City.

TUESDAY MORNING SESSION

October 3, 1933

The first session of the Delivery, Taxicab and Bus Section was called to order by C. B. Auel, the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., who welcomed the delegates in the name of the Executive Committee of the National Safety Council. He then introduced General Chairman C. V. Wells, Pillsbury Flour Mills Company, Minneapolis, Minn., who presided. Chairman Wells opened the meeting for formal business, and the following actions were taken:

1. The old set-up of sectional officers was changed to consist of one general chairman, fourteen vice-chairmen for different types of fleets, a secretary who is also to serve as head of the Program Committee, three chairmen of general committees on Engineering, Posters, and Statistics, respectively, besides which there are to be an indefinite number of members at large, including the past general chairman of the section.

2. It was decided to go over the sectional membership to weed out those who had been automatically enrolled but had no particular interest in the activities of the section, and to invite through the News Letters of other sections other Council members with fleets of more than five vehicles to enroll in this Delivery, Taxicab and Bus Section. It is understood that all fleet members and insurance companies writing public liability insurance are to be retained automatically as section members.

Report of the Nominating Committee

Chairman Wells called for the report of the Nominating Committee and this was presented by Joseph Hollender, The Hollender Storage and Van Company, Chicago, Chairman of the Nominating Committee. The following officers were placed in nomination and elected:

General Chairman—C. H. Ruth, The Evening Star, Washington, D. C.

Vice-Chairman For Bakery Fleets—A. E. Cameron, Pic Bakeries, Inc., Newark, N. J.

Vice-Chairman For Beverage Fleets—T. A. Schendel, Premier-Pabst Corporation, Milwaukee, Wis.

Vice-Chairman For Bus Fleets (City)—Leonard E. Manuel, United Motor Coach Company, Des Plaines, Ill.

Vice-Chairman For Bus Fleets (Inter-City)—Earl Hensley, Pacific Greyhound Lines, San Francisco, Calif.

Vice-Chairman For Dairy Fleets—A. E. Lundstedt, Bowman Dairy Company, Chicago.

Vice-Chairman For Ice and Cool Fleets—L. W. Dawley, Southern United Ice Company, Jackson, Miss.

Vice-Chairman For Newspaper Fleets—W. F. Burk, Traffic Manager of the Canton Repository, Canton, Ohio.

Vice-Chairman For Petroleum Fleets—Clyde W. Smith, Standard Oil Company (Indiana), Chicago.

Vice-Chairman For Public Utility Fleets—H. N. Gainer, New York & Queens Electric Light & Power Company, Long Island City, N. Y.

Vice-Chairman For Retail Store Fleets—C. G. Hohart, Wieholdt Stores, Inc., Chicago.

Vice-Chairman For Taxicabs—Frank E. Toye, Toye Brothers Yellow Cab Company, New Orleans, La.

Vice-Chairman For Trucking (City)—H. E. Trezise, Koppers Seaboard Coke Co., Brooklyn, N. Y.

Vice-Chairman For Trucking (Inter-City)—D. M. Miles, Here Comes Meeks, Seven Mile, Ohio.

Secretary and Chairman of Program Committee—S. S. Greenburg, Maxwell-Davis, Inc., Hartford, Conn.

Chairman Engineering Committee—A. D. Prentice, Hartford Accident & Indemnity Company, New York City.

Chairman Poster Committee—V. L. Nutley, Northwest Casualty Company, Seattle, Wash.

Chairman Statistics and Contest Committee—George A. Meyer, Southwest Transportation Company, Texarkana, Ark.

Members at Large—

Marcus Dow, Greyhound Management Company, Cleveland, Ohio.

Robert Clair, Liberty Mutual Insurance Company, Boston, Mass.

Dale Harman, Yellow Cab Company, Kansas City, Mo.

C. V. Wells, Pillsbury Flour Mills Company, Minneapolis, Minn.

B. C. Screen, City Ice Company of Kansas City, Kansas City, Mo.

C. C. Rosenberger, Markel Service, Inc., Kansas City, Mo.

George Widua, Builders and Manufacturers Mutual Casualty Co., Chicago.

A report of the Poster Committee, prepared by Victor L. Nutley, chairman of this committee, was read by G. J. Coleman, Northwest Casualty Company, Seattle, which called attention to the fact that all through the depression the Council has steadfastly offered a large assortment of posters for the use of its members. Since the last Annual Safety Congress, 756 different kinds of posters have been offered to the members, and 2,888,000 copies have actually been used. More posters have been issued that were suitable for the Delivery, Taxicab and Bus Section members than for any other individual section. This is probably attributable to the fact that most industrial concerns operate a fleet of motor vehicles, thus making them eligible for membership in the section.

The Chairman then introduced the first speaker:

Selling Safety to Drivers

By MERRILL HUTCHINSON

President, Hutchinson Advertising Agency, Minneapolis, Minn.

Mr Hutchinson spoke extemporaneously from notes, and therefore, unfortunately, no copy of his talk is available and only the substance can be reproduced here. He said: There are three important steps which must be discussed in the selling of safety, just as the same steps occur in the selling of any other commodity or service. These are, first, whom do you want to reach; second, what do you want to get him to do; and third, what means have you to get at him?

Now, although these principles are the same in any kind of selling, the selling of safety is usually left up to the transportation department or the delivery superintendent, or some other administrative officer, and the advertising department of the concern or the public relations department is left entirely out of the picture. Perhaps this is a mistake. If the advertising men of the business were called in for advice or as-

sistance, they could doubtless make valuable suggestions, and I want to recommend co-operation in this respect.

It would be splendid if we were able to say that posters reduce accidents 17 per cent, safety talks 5 per cent, employees' magazines 3 per cent, and so on; but there is no way to discover what medium accomplishes the results when several are used. Therefore, we cannot answer the question: "What is the best way to sell safety?" The situation is like that of a sick man who goes to a doctor who makes him go on a certain diet, take certain exercises, get more fresh air, and take certain treatments. Neither the doctor nor the man will be able to tell which of these did the business nor how much each one contributed. It is emphatically not a matter of using this or that method, but of using this and that,—all together.

Let us now consider whom we want to reach with the safety message in fleets. What kind of people are these drivers? We know that their average intelligence is about 12 years. Therefore, we must not tell them anything in words or figures which a 12-year-old child would not understand perfectly. One of the great stumbling blocks in advertising safety or sausages or shoes is that the man who pays for the advertising wants the advertisement to be the kind that he would like, and fails entirely to realize that this would only be good for reaching people like himself. If the management insists on thinking that what it wants is what the other fellow also should have, the effects of the effort may be entirely lost.

Another thought in selling safety or anything else is that the thing is not undertaken like starting a chicken farm. That is, by getting a few hens and a rooster and putting them in a coop, with a yard, to produce eggs. Advertising doesn't work that way. The thing doesn't keep going by itself after it is started; it has to be pushed all the time hard or it will stop dead. This pushing must be of good quality as well as abundant in quantity. It is not enough to keep on making a noise; the noise must be an enthusiastic one. The advertising material must radiate belief in something.

With regard to the medium to be used in reaching drivers, I have already intimated that as many different approaches should be used as possible. Care must be taken, however, in using novel ideas. They are only effective when closely associated with the idea you wish to put across. For example, a dentist might use a giant tooth for a savings bank to pay for dental work, but a giant tooth would not be good for a piano company to use. If the associated idea detracts from the central one, it should be discarded. Some advertisers consider that it is necessary to have a beautiful girl to advertise things, but I cannot see where this is advantageous if the beautiful girl is not associated with the things advertised. The person to be reached is too likely to remember the girl and forget safety. In any case, however, it is necessary to use something out of the ordinary to get attention.

Position of posters or bulletins is also important. You simply can't get a human being to go out of his way to look at your advertising, no matter what it is. You must stick it right in front of them and dress it up. The billboard stuck up on a dump heap will not be nearly so successful as one put on an attractive spot.

The appeal used in your advertising of safety should challenge. I remember a splendid example from an insurance company which advertised, "Will your widow dress as well as your wife does?" That sort of thing bangs you in the eye. This is a difficult thing to do but important and worth much study. You want your reader to say "That's right" when he gets your message. It must ring a bell in him.

Finally, let me advise you to sell safety on the basis of selfishness. Let the men

you want to reach know that if they are injured in an automobile accident, that may be the end of them. Or worse still, they may be crippled for life. Let them know definitely that if they kill a child with their vehicles, they may never get over it and may be nervous driving for the rest of their lives. You must make continually clear what effects accidents will have on the man you want to reach.

Recent Technical Problems of the Engineering Committee

By W. E. SANFORD

Safety Supervisor, The United States Electric Light and Power Company,
New York City

The speaker said in part: The following subjects have been referred to the committee for action during the past year:

1. Revision of part II of the "You and Your Car" leaflet series, entitled "Mechanical Equipment." This subject apparently carries considerable interest, as it brought forth many constructive suggestions.

2. "Safe Driving." This pamphlet, designed for the use of organizations which do not feel justified in going to the expense of publishing drivers' rules, also excited wide interest and many valuable suggestions were made. The pamphlet is now available to organizations and to date some 50,000 copies have been sold.

3. "Brakes on Trailers." The proposal of Wisconsin to enact a law requiring brakes on all trailers having a gross weight of 6000 pounds or more, made it desirable to secure the opinion of organizations interested. The consensus of opinion seems to be that all loaded trailers should be controlled by the operator of the power vehicle and that depending on an attendant on the trailer or semi trailer would be extremely hazardous. It is also considered to be essential that adequate parking brakes be provided on the trailer, so arranged that the wheels may be locked when the trailer is detached from the motor vehicle.

4. "Refueling Hazards—Buses." Considerable information was furnished on the operating experience of organizations all over the country; accidents, however, have been infrequent. It is suggested that the succeeding committee follow up this question.

5. "Side Lights on Vehicles." Should some form of side lights be required on all vehicles, with a view to reducing the danger of night accidents at intersections? It is suggested that this subject also be carried on by the new committee.

Brakes and Accidents

By LIEUTENANT GEORGE ANDREWS

Vehicle Homicide Squad, New York City Police Department

The speaker said in part: In the early part of the year 1930, a conference was held by the Police Commissioner and the Chief Magistrate of the Magistrates Court, City of New York, for the purpose of formulating a squad organization to supply complete information and reports of fatal and near-fatal accidents. This squad investigates and reports on such accidents in the boroughs of Manhattan, the Bronx and Brooklyn. These squads have a personnel of three lieutenants, forty-five detectives, and cover twenty-four hours service daily. The detectives assigned to this

work are picked for their qualifications and knowledge of automobile mechanism, some having technical training in automotive lines, others training in draftsmanship, and in conjunction with this they are instructed by engineers and professors in the study of physics that apply to formulas, as used in the stopping distance charts.

All rules, tapes, and measuring devices used have a certificate issued for their accuracy by the Bureau of Weights and Measures. A decelerometer is used to test brakes, of the type that holds a maximum reading throughout the stop. A gauge to test air brakes, also a pedal pressure gauge and two mercury gauges to test booster brakes operated by vacuum. A special form has been provided for the answering of questions relative to the vehicles tested.

These police detail squads are investigating squads and do not make arrests or issue summons. Each squad operates from the borough headquarters of the detective division, under the immediate supervision of the inspector of the borough. Upon notification of a fatal or serious accident, from the telegraph bureau of the borough in which the accident occurs, that particular squad immediately responds. Proceeding to the scene in the police department automobile, witnesses are detained, statements taken from them and measurements made. Then the motor vehicle is examined for brakes, steering, lights, etc., and upon the completion of the investigation a report is submitted on the findings to the desk officer in the precinct in which the accident occurred.

Based on the investigations that have been made, the following causes of accidents have been listed: fatigue of the driver; poor judgment of speed or distance when a quick stop has been required; ignorance of road conditions or pavement surface when required to stop suddenly; cars parked in narrow streets and pulling out without looking; operator's vision on trucks obstructed; hitching on one car and falling in the path of another; starting before the green light appears; turning left on the green light, thereby striking persons crossing walk; listening to radio, his mind, therefore, not being on his driving; disregard of the eight-foot clearance law between vehicles in motion.

Lights and Reflectors for Commercial Vehicles

By WILLARD C. BROWN

Illuminating Engineer, General Electric Co., Nela Park, Cleveland, Ohio

Mr. Brown first demonstrated how the ordinary headlight with a parabolic reflector projects on the screen a spot of light, and how this may be modified or extended by use of prisms. The ordinary headlight beam which is narrowed vertically so that the light is concentrated near the horizontal center line and spread horizontally, was then shown. It was demonstrated how sensitive such a beam is to loading of the vehicle and to bumps of the road, and this pointed to the conclusion that no beam that would give adequate illumination could be made free from glare with ordinary lamps fastened to the automobile body. The necessity for a second filament in the lamp to give a depressed beam (or other means of accomplishing the same results) was then demonstrated. And it was pointed out that this arrangement is illegal now in some states.

Following this, lantern slides were shown which indicated a very great diversity of state legislation with respect to automobile headlighting and it was pointed out how it would be necessary to get approval of modern equipment before manufacturers

would install it on automobiles which are being marketed. Automobile headlight makers were reported to be several years ahead of legislation in the various states in this field.

Finally, the effectiveness of headlights in which only the left side of the beam was depressed for passing while the right side remained at normal intensity to illuminate the road, was shown. Public education, it was pointed out, would be necessary to bring dual-beam headlights into sufficiently good repute to force legislation in a progressive direction. Drivers must learn to use the new equipment before it will be acceptable. When proper education has taken place we can expect very much better headlighting.

Regarding tail-lights, it was stated that although red had been standardized to such an extent that it would be almost impossible to change it, yellow would probably be a preferable color, and is being introduced in present tail-lights to the extent that they are now orange rather than red. The tail-lights of the future will probably be two in number with a standard spacing by which a person can judge the distance of a vehicle ahead and estimate his rate of approach. With these tail-lights will probably be included stop and turn indicators which may be in the form of flashing indicators of the tail-lights themselves, or part of it.

WEDNESDAY LUNCHEON SESSION

October 4, 1933

Progress in Commercial Vehicle Safety

By A. E. LUNDSTEADT

Claim Agent, Bowman Dairy Co., Chicago

*Original paper
Ad 520
Sent*

The speaker said in part: In compiling data for the fiscal year 1932-33, it was desired to have the experience of as many fleets as possible. In addition to facts reported by fleets in the contest, therefore, data were gathered from other members of the section and also from a considerable number of fleets affiliated with local community safety councils. As a result, it was possible to obtain accident data from 602 fleets with over 41,000 vehicles in use and operating 583 million miles during the year.

The 602 fleets, consisting entirely of either gasoline or electric motor driven vehicles, experienced 314 accidents per 100,000 miles during the fiscal year. This is one accident for about every 33,000 miles of operation.

It is a pleasure to report that accident rates were materially reduced last year. Accidents per 100,000 vehicles miles declined 37 per cent in comparison with 1931, and this improvement, together with a smaller reduction in 1931, makes a total decrease of 41 per cent since 1930. The improvement in the past year is based on the records of 306 fleets operating about 22,000 vehicles that travelled nearly 320 million miles during the year. Exactly the same fleets were used for both years, in making the annual comparison, so that this change is a reliable indication of what occurred in a very large exposure.

Turning, now, to an analysis of the past year's experience, we find that small fleets, as in previous years, had lower accident rates than large ones, averaging 2.42 against 3.35 for the large units. The rates of small fleets, likewise, are generally

lower in such groups as department stores and other retail deliveries, in laundries, in public utilities where reports were classified in large, middle sized and small units. Large petroleum fleets, however, averaged 1.88 in comparison with 2.17 for small units; and large dairies, operating almost entirely in large cities, had less than half as many accidents per 100,000 miles as their smaller competitors.

Considering the three principal types of motor vehicle fleets, commercially used passenger cars had the best experience, averaging 2.60 accidents per 100,000 vehicle miles, and commercial trucks had the worst records, averaging 3.07. Bus fleets engaged in both city and inter-city transportation had a comparatively low rate of 2.96 which, however, is due to the favorable experience of inter-city bus fleets. Such fleets averaged 1.04 accidents per 100,000 vehicle miles in comparison with 6.00 for buses operating over city streets.

Rates among ninety different types of commercial trucks ranged from 1.99 for petroleum fleets to 6.95 for units engaged in hauling fuel. The rates of fleets operating mostly in urban sections are, on the whole, higher than for vehicles used mostly in rural areas. Inter-city trucking fleets had an average rate of 2.09; fleets operating in both urban and rural territories averaged 2.85; but trucking companies whose operations are confined almost entirely to cities averaged 5.19.

An analysis made by the National Safety Council staff indicates that fleets definitely known to have adequate safety programs have been successful in reducing their high rates for previous years. I am told that one city bus company located in a large eastern city reduced its rate 64 per cent in the past year; also that a large bakery along the Atlantic Coast had a reduction of 59 per cent; and that a large fleet of passenger cars and trucks operated by a public utility company decreased its rate 49 per cent.

In conclusion, let me emphasize the opinion of your Statistics Committee that the principal value of these records is in the individual fleet. We urge you to keep complete accident records so that you can determine without any doubt just what your own accident problems are. If you will do this, then it is a very simple matter to file the simple monthly report necessary in the National Safety Council. It may be that there are some fleets represented in this audience that are not yet enrolled in the present contest which started July 1. If so, I suggest that you send your registration at once to headquarters. I believe you owe it to yourself, to the section, and to commercial vehicle operation in general, to maintain adequate accident records and to participate in this competition as a means of achieving greater safety.

Accident Records and Costs

By A. E. SCHMEISER

General Claim Agent, Aurora, Elgin & Fox River Electric Co., Aurora, Ill.

The speaker said in part: Accident records and costs are two separate matters, but they are closely related. The claim agent or superintendent who is in charge of accident prevention work would be lost indeed if he had no system which would inform him as to where to place the damper on the steady flow from the treasury of his company.

In explaining our system, I want to outline how we handle the accident situation as a whole. The company that I represent has a combination service to the public of street railway, bus service and the sale of gas and electricity, and as such we require separate types of accident reports for the various kinds of accidents we encounter.

For our street railway department we have one type of accident form, flexible to the extent that it meets the requirements of various types of accidents. We also have a bus report form which is also used in the gas and electric department for automobile accidents. Then we have a type classed as the public accident form which we use for accidents in both the street railway and gas departments for cases with the public which do not involve either an automobile, bus, or street car. I have in mind such accidents as the falling of trolley wires, poles being struck by autos, the destroying of trees by gas leakage, unprotected ditches and hundreds of other cases along this line. We also have a report form covering personal injuries for employees of all of our properties. For this we use the standard State of Illinois Industrial Board report form, and our reason for this is that we find the questions in this form as a rule cover any accidents which our employees have.

Aside from reports, we obtain additional information by having our employees report direct to the claim agent's office on all serious accidents. This is in addition, of course, to an investigation by an investigator. It is an ironclad rule of our company that the failure of an employee to make out a report on any accident that he might have is a serious offense and subject to a severe reprimand. In the majority of cases we obtain a quick and very thorough report of all accidents.

Managerial Control of Fleet Accidents

By ROBERT CLAIR

Home Office Supervisor, Liberty Mutual Insurance Co., Boston

The speaker said in part: True managerial control as applied to accidents is a comparatively recent development. An application of it to our fleet problems will give us almost everything we can desire in the way of efficiency.

1. What has fleet safety in common with industrial safety?
2. How has managerial control of accidents developed?
3. Of what does modern managerial control consist?
4. How may we apply this efficient method of accident control?

From the standpoint of organization, industry has always operated on a department or foremen's group basis. This provided a ready made system of employee supervision which conforms to the requirements of any problem of managerial control.

The large fleet owner who is organized under a sales or regional supervisory system, or who operates his vehicles from segregated terminals, has a set-up for managerial control almost identical with that of the industrial foreman's system.

The small fleet, which does not use the supervisor plan but which operates its vehicles out of a single garage, differs but slightly from the industrial organization plan. If the operator runs ten trucks, the ten drivers assume practically the same status as ten industrial foremen. The drivers are both foremen and laborers in dual capacity. They are of foreman caliber both in view of their responsibilities and because they possess, generally, a higher degree of intelligence than the average factory worker. They are really individual supervisors with no one to supervise but themselves. As such, they are truly susceptible to managerial control.

These comparisons should dispose of any existing idea that the fleet operating organization is not comparable to the industrial system. It is only the "tools" of the fleet accident prevention trade which differ from those used in industry. The fundamentals are the same.

We have prepared a chronological chart containing a comparison of the histories of the industrial and the commercial fleet safety movements. The conclusions which the chart indicates are:

1. Organized industrial safety work is about eight years older than organized fleet work (1906-1914).
2. It required 22 years for industry to arrive at a general recognition of the effectiveness of managerial control of accidents (1906-1928).
3. Fleet work arrived at a comparable conclusion in respect to managerial control in 18 years (1914-1932).
4. Fleet operators could have reduced this 18 year period of development to 14 years by following more closely the developments in industry. There should have been a coincidence of conclusions regarding managerial control of accidents in 1928.

Managerial control consists, in the first place, of a clear understanding of two things:

First, the definition of a vehicle accident, as adapted from the definition of an industrial accident; second, the actual cost of a vehicle accident.

As early as 1919 we find an industrial accident defined as "an interruption to production." The fleet executive or safety man has probably always ignored this as not being pertinent to his operations.

As a matter of fact, the success of any commercial fleet is fundamentally dependent upon its ability to produce miles. Inefficient miles destroy and delay cargo, make customers dissatisfied with your service, and adversely affect your volume of business. Accidents, more than anything else, prevent the commercial fleet owner from producing efficient miles. For profitable fleet operation, inefficiency must be removed, and therefore accidents must be eliminated. There can be no compromise with the word *must*!

In regard to the cost of accidents, the modern fleet operator must again heed the advice of industry. In 1927 it was demonstrated that the incidental accident cost paid by the employer directly is four times the amount represented by compensation and liability claims and medical treatment.

Do we really know the cost of the accidents reported by our drivers?

Within two months, we had occasion to talk with the officials of a large trucking fleet who had been drifting along, hypnotized by the idea that "they were paying their insurance company to pay for all their accidents." The results which had followed this old-fashioned attitude had been pretty sad. For the previous six months their accident losses amounted to \$10,000.

It was pointed out to the officials of this fleet the fact that the accidents which their drivers had reported were worth approximately \$10,000 to settle and that, in all probability, these same accidents represented an additional \$10,000 in direct and indirect uninsured losses paid directly by the fleet management itself. After a moment's consideration of the statement, the treasurer of this fleet said: "You are not far out of the way in making that statement!"

As a matter of fact, the accidents which they reported probably cost, in actual cash, more than \$10,000 which came directly out of that fleet's profit and loss statement.

The superintendent of maintenance of a fleet operating more than 200 delivery trucks tells me that the average cost of each truck accident reported is \$80, which represents a direct loss to the fleet owner on items on which he cannot or does not carry insurance.

With the help of another maintenance superintendent we worked out the usually uninsured cost of a typical intersection collision. We arrived at a figure of \$397. Although this accident may have been more severe than the average, some indication may be had regarding the volume of such costs which come directly out of the fleet owner's pocket.

These few indications of the true cost of vehicle accidents will serve our immediate purposes. We will not even mention other cost items such as increased insurance rates and loss of good will which also are apt to follow vehicle accidents.

The fleet operator must banish from his mind the idea that it is necessary for him to give his drivers some special educational, psychological, monetary or inspirational treatment to enable them to drive carefully. His accident problem presents fundamentally a problem in non-productive operating cost elimination. Reduced to this form, our fleet safety problem only needs some direct and aggressive executive control applied as you would apply it to any other operating cost problem.

On the basis of our country-wide experience, it has been only during the last year or two that we have generally found fleet operators becoming aware of the efficiency of direct managerial methods for controlling their vehicle accident costs.

For instance, a chain of six grocery stores back east had developed most unsatisfactory truck losses for two consecutive years. This in spite of the fact that their president is a young and capable individual who has been carrying on actively with all the conventional "tools" of the accident prevention trade. Among other things he had been holding quarterly dinner meetings, at considerable expense, for all his drivers. These took the form of safety rallies. Last January he developed a new method of attack. He decided to cut out all his meetings and rallies. He called in his store managers and told them that from that day forward he expected them to control accident costs in the same way as he expected them to control the cost of twine and wrapping paper and other things which came under their supervision. He told them that each month he would review all the accidents, in groups, as reported from each store, and that he would call each manager to account should his experience appear to be out of line. During the first seven months of this year his truck accident costs have dropped 62 per cent from their 1932 level. This executive used direct methods of accident control, and the conclusion is obvious.

Such results are typical. They can be predicted almost invariably when a top fleet executive discontinues indirect methods and reaches for his most effective weapon which is direct managerial action.

There is a type of fleet official who stamps his approval upon some sort of safety program and then passes along to the next business of the day, thinking that his accident problem has thereby been solved. It has not! The mistake made by such officials is obvious. A *passive* managerial interest or approval will not make any program permanently effective.

There is another fleet executive or engineer who works hard at the business of accident prevention. He becomes quite discouraged after having spent time and effort, as well as money, on elaborate educational campaigns involving rallies, high pressure speakers, safety committees, and all the other fixings with no satisfactory results forthcoming. These men finally decide that there must be some trick, or stunt, or secret which they need to put their accident prevention work on a paying basis.

This second man makes a mistake because, going back to our earlier distinction, he thinks that the "tools" used in the actual carrying out of a safety program are the

things that get the results. This is not true but what *does* get the results is the managerial control that gives these "tools" their authority. We must continue to use these so-called "tools" of our trade in our interpretive work. They are common property. The National Safety Council and most of the insurance companies can supply almost endless lists of them such as:

- Safe driving bulletins on general hazards
- Mimeographed bulletins on local and seasonal hazards
- Drivers' bonus plan
- Drivers' group contest for a trophy or other prizes
- Driver awards or buttons
- Safe driver certificates
- Method for selection of drivers
- Driver training or education
- Driver's safety committees, either fact-finding or Court of Inquiry
- Psychological tests
- Road tests
- Personal letter messages to drivers
- Safe driving rule books
- Driver's request for repair form
- Drivers' meetings, rallies or dinners
- Statistical studies and cause analyses
- Blackboard demonstrations of accidents
- Accident prone studies
- Accident spot maps
- Dashboard slogan cards
- Physical examinations

I believe that any given combination of these "tools" or procedures will prove successful among any given group of drivers if the proper moving spirit of managerial control supports them.

It is difficult to outline the details of just what steps a fleet operator or engineer should take to install a system of managerial control. There is a wide variety of local conditions to be considered. Managerial methods differ.

Based on the fact that vehicle accidents not only can but must be reduced and that the best control methods are the most direct methods, the highest fleet executive should begin by issuing an executive order or official set of rules governing automobile accidents. Directed to supervisors or individual drivers, these instructions must be clear and they must have "teeth." Disciplinary examples must be made as would follow the infraction of any executive order of a similar kind.

Kindly understand that we are not recommending hard-boiled methods. Discipline is necessary for effective control in any field of organized activity. We are using it in many other phases of our managerial activities. Such discipline is fair but firm. Why should we not be consistent and use it for the control of our fleet accidents? It works!

Let us take advice from a tried and true industrial safety man, G. A. Kuechenmeister of the Dominion Forge and Stamping Company, who wrote, in the January 1932 Food Section News Letter: "I have been wondering whether the pioneers in safety did not lead us all astray and complicate the whole matter of safety by originating all the 'monkey business' of committee and campaigns and prizes, etc. My personal opinion is that if they had recognized safety as merely a part of, not the

whole thing, in plant operation, and had had the guts to treat it in exactly the same way they treated infractions of all other rules and spoilage of material and machine smashing we would be a lot farther along toward a practical minimum of accidents than we are.

"Yes, I started with committees, campaigns, prizes and all the other fol-de-rol stuff but quite a long time ago I determined to fight it out on a 'safe production' basis to the bitter end. I have gone far enough along that line to see that when it gets results it gets permanent results."

If we were to ask representatives of those fleets which were successful in winning trophies in last year's national inter-fleet safety contest, I venture to say that each of these men would give credit for their success to some specific "tool" which probably has been enumerated among those we have listed above.

We need not be so much interested in the "tools" to which these men attribute their success. It does not make so much difference what sort of a safety committee they used, what kind of bulletins they distributed, how they analyzed their accidents, or whether or not they used individual driver awards. Whatever "tools" they used were undoubtedly dominated by the executive energy and the control methods of the fleet officials themselves. In other words, we can depend upon it that these fleets are efficiently operated fleets.

Among the concluding remarks in the findings of the Committee of the American Engineering Council, which published its history-making report on "Safety and Production" in 1928, appears the following: "There are hidden sources of strength in executive control which here hitherto have not been applied to the accident situation. If American industrialists adopt the same executive policy toward safety which they have developed toward production, we may confidently expect a decreasing number of deaths and disabilities, with their attendant cost."

With every feeling of confidence, the owner and the safety engineer can apply this same conclusion to fleet safety work.

The manager of every commercial fleet has the direct and simple answer to his accident problem right in his vest pocket. This takes the form of a direct and aggressive system of managerial control applied as we are applying it in all other phases of our business. Management is apt to be unaware of this, in which case it is up to us safety men to do some logical talking to secure the necessary managerial control methods.

WEDNESDAY LUNCHEON SESSION

October 4, 1933

Upon calling the session to order Chairman C. V. Wells introduced R. I. Catlin, Vice-President for Public Safety, National Safety Council. Mr. Catlin, whose duty it was to present the National Safety Council trophies to the winners in the National Fleet Safety Contest, which ended June 30, 1933, first briefly reviewed the high lights of the contest.

More than 200 fleets participated in this Second National Fleet Safety Contest sponsored by the Delivery, Taxicab and Bus Section of the National Safety Council. During the contest year from July 1, 1932, to June 30, 1933, the vehicles enrolled in the contest operated 319,972,489 miles and were involved in 7,134 accidents. For the entire contest this meant an average rate of 2.23 accidents for each 100,000 vehicle miles operated.

All vehicles, except the horse-drawn division, were rated on the basis of accidents per hundred thousand vehicle miles. For horse-drawn vehicles rates were computed on the hourly basis.

With a few appropriate remarks in praise of the good records made, Mr. Catlin presented the handsome plaque trophies to representatives of the following companies:

Public Utilities Division

(Large Fleets)—Ohio Power Company, Canton, Ohio.
(Small Fleets)—Lincoln Telephone and Telegraph Co., Lincoln, Neb.

Petroleum Division

(Large Fleets)—Gulf Companies, Fort Worth, Texas.
(Small Fleets)—Gulf Companies, Shreveport, La.

Inter-City Bus Division

(Large Fleets)—Greyhound Lines, Cleveland, Ohio.
(Small Fleets)—Pocahontas Transportation Co., Welch, W. Va.

City Bus Division

(Large Fleets)—Triple City Traction Corp., Binghamton, N. Y.
(Small Fleets)—Duluth Street Railway Co., Duluth, Minn.

Coal and Ice Division

(Large Fleets)—Southern United Ice Co., Tennessee.
(Small Fleets)—Central California Ice Co., Bakersfield, Calif.

Dairies and Bakeries Division

(Large Fleets)—Schulze Baking Co., Chicago, Ill.
(Small Fleets)—Schulze Baking Co., Grand Rapids, Mich.

Heavy Trucking Division

(Large Fleets)—Southwestern Transportation Co., Texarkana, Texas.
(Small Fleets)—Trexler Farms, Allentown, Pa.

Light Delivery Division

(Large Fleets)—General Cigar Co., San Francisco, Calif.
(Small Fleets)—United Parcel Service Co., Los Angeles, Calif.

Miscellaneous Manufacturing Division

Pittsburgh Steel Co., Monessen, Pa.

Transfer and Storage Division

John Winkler's Sons, Inc., Far Rockaway, N. Y.

Horse Drawn Vehicles

R. F. Worden & Sons, Inc., Waterbury, Conn.

ADJOURNMENT

**TWENTY-SECOND ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL**



Electric Railway Section

Officers 1932-33

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TUESDAY MORNING SESSION

October 3, 1933

The first session of the Electric Railway Section was called to order by Charles B. Scott, president, Bureau of Safety, Chicago, who welcomed the delegates in the name of the Executive Committee of the National Safety Council. He then introduced General Chairman Ralph C. Bush, Transit Mutual Insurance Company, of Boston, who presided. Chairman Bush gave a brief resumé of the activities of the section during the past year, and then introduced the first speaker.

The Human Factor in Accident Prevention

By G. A. RICHARDSON

President, Chicago Surface Lines, Chicago

The speaker said in part: The story of the increase in street traffic has been told many times. It is sufficient here to point out that in 1913, only two decades ago, there were but 1,700,000 motor vehicles in the entire United States, while today their number is approximately 26,000,000. Not only has there been a tremendous increase in the number of vehicles, but there also has been a vastly greater increase in speed of operation. Most of us can remember when city councils worried about the speed of a trotting horse and can recall how they wrinkled their brows over the great menace of the speeding bicycle riders. In those days eight or ten miles an hour in city streets was a menace to humanity. Even in the early days of the automobile our ideas of speed were crude. Ten or fifteen miles an hour was regarded as the limit with safety and even on the open road cars could not exceed thirty-five or forty miles an hour because of their mechanical limitations.

Recall this picture, contrasted with the traffic on streets and boulevards of the modern city, and you get a very clear idea of the reason for the existence of such an organization as the National Safety Council. You also will understand better what has been accomplished in accident prevention, in spite of the huge accident total today. You will wonder that this total is not larger than it is.

Much has been accomplished, but much remains yet to be done. Improved equipment of all vehicles has been most helpful. Indeed, without the improved brakes, the sturdier construction and the greater ease in handling of all classes of vehicles, the traffic flow and the speeds maintained today would be an impossibility. Another helpful improvement has been the wide-spread education and agitation against recklessness on the part of the operators of vehicles and the tendency toward requiring some evidence of fitness on the part of the driver before he is permitted to operate an automobile. Electric railway trainmen who operate on fixed tracks with precise clearances and therefore fewer hazards, are selected with great care and are thoroughly trained before being allowed to operate a car. Something of the same requirements should be made in the case of those who operate private automobiles which are relatively more dangerous than street cars, since they are free agents, weaving in and out of traffic and starting, stopping and turning at the will of the driver.

In the development of safety appliances we must admit that the electric railway industry did not keep pace with the automotive industry. There has been little improvement in braking efficiency since the invention and application of the air brake and until recent years little attention has been paid to the weight of cars. Instead of building a car with complete equipment adjusted to the unit, as automobile manufacturers do, we have followed the practice of assembling cars with equipment purchased from various manufacturers. The individual companies have had too much pride of authorship. A car body is designed to satisfy some local ideal and then the purchasing agent shops here and there for the equipment. Needless to say, the result has not always been a happy one. Out of many experiments, however, there is reason to hope that the electric street car of the immediate future will be on a comparable basis with the automotive vehicle in quick acceleration, smooth starting and stopping, braking efficiency and riding comfort. All of these factors will contribute to the prevention of accidents.

Likewise, the industry is making long strides in the selection, training, and man-

agement of men, and this is the most fertile field of accident prevention for, after all, the human equation is by far the most important.

In any discussion of man power, the selection of employees, of course, has first place. In the early days of electric railway operations, trainmen were selected without much regard for their adaptability to this class of service. If they were healthy and physically fit and could establish a reputation for honesty, little thought was given to their other qualifications. We have now discovered that there are men who are physically fit and who have a good reputation for honesty, but who are incapable of making good trainmen because of temperament or other personal handicaps or limitations.

Street car operation, either as motorman or conductor, requires a certain type of personality. The motorman must be alert, quick to comprehend the traffic situation and do the right thing at the right time. The conductor must be even-tempered and well-balanced enough to attend to all of the duties of his job and at the same time be courteous and obliging.

Consequently the better operated systems have built up some form of examination and inquiry for the employment of men which seeks to discover not only their physical condition, but their mental alertness and their temperament. A period of trial is generally required during which the man is given ample opportunity to show the stuff that is in him. If he fails to measure up to the standard of the company he is not employed. The efficacy of this employment system naturally has a great deal to do with the accident prevention record of the company. It reduces to the minimum the number of new employees who are "accident prone." It provides a foundation for the building up of the right kind of personnel.

Unfortunately, the industry does not have at the present time any adequate standardized system of preliminary examination to determine the fitness of men who apply for positions in the train force. The examinations on a number of properties are good, but little effort has been made to co-ordinate them and get a system based on the best experience of all properties. It is not sufficient for the prospective trainman to show that he knows how to perform all the perfunctory duties of his position. An effective examination should try him out in various typical emergencies and see how quickly and how efficiently he reacts to them.

In some states, in examining applicants for state automobile drivers' licenses, the driver is placed on the front seat of an automobile body in front of a motion picture screen. On this screen is shown a picture taken from an automobile proceeding down the street, thus giving the driver the impression of proceeding through congested traffic. Various emergencies are flashed on the screen in front of him, such a child suddenly darting from the curb, an automobile turning without signal, and the sudden stopping of a vehicle in front of him. His reaction to these emergencies and the time required by him to apply the brakes or make the necessary turn of the wheel are properly registered and they determine his fitness to drive in traffic.

Some such test could be made for prospective trainmen. Various other mental alertness tests also can be adapted to this particular problem. We measure the man seeking a job to determine his height, we weigh him and test his lungs and kidneys, why should we not also measure his mind and test his nerves?

An indication of what can be accomplished by proper selection of operators, the experience of the Chicago Surface Lines with its trolley bus service is worth mentioning. When this service was inaugurated in 1930 the operators were selected from the younger men in the train force on the basis of their records. Last year these

one-man operators of trolley buses, operating in traffic without the advantages of fixed clearances such as rail operators have, made a remarkably good record. Compared with two-man cars on street car lines, they made about 50 per cent better showing on miles per accident.

Important as good employment practices are, however, they can change the character of the train force only by slow degrees. In the period prior to the depression the annual turn-over in train forces on large properties was about 10 per cent, and since that time it has been negligible. The big problem in dealing with the human factor, therefore, is to build the proper morale and sense of individual responsibility in the operating personnel. Many of these men have been in the service for years. They entered it when the life was not nearly as strenuous as it is today, and some of them have not adjusted themselves to the changed conditions. These men must be brought to see that most accidents are preventable and that they must train themselves in accident prevention.

I am not much of a believer in safety preachments. Golden rule talks on man's duty to man and generalizations on the necessity for "playing safe" do not hit the mark. Like everything else that is worth doing, accident prevention must be systematized.

The first step in any system of accident prevention is to provide accurate and detailed information on every accident, fixing the responsibility squarely where it belongs. On the Chicago Surface Lines we have had such a system in operation for the past six years and the results in the decreased number of accidents seem to indicate that we are on the right track.

Under this plan accidents are classed as chargeable or non-chargeable. The supervisor of accident prevention gets a report of every accident immediately after it occurs, makes an investigation and places it in the classification where he believes it belongs. The man involved in the accident has a right to appeal to the supervisor for a change in classification if he does not agree with the decision, and he also has the right to appeal from the decision of the supervisor to a committee on accident prevention consisting of the heads of the operating departments. When the classification is determined it is made a part of the man's record. In this way it is easy to spot the accident-prone men—those who have a number of chargeable accidents—and also to give credit to the men who have no chargeable accidents marked up against them.

The proof of any system is in the results and we are very well pleased with the results obtained by this method. Last year 8,040 men out of the total train force of 12,000 had no chargeable accident during the twelve months. Of this number, 1,895 had had no chargeable accidents in the six years since the system was established.

A comparison of certain types of accidents during this six year period as against the previous six years, shows a decrease of 20 per cent in car or bus and person accidents, of 53 per cent in car or bus collisions, 12 per cent in car or bus collisions with vehicles, and 16 per cent in fatalities. The number of motormen who had six or more accidents in one year has decreased 50 per cent as compared with 1930.

Whatever success in accident prevention has been attained on this property has been the result of keeping eternally at it. Under the direction of the supervisor of accident prevention, the staff committee with whom he advises and the heads of all operating departments, there is a constant hammering at this problem. The results of the study of all accidents are passed on to the men for their information. They are shown how certain types of accidents could have been prevented, and intersections

which have proved particularly dangerous, because of the number of accidents occurring there, are spotted and the men are warned to be unusually careful at these points.

Accident prevention contests are carried on throughout the year among the various divisions and suitable awards are made to the division with the best record. Eye tests are required and the men must wear glasses when they are needed. Group meetings are held at which all types of accidents are discussed and helpful suggestions are requested. Especially do we make it a point to recognize records. I am thoroughly convinced that more can be accomplished by a word of appreciation for the man who has done a good job than by harsh disciplinary measures and the general attitude of taking it for granted that those with good records have only done their duty.

When you have provided the best type of equipment and have done all you can in co-operation with public officials to secure satisfactory regulation of street traffic, the prevention of accidents in local transportation simply resolves itself into a problem of psychology. Our trainmen are human, like the rest of us. They have the same reactions to praise or blame; they are just as anxious to earn the good opinion of those about them and they enjoy the same satisfaction in going home to their families at night with a feeling that they have done a good day's work—that "something attempted, something done has earned a night's repose."

The destiny of any transportation property is in the hands of its operating employees; they can make it or break it. They can be driven by the lash of discipline to perform their duties servilely, but servile obedience to rules destroys self-respect and initiative. On the other hand, they can be made to feel that they have the confidence and the respect of the management, that they are relied upon for intelligence and loyalty, and that they will receive congratulations for work well done as well as censure for neglect of duty.

Railroad-Highway Grade Crossings and Their Protection

By J. R. BLACKHALL

Manager for the Receivers, Chicago North Shore and Milwaukee R. R. Co.

The speaker said in part: Railways have used many types of crossing protection, which may be broadly classified as follows:

- a. Warning signs, such as the standard fixed crossing signs.
- b. Visible and audible signals, such as wig-wags, flashers, or watchmen equipped with stop signs and whistles.
- c. Gates or barriers, equipped with lights and bell, manually or automatically operated.
- d. Grade separations.

In the public mind there has developed the thought that the answer to this problem lies in grade separation and in recent years considerable demand for extensive crossing elimination projects has been voiced. The separation of crossings which are heavily traveled by highway traffic can be justified, in many cases, but the justification is based on the economic value of the prevention of traffic delay as well as on accident prevention. The emphasis placed on the grade separation question results from a lack of knowledge of the costs involved and a misunderstanding of the share the railways play in motor accidents, or of the relative delays to highway traffic at railway crossings as compared with highway intersections. The grade separation

demand receives support because of the disinclination of people in general to exercise care and intelligence, or to be subjected to restraint or delay at railroad crossings.

There is, both from the viewpoint of accident prevention, and of reduction of loss from traffic delay, a greater need for grade separations where trunk highways intersect highways, than where highways cross rail lines. A little thought makes it apparent that, whoever pays the initial cost of such projects, it is the general public who ultimately foots the bill, either in increased taxation, or in higher rates for railroad service, or both. Therefore, it is logical that when expenditures are made for this purpose, the work should be done at those locations where the entire public will derive the maximum benefit.

Looking at the problem from a purely economic point of view, grade separation seems justified when the value of time consumed in delay to traffic at an intersection equals or exceeds the carrying charges on the improvement. On this basis it has been computed that, assuming normal rail traffic, an average urban crossing should be separated when the vehicular traffic becomes approximately two thousand units per hour for at least twelve hours of the day, and that the average rural crossing should be separated when the traffic reaches an average of one thousand vehicles per hour for at least twelve hours of the day.

These facts lead to the question whether grade separation should first be considered at the railway crossing because it is a railroad, or at those main highway intersections where the volume of traffic is more dense, where the hazard is more pronounced, and where by far the greatest number of accidents take place. It would be wiser to ask whether the railroads could not accomplish much more, both in the matter of accident prevention and in the reduction of traffic delay, by being allowed to use what funds they can obtain for these purposes in the installation of protective devices at a much greater number of crossings, than by being required to invest large sums in a few expensive grade separation projects.

We should seriously concern ourselves with the questions of how many crossings can be provided with safeguards and what type of protection furnishes the maximum effectiveness. That some kind of protection is needed at grade crossings is clearly indicated by the figures of the Interstate Commerce Commission. The Commission's report shows that in 1931 approximately two thirds of the grade crossing accidents of the country happened at unprotected locations. The same approximate proportion holds true for the number of persons killed and injured in accidents of this class.

In 1928 we made a complete grade crossing survey of the Chicago North Shore and Milwaukee Railroad. Each of the 184 crossings was photographed from the direction of view of the motorman and the motorist. These photographs supplied valuable information as to visibility and, combined with written data on the type of protection installed and other circumstances affecting the hazard, they make a useful record. Following this survey, 36 per cent of our crossings were protected by gates. Thirty-three per cent were protected by visible and audible signals, including watchmen. Thirty-one per cent were equipped with fixed warning signs. In that year two-thirds of our fatal accidents occurred at crossings protected by visible and audible signals and one-third at those equipped with warning signs. There were no fatalities at gate protected crossings.

Our program of crossing protection has progressed until at present our 187 grade crossings are protected as follows: Forty-five per cent are equipped with gates, one-half manually operated and one-half automatic. Thirty-three per cent are equipped with visible and audible signals, as was the case in 1928. Only 22 per cent have warning signs.

We have analyzed our fatal crossing accidents for the three and one-half year period embracing 1930, 1931, 1932, and the first half of 1933. Although we had an average of 82 gate protected crossings as compared with 62 locations protected by signals, we had three times the number of fatal accidents at the latter group of crossings as at the former. The 82 crossings where gates are used account for nearly one-half of our total number of crossings, but in three and one-half years we had only four fatal accidents where gates were in use. In all four cases the gates had been properly lowered and had not been prematurely raised. Two of the four cases involved pedestrians who walked around or under the lowered gates. The other two accidents happened when motorists drove through the gates.

Our experience, during this period of three and one-half years, with the three general types of protection, as measured by fatal crossing accidents, is as follows: Crossings protected by gates, 82; signals, visible and audible, 62; warning signs, 44. Fatal accident per crossing protected by gates, .05; by visible and audible signals, .18; and by warning signs, .09. However, these figures make no allowance for the differences in highway traffic. With a given number of trains, the accident possibilities are far more pronounced, of course, at the crossings traversed by the greater number of vehicles. Many of the locations equipped with warning signs are little more than farm crossings, and do not present the danger of collision found at a heavily traveled highway. Therefore, I have had the above figures weighted, to make allowance for traffic differences, in order to show more clearly what the results have been in relation to the possibilities.

On the basis of a large number of actual traffic counts made during the period under consideration, both at gate protected crossings and those equipped with signals, we have found that in our territory there is a traffic ratio of six to one between these two types of crossings. Making allowance for this difference, our fatal accidents per crossing protected would be .18 for the crossings equipped with signals and .008 for those protected by gates.

The highway traffic at the crossings where we use visible and audible signals is nine times as heavy as at those where we have warning signs. Allowing for this difference, our accidents per crossing become .02 at signal locations compared with .09 at the warning sign locations. Comparing all three types on a weighted basis, we had .09 accidents per crossing where warning signs were used, .02 where signals were used, and .0009 per crossing where gates were used.

Stating the case in another way, we find, if we regard each vehicle crossing the track as an accident possibility, that our gate protected crossings are twenty-two times as safe as the signal protected crossings, and are one hundred times as safe as the crossings equipped only with warning signs.

Nomination and Election of Officers

The report of the Nominating Committee was then called for and officers for the ensuing year were elected as follows:

General Chairman—Ray A. Finch, Bureau of Safety, Chicago, Ill.

Vice-Chairman—Paul Hodson, East St. Louis Railway Co., East St. Louis, Ill.; W. A. Brown, Tennessee Electric Power Co., Nashville, Tenn.

Secretary—H. V. Schreiber, Capital Traction Co., Washington, D. C.

News Letter Editor—Ernest G. Cox, Chicago North Shore and Milwaukee Railroad Co., Highland, Ill.

Engineering Committee Chairman—W. G. Clevenger, Northern Indiana Public Service Co., Hammond, Ind.

Membership Committee Chairman—A. E. Parker, Winnipeg Electric Co., Winnipeg, Canada.

Poster Committee Chairman—Harold F. Webb, West Penn Electric Co., Pittsburgh, Pa.

Program Committee Chairman—Paul R. Kuhn, Penn Central Light and Power Co., Altoona, Pa.

Publicity Committee Chairman—William Pasche, Chicago Surface Lines, Chicago, Ill.

Statistics Committee Chairman—E. E. Grover, The Columbus Railway, Power & Light Co., Columbus, Ohio.

Members at Large—

M. W. Bridges, Chicago Rapid Transit Co., Chicago, Ill.

Ralph C. Bush, Transit Mutual Insurance Co., Boston, Mass.

R. W. Emerson, The Cleveland Railway Co., Cleveland, Ohio.

H. C. Foss, Savannah Electric and Power Co., Savannah, Ga.

G. C. Hecker, American Transit Association, New York, N. Y.

G. T. Hellmuth, Chicago North Shore and Milwaukee Railroad Co., Chicago, Ill.

H. M. Keyser, Washington Railway & Electric Co., Washington, D. C.

E. J. Kreh, Philadelphia Co., Pittsburgh, Pa.

B. G. Noah, Duluth Superior Transit Co., Duluth, Minn.

Samuel H. Reid, Diener-Dugas Fire Extinguisher Corp., Chicago, Ill.

A. P. Schendorf, National Pneumatic Co., Rahway, N. J.

Glenn H. Shaw, Ohio Edison Co., Akron, Ohio.

George R. Whitmore, Illinois Power and Light Corp., Peoria, Ill.

Orig. Paper
6954
THURSDAY MORNING SESSION

October 5, 1933

The Accident Prone Employee

By W. J. McCARTER

Superintendent, Employment and Training, The Cleveland Railway Co., Cleveland, Ohio

The speaker said in part: Last year I constantly heard the expression, voiced by many speakers at the Congress, "If we could only find out what goes on between the ears."

In the last couple of years 130 men have been studied in Cleveland in great detail including the giving of the mechanical tests. The group is a selected group of men who have been in service for a number of years, and it is reasonable to expect that most men who lacked the proper mechanical ability to perform the job had been eliminated by the process of natural selection. The results should be understood, then, to be the relation between test scores and the accident rating of men who have somewhat successfully filled the job for a number of years. All of the correlations are near enough to zero to indicate that the mechanical factors are in general not causes of accident-proneness for men who have survived a number of years of service.

In my paper two years ago I pointed out that our subjective analysis of the causes of individual accident-proneness were largely of an emotional nature. These included

family troubles, distractions, emotional tensions, and other form of purely mental difficulties. Here, then, is a real problem of finding out what goes on between the ears.

As early as 1917 Dr. Woodworth devised an adjustment questionnaire to get at the mental maladjustments of the soldiers during the war. This has been revised over and over again by other psychologists and given with varying results. An integration of these various questionnaires designed to measure adjustment has been effected in a "Personality Inventory" constructed by Bernreuter and published by the Stanford University Press. This questionnaire of 125 questions to be answered by checking one of the three responses—yes, no and ?—is scored four ways to yield, first, a measure of neurotic tendency, second, a measure of self-sufficiency, third, a measure of introversion-extroversion, and fourth a measure of dominance-submission. The reliability co-efficients are reported high.

After studying all of the questionnaires I decided to make up my own in the form developed by Dr. Ohman, Head of the Department of Psychology of Cleveland College. I have called this a "Social Behavior Questionnaire." It consists of thirty-one social situations. For each situation I have indicated seven types of behavior.

Type 1, represents an aggressive, defensive, belligerent, domineering, bitter sarcastic, attack upon the problem. It might be called a strong defense reaction against conscious inferiority. Usually it is an attempt to break the situation.

Type 2, represents a direct, straightforward, natural, unemotional, attack on the problem; doing what is most reasonable and least emotional. This is supposedly the most healthful type of behavior.

Type 3, represents flight reactions. These may be objective flights in the form of disregarding, avoiding, moving away, etc., or subjective flights into phantasy and day dreams and wish thinking.

Type 4, represents an "on the fence" or nervous type of behavior. Indecision, doing nothing about it, allowing tensions to accumulate, becoming restless and nervous, is typical.

Type 5, represents what I have called an "indirect reaction from the problem." It is a sort of an emotional explosion resulting from the problem but not made to the problem. It is an emotional transfer. It is emotional outburst caused by the problem but the tension release is usually directed to things and people rather than the problem. Often it is an outburst after the situation has passed. It is usually infantile in nature, and resembles the tantrum under thwarting. Most of these reactions are carried into adult life because of conditioning earlier.

Type 6, represents a "sense of humor" reaction. It involves a change of attitude, viewing the situation from a new perspective, taking an impersonal slant at it, taking it "philosophically." It might be said to be an inner adjustment rather than an external social adjustment. It is a way of making one's peace with himself by making the situation impersonal and therefore objective and unemotional.

Type 7, represents a submissive, giving-up, acceptance of defeat reaction. It is probably the true inferiority reaction. It is self-blame. One would expect that the same individual might show some of Type 7 and Type 1 (defensive) behavior.

I was particularly fortunate in having a group of furloughed men to re-employ in the last month, on 40 of whom I had sixteen months of accident record. As they passed through my office I asked each man to fill out this questionnaire for me.

For the first type of response, the aggressive, domineering, attack type of response, 30 of the men had questionnaire ratings and accident numbers on the same side of the

mean. In other words the most aggressiveness as expressed by themselves corresponds to their degree of accident proneness. For the other type of response there were no significant relations to accident proneness.

Of course, the research on this phase of the problem is just begun but if a questionnaire can be developed which will tell us our emotional types with reasonable accuracy, and this is found after further investigation to have a close relation to accident proneness, it will be important in two ways: In the re-education of our older men in their specific attitudes; and in the selection of new men with the proper attitudes to prevent accidents.

*Orig. paper
8-20*

Analysis of the Safe Operation of a Street Car

By J. J. CONNORS

Safety Director, The Tennessee Electric Power Company, Chattanooga, Tenn.

The speaker said in part: After attending several conferences for vocational instructors, in which the training of apprentices, learners, helpers, etc. how to do their jobs was stressed to increase production, it occurred to us that some sort of safety training along this line for the man who already knew his job might be beneficial in reducing accidents. To test this theory, we organized our transportation operators in groups of 25, and proceeded to analyze the safe operation of a street car.

We selected the simple job of an operator taking on a passenger and operating the car a distance of two blocks. The operators developed this analysis themselves, the instructor placing upon the black-board the various operations and hazards as they were developed. The instructor started the discussion as to the relative importance of these hazards, rearranging them in their sequence as decided by the group.

It developed that in stopping a car, to take on a passenger and start the car, seven operations were usually performed by the operator. These operations were taken up and analyzed as to the hazards involved. It was found that there existed 13 hazards or ways that an accident might occur in bringing the car to a stop. The most serious was the operator accidentally using the emergency feature. Opening the door for the passenger to board, offered 5 hazards, the most serious being, opening the door before the car stopped. Closing the door occasioned another 5 hazards, the most serious being striking the passenger with the door. Then as the operator started the car, 7 hazards existed, the most serious being the abrupt starting of the car. Operating the car in relation to traffic and pedestrians brought out 27 hazards, the most serious being automobiles passing on the left side of the car. Six hazards in regard to passengers falling in the cars developed. Here again abrupt starting of the car was listed as the most serious.

Six types of collisions between cars and automobiles were listed, the head-on type being most serious. These types of collisions were discussed in their order and it developed that head-on collisions occurred mostly from 3 causes, the most serious being automobiles pulling out of line of traffic. Five causes of rear-end collisions were developed, the most serious being following the vehicle ahead too closely.

The side-swipe type of collision developed 3 hazards, the most serious occurring when trying to pass the vehicle going in the same direction. The rear-end swing developed 3 hazards, the most serious being not making allowances for width of car while rounding curve. Cutting-in collisions occasioned 3 hazards, the most serious being the operator not anticipating automobiles pulling on to the track. Collisions at intersections developed 6 hazards, the most serious being lack of vigilance on part

of the operator. Causes of collisions in general were 5, the most serious being thoughtlessness on the part of the operator.

Weather condition and its relation to accidents brought out 3 hazards, fog being the most serious. Light conditions developed 2 hazards, dusk considered the most serious.

Track conditions occasioned 4 hazards, sweaty condition of track being considered the most serious. Street conditions developed 4 hazards, street covered with a sheet of ice being considered the most serious.

We do not claim that this analysis is correct, either in part or in its entirety, and we agree that if a similar analysis were made with a group of operators in another city, the development would probably be entirely different as to which hazard in the various groups is considered the most serious. But we do feel that the value of such methods is getting the operator to think about the various hazards which exist in the operation of a street car.

It will be noted that the actions of drivers and pedestrians were almost eliminated from these analyses; however, before these group meetings were inaugurated the writer made a check in order to ascertain the actions of pedestrians and drivers, and the relations of their actions to accidents. This check was made by riding on the front platform of a street car with an operator during his nine hour period on duty. At the end of this 9 hour run, this check indicated that if the operator had operated his car as thoughtlessly as the drivers and pedestrians which he came in contact with during the day, it would have been necessary for the operator to write out 516 accident reports. This operator actually prevented 35 accidents by reversing the car, using his emergency air brake and using his head during the duration of his run.

Relationship Between the Claims and Safety Departments

By A. E. PARKER

Orig. paper 8-20

Accident Prevention Committee, Winnipeg Electric Co., Winnipeg, Canada

The speaker said in part: Every accident is an object lesson, provided we know the actual conditions that lead up to it. There are at least two departments immediately involved when an accident happens; the claims department and the accident prevention department. For the time being, the claims department is usually given priority—it is expected to be on the job immediately to protect the company's interest, to get the actual facts and thus guard the company against excessive, illegal or fraudulent claims. The duties of the claims department are primarily to ascertain the legal liability, if any, of the company to those affected by the accident. The claims agent has no immediate concern as to whether or not the accident could have been prevented, except in so far as this affects the company's liability. He is faced with the stern reality that the accident has happened and it is his job to see that his company does not pay more than it should in settlement of claims that result therefrom.

Once the immediate needs of the claims department have been complied with, the accident prevention department should join in the investigation of the circumstances surrounding the accident. This makes an ideal combination. Both departments desire to get all the facts, but for different reasons, the claims department to enable it to deal with claims and the accident prevention department so that it may prevent similar accidents in the future.

How can such an investigation, carried on by these departments with quite different objectives, be made a thing of joint value to each of them, and of outstanding value to the property concerned?

First, it will be agreed that the better the accident prevention work is, the fewer the claims will be, with consequent benefit to the company. It will also be admitted that the thorough investigation of accidents will provide most valuable knowledge upon which to base accident prevention policies. Furthermore, in this as in many things, two heads are better than one.

The claims officer in the course of his duties gets the evidence of witnesses, many of whom will not be in the employ of the company. In this way he gets an outside viewpoint. Through these witnesses he is able to see the company's operations as others see them; he learns of accident hazards the outsiders see but which, owing to familiarity with the work, employees perhaps do not see. He sometimes finds that while the company is technically not liable for a particular accident, with a slight change in the circumstances it might have been. He knows the company should not go too far in assuming responsibility for conditions over which it has no control, lest it thereby make itself liable by publicly acknowledging hazardous conditions. We have had instances where an over-zealous official has recommended the display by the company of warning signs for the benefit of the general public, which our claims department, though its legal representative, advised us would provide *prima-facie* evidence of the company's liability, should such conditions result in an accident.

On the other hand it is the duty of the accident prevention department to use a little imagination and certainly not to underestimate the results of an accident. A particular accident being investigated may be a minor occurrence, just because the company got the breaks. As an illustration, a collision between two street cars, when there were no passengers on board, would not cause much worry to the claims department, but if the cars were loaded with passengers it would be a different story. To the accident prevention department, there is no difference, whether there are passengers on board or not. To that department the outstanding fact is that there was an accident which should not have happened.

We therefore must always keep in mind the different objectives each department has when investigating accidents, and endeavor to find the common ground which exists, despite the difference in objectives.

The practice and policy of the company in the matter of operation, inspection of equipment, examination of employees, rules and regulations governing passengers and accident prevention methods generally in use on the property may have an important bearing on the cause of accidents as well as on the liability of the company. The accident prevention officer should have a detailed knowledge of these, the claims agent should also have that knowledge, and there should be complete co-operation between them so that this joint knowledge can be used for the protection of the company and the prevention of similar accidents in the future.

The claims agent can usually get a quicker and more dependable opinion of the reaction of employees to unusual or emergency conditions than the accident prevention officer can. The claims agent sees the employees immediately after the accident—the event is still predominant in their minds, they have not had time to think out ingenious reasons for the accident and the part they had in it. The experienced claims agent senses immediately whether or not the employee is telling the whole story; the agent through long experience knows how to draw the complete story out of a reluctant witness. He gets the facts—all the facts—and these facts are what the accident prevention officer needs.

Bonuses and Awards

By H. M. KEYSER

Secretary and Assistant Counsel, Washington Railway & Electric Co.
Washington, D. C.

The speaker said in part: I believe some form of bonus or award is justifiable as a recognition for good work. Such a recognition is the source of much satisfaction to the man recognized, and is an incentive to the other men in the group who might have won the recognition or who will be contestants for a future award.

The value of an award lies largely in the importance attributed to it by the management in the attention given to the contest and interest shown in its presentation. I do not favor cash awards, but do believe awards of useful articles, such as uniforms, are better appreciated and do more good than cash or objects which are of value merely for display.

For some time we gave both cash and uniform awards, but when the cash award was abandoned, the reason was explained, uniforms were retained, and we did not suffer by the change.

We have some 60 men who have been awarded uniforms every year for twelve years, and many men have won them for long or shorter periods. The fact that we have been keeping up this contest for twelve years and still find many men winning uniforms and still keep our accidents down, leads me to believe that this form of recognition for safety interest and effort is still very well worth while.

The question may be raised whether such awards tend to promote blind claims—unreported accidents—but our experience does not leave any question in our minds on that subject, as such cases were reduced as much as accidents during the first year, and do not now give us any undue concern. We have, of course, a severe penalty attaching to any unreported accident which can be shown to have occurred in which one of our men is found to have been concerned.

I do not believe that the cost of such awards is great enough in comparison with the savings they effect that we should abandon them, even if income has greatly declined. The fact that our men are today more interested in doing a good job just to hold their jobs when jobs are so scarce, still does not, I believe, justify abandonment of this award.

Group awards, even though of no financial value, have a healthful influence in that they promote co-operation and understanding between the men and the management.

The Training and Supervision of Trainmen

By J. L. TROY

Supervisor of Street Operation and Safety, Boston Elevated Railway

The speaker said in part: Boston, like all other railways, is using a one-man service wherever this is possible. At the present time approximately 85 per cent of the schedules during the rush period is one-man operation and after 8 p. m. and on Sundays and holidays it is 100 per cent one-man operation.

To arrive at this change-over from two men to one man operation, it required considerable training of trainmen. The most difficult problem was the training of long service conductors to one-man operators. The management felt that the conductors,

due to their long and faithful service and because of the changing conditions, should be given an opportunity to qualify as operators.

A study was made to determine if it was possible to shorten the length of time for an operator to gain the experience necessary so that he would be classified as a good operator. It was then found that the problem became a matter of supervision. Therefore, as a part of a street supervisor's duties, he is required to supervise the new men. He does this by boarding the car or coach as it passes through his district, and making observations of the operator's habits that need correction; unless very serious, he does not correct them at this time but makes a written report.

When the reports are assembled from the different supervisors on any particular operator his most prominent habit of improper operation is noted and the operator is then given special instruction to correct this habit. Each faulty habit is watched thoroughly and when it is found that the most serious habit is eliminated he is then corrected on his minor faults. He is placed on probation for a period, not exceeding ninety days, and if he has not the primary qualifications, he is then disqualified.

1. The theory of this development was to have a unified system of training and supervision under one director based on a job analysis of a street supervisor's or inspector's duties. The job analysis, summarized as follows, provides that all inspectors must—

Know their respective districts, especially the heavy and important traffic points and accident hazards; be familiar with the location of cross-overs and cut-outs; observe all list notices in regard to car and motor coach operation and see that operators comply with these notices; have complete knowledge of schedules, running time and timing points; know where heavy loading points are, both in the morning and afternoon rush hours and observe where the riding is during the normal hours; maintain a headway and assist in loading passengers; see that operators have their cars under control when passing intersecting streets or when passing moving or parked vehicles or persons; observe conditions of rails, order sand car when needed, and report all dangerous conditions of track or street; and caution or instruct operators in a manner not offensive to them.

2. The street supervisors or inspectors were especially selected from the younger men who were operators and car starters, whose previous records indicated that they had qualifications that would fit them into the program. This was done gradually.

3. They were then given special training in car equipment and trained to operate coaches by representatives of motor coach companies, who selected some who were to do the training of coach operators.

4. The street supervisor is assigned to a district. The district to be covered is based on the mileage and headway that is operated.

5. They were held strictly responsible for every unusual occurrence in their district, such as: collisions, uneven headway, delays, etc.

6. Conferences are held by districts every ten days and all matters pertaining to their district are discussed with them.

7. A measure sheet is kept on each street supervisor which indicates the work he performs while on duty.

Summarized, the object of the unification plan was to insure safety and regularity of service. The system required considerable small detail: the close check and follow-up of the individual operator and the close check and follow-up of the individual street supervisor. This system has proved itself from the results obtained.

My Observations of Careless Habits

By CHESTER K. THOMAS

Chicago North Shore & Milwaukee Railroad Company

The speaker said in part: Although I shall confine my remarks to a discussion of those habits common among motormen and bus operators, I want to say emphatically that all those careless habits commonly indulged in off the job, that tend to undermine the morals, destroy the health and injure the personality of the worker, have an important bearing on the subject of careless habits as discussed here, because they weaken and sometimes destroy the person's mental discipline and control, which are his more effective weapons against acquiring careless habits while at work.

The careless habits common to motormen and bus operators can be put in three groups: 1. Habits of omission, conceived in failure and neglect. 2. Habits of commission, conceived in recklessness and intolerance of other forms of traffic. 3. Concealed habits.

The first two groups are outward manifestations of certain mental tendencies. The source of concealed habits is entirely mental, but there is no outward manifestation. I disagree with those who say carelessness is mental lethargy. Laziness, indifference, lack of interest, recklessness, etc., all these constitute a description of a careless person, but carelessness itself is merely lack of precision in thought or in action, or in both. A habit is a development of repetition, so a careless habit is the product of repetition of an act characterized by lack of precision. It would be useless to study careless habits without recognizing that they reflect a certain type of individual. We must learn the cause of these habits if we would eliminate them, and the cause lies in the mental complexities of the man who has them.

I will mention a few habits of omission. Failure to report for work. Failure to read bulletins and special instructions. Failure to inspect equipment for defects. Failure to report defects. Failure to leave terminal on time. There are plenty of others, but you will note that failure and neglect are apparent in each. These belong to a lazy, indifferent sort of person, one who has little or no interest and enthusiasm for his work. Probably his one great desire is for an extended period of inactivity, and if he is a bad case, the industry will be better off to give him his desire and make it permanent. Laziness, indifference and a lack of interest represent a combination well nigh incurable and a person so afflicted should be in some other industry where he could be subject to continuous personal supervision.

I now mention a few habits of commission. Stopping and starting with a jerk. Following other vehicles too closely. Short braking. Passing other vehicles in the face of on-coming traffic. Disregarding stop signs and other traffic regulations. Excessive speed over switches, around curves and through points of congestion. Taking chances on clearance when passing parked cars, and numerous others of a similar nature. You will note that in each of these habits there is evidence of haste and excessive energy. A person with these habits may be suffering from any one of the following: lack of knowledge, recklessness, mania for haste, over-anxiety, intolerance of other forms of traffic. He is a good man to have around if he can be controlled. I would say this could be done if gone about properly. If his trouble is lack of knowledge, instructions will be needed. If recklessness is the cause, plain talk and, if necessary, punishment is the remedy. If his trouble is mania for haste, over-anxiety or intolerance, then a supervisor in whom he has confidence can bring him out of this by explaining to him in a firm, but friendly manner, that these habits

are not only endangering his record, but are also taxing his mental and nervous energy to an unnecessary degree. This type of man has energy, interest and alertness and you can well afford to spend time and effort to improve his work. More than likely he covets the good opinions of his superiors and this can often be used as a cure.

The third group, or concealed habits, is a delicate question; delicate because it is difficult to prove anything you may say about it. I know it exists and I know it is dangerous because I have had to combat it myself for over twenty years of my twenty-five of active work. I refer to the habit of letting the sub-conscious mind direct our work while the psychic mind is allowed to travel to parts unknown. This I consider most dangerous of all careless habits, and certainly the most difficult to control. The bad thing about it is that it usually afflicts the best men in the service, creeping up on them gradually, so gradually, in fact, that they often put in a lifetime of active service without knowing they have been its victim. You cannot know they have it by observing their work. They are skillful and alert apparently. They seem to do everything right, and yet if you could photograph their thoughts for a trip you would be amazed. On a trip of 50 miles you would see a picture of their love, hate, war, all the extravagancies of wealth, and thousands of visions, fantastic and impossible, that flood the mind of an individual while alone. Along with all this you would see a nice train or bus ride for a surprisingly small portion of the distance. When an emergency arises the minute interval required for the psychic mind to assume control may represent the difference between escape and disaster. The sub-conscious mind cannot visualize, it cannot anticipate. Therein the danger lies.

The remedy, if any, is suggestion to your men as a group that they try the trick of keeping their minds concentrated on their work between two designated points just to see if it could be done. This would serve to let them know that you suspect they have the habit, and at the same time it would make the man who has the habit, realize how thoroughly it has gotten hold of him. Another remedy is schedules as fast as can be made, considering condition of equipment and track. This makes the operator put more concentrated effort into his work and renders him less liable to the wandering habit.

Finally, I want to say that whenever carelessness is evident among motormen and bus drivers you will also find it among those managing the property. Not all carelessness is at the bottom. Some must be at the top. Carelessness is mental and can be treated only by precept and example. It is the function of managements to furnish instruction and set an example. Know your men. Classify their habits. Diagnose the cause, and by patience, intelligent effort, coupled with the right kind of example, much can be done to eliminate the menace of carelessness.

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Food Section notes filed. F.B.I.

TUESDAY MORNING SESSION

October 3, 1933

The first session of the Food Section was called to order by Ernest W. Beck, United States Rubber Company, New York City, who welcomed the delegates in the name of the Executive Committee of the National Safety Council. Mr. Beck then introduced Vice-Chairman Frank A. Hasse, Corn Products Refining Company, Chicago, who presided.

The first feature of the morning program was a general discussion of the "Safe Handling of the Various Substances used to Promote Sanitation in the Production, Preparation and Distribution of Food Products." This was divided into two subjects, handled by separate speakers. Chairman Hasse introduced the first speaker.

Acids, Caustics and Cleansing Agents

By S. E. WHITING

Assistant Chief Engineer, Liberty Mutual Insurance Company, Boston, Mass.

It may well be assumed that any plant that is manufacturing food for human consumption must keep all its cooking vessels, containers and floors thoroughly clean by repeated applications of suitable cleansing materials. Soaps vary in their injurious effects on the body depending mainly on whether or not they contain any free alkali and this variation may be interceded by the common terms "strong soap," "mild soap" and even "super-fatted soap."

I would assume that anyone who desired to retain "that school girl complexion" would not attempt to use a strong soap, yet a food plant might be impelled to use a strong soap from the service standpoint. No harm need result therefrom providing employees assigned to the cleaning work use reasonable care in avoiding personal contact with the soap itself especially in its concentrated form. While splashing of strong soap solution into the eye might cause severe inflammation, the chief industrial danger in handling strong soaps has been formation of skin rashes or dermatitis. This danger is a slight one and can be readily guarded against by care in handling the soap and particularly by thoroughly cleansing the hands with warm water after work, followed by thorough drying of the skin, especially in the winter time. However, with dermatitis in most any industry, there are the rare individuals who have a susceptibility to skin lesions and such persons should preferably avoid this class of work altogether. Even salt water, as experienced sometimes by ice cream manufacturers, may be the cause of skin troubles unless careful individual hygiene is maintained.

While the chemist knows many kinds of acids and bases, it is mainly the strong inorganic acids, such as sulphuric acid, nitric acid and hydrochloric acid (sometimes called muriatic acid) and the strong inorganic bases like sodium hydroxide and potassium hydroxide, which are sufficiently active chemically to cause severe bodily injury. I am not, of course, attempting to list all caustic chemicals by any means and some of the organic acids such as oxalic acid need to be handled with great care.

The general rule of safety in handling these caustics, especially important where they are present in other than a straight chemical industry, is to impress upon the

employees that any spillage or splashing of the chemical, particularly when it is in concentrated form, should be carefully avoided. The responsibility for following out of this practice can, by no means, be placed entirely upon the employee himself. The employer should provide such equipment for handling the chemicals in bulk that any spillage or splashing is reduced to the minimum. I refer not only to the use of inclinators or pumps for pouring caustics out of heavy carboys but also the use of safe containers for carrying the caustic wherever it may be needed throughout the plant. Glass bottles are in many respects the most suitable containers for caustics because of their non-corrosive character but they are so easily fractured that it is a wise practice to place them in a suitable carrier that will prevent any spillage in case the bottle itself is accidentally broken. Thus, in one food plant, I observed the refinement of having a lead-lined box in which the small bottle of sulphuric acid could be kept when not in use so that if a bottle cracked the acid would not spill about the floor. I feel that we cannot over estimate the value of the greatest care in handling strong caustics. A single splash on the clothing may lead to so severe a burn, healing is delayed and there will be the danger of infection with prolonged disability or even a fatal outcome. A single splash of strong caustic in the eye might cause the loss of sight or at least a reduction in vision sufficient to make the eye practically useless.

Sulphuric acid, as you know, is used in the milk industry in connection with the Babcock test. In ice cream manufacture, the analogous test is made, I understand, with glacial acetic. While this is one of the organic acids and is the same thing as ordinary table vinegar, its concentrated solution and its dry crystal form demand every refinement in care of handling. As to strong alkalis, I have not found that caustic soda is used in any food industry but, if so, the solid or flake form of caustic soda must be handled with particular respect. A mere speck of it in the eye will produce a "burning" action that will cause irreparable damage unless prompt and adequate first-aid measures are instituted. In diluting the strong acids and alkalis with water, care must be exercised because there is usually a heat reaction that may cause the cold water to quickly reach boiling point, with resulting splattering or fracture of the container if it be made of glass. In general, only responsible and well instructed employees should be assigned to any handling of the bulk chemicals as they come into the plant.

While it is beside the subject matter of this paper, I cannot refrain from calling your attention to a particular type of chemical reaction that has occurred in certain food manufacturing plants and converted an apparently harmless process into a fatal death hazard. I refer to an asphyxiation hazard in closed bins, tanks, vats, etc., and particularly to an asphyxiating gas that has no odor whatever and thereby lies its chief danger. It is odorless, colorless and, in dilution, entirely non-poisonous. The gas called carbon dioxide, CO_2 , is the natural end product of the oxidation or burning of carbon. It is a constituent of all flue gases, of gas engine exhaust (I am not referring to carbon monoxide), and of fermentation processes. It is in the latter process that the members of the Food Section may find some possible interest in this hazard of carbon dioxide when generated within enclosed spaces. An additional important source of carbon dioxide is dry ice which is getting into common use in the food industry wherever refrigeration is necessary. Dry ice is merely solidified carbon dioxide gas and when the dry ice absorbs heat, it evaporates into this same colorless, odorless, "non-poisonous" gas of carbon dioxide. The gas is about 50 per cent heavier than air of the same temperature. I almost overlooked the

fact that carbon dioxide is now being used in increasing quantity in the manufacture of beer in which, as with all aerated waters, carbon dioxide is the gas that causes the sparkle or the foam.

Because of its inert nature there is no harm from the discharge of carbon dioxide in open spaces where it quickly diffuses through the atmosphere and there is no harm in swallowing it dissolved in aerated drinks. In fact the exhaled air from our lungs is laden with carbon dioxide since one of the basic chemical reactions of the body is the oxidation of carbon from our food by the oxygen from the inhaled air.

One man was asphyxiated when he was lowered into an "empty" bin that had contained cracked grain. He had to be lowered to the bottom of the bin to clean out the chute at the bottom. Even after the first man had been asphyxiated in this manner, no one really appreciated the hazard because there was nothing to see or smell and the foreman himself insisted on entering the bin to rescue the first man. He was fortunately equipped with a life line and was promptly withdrawn when his helpers noted his immediate loss of consciousness after he had been lowered a foot or two into the empty grain bin. Evidently the grain that had just been removed from that bin had fermented and generated sufficient carbon dioxide gas to drive out enough oxygen from the air so that it was too lean to support life. The human body is quite sensitive to any lack of the normal 21 per cent of oxygen in the inhaled air and a dilution of this normal proportion by 50 per cent or even less causes immediate symptoms of collapse and ultimate death unless the individual so exposed is promptly rescued.

The second case I will mention was so harmless a thing as a vinegar vat which had been drained empty to allow men to enter it for repair work. Not only was the first man to enter killed by asphyxiation but also his first rescuer. In addition, the second rescuer was almost killed also. I believe the last man did indeed wear a gas mask for protection before entering the tank but gas masks are of no value whatever in atmospheres that are deficient in oxygen since they merely absorb toxic gases and do not supply oxygen to the wearer. Even against toxic gases, such masks are suitable for only low concentrations, usually not exceeding 5 per cent.

I have not heard, as yet, of any carbon dioxide asphyxiation from the handling of dry ice but it is bound to occur sooner or later, even in an open pit that contains the evaporating dry ice,—unless the hazard of this colorless, odorless and heavier-than-air gas is appreciated wherever dry ice is handled in non-ventilated spaces. The general answer to all such asphyxiation hazards is thorough ventilation of all enclosed spaces before men are put into them or at least the wearing of hose masks by which a constant stream of pure air is supplied to him. In every case of doubt the man should be protected by a life line with helpers ready to remove him from the enclosure instantly if he shows the slightest symptoms of distress.

In closing, I will mention the first-aid practice that should be followed after there has been accidental exposure to acids and alkalis. Promptness in applying the first aid is quite essential since the severity of the injury is almost directly proportional to the time of exposure. The application of first-aid should not be delayed for the arrival of a doctor nor even for the time necessary to go to a first-aid room. Fortunately it happens that no special knowledge or equipment is necessary. All one needs to do is to apply water to rinse off the chemicals that are causing the injury and no food plant is likely to have exposure to any chemicals that are not freely soluble in water. The only point to be emphasized in this connection is to make the washing job a very thorough one and moderately warm

water is preferable to cold water. Especially in the case of eye burns is it of prime importance to apply the water in so thorough a manner that all residue of the caustic chemicals has been removed. Subsequent treatment of the chemical burns is usually along the lines of treating burns of any type and this can be left to the medical profession. However, it is clearly the first-aid man's job to see that suitable facilities are provided (faucet, hose, etc.) for instant application and that the employees exposed have been clearly instructed in their use.

Fumigants for Foods

By E. A. BACK

In Charge, Stored Product Insect Investigations, Bureau of Entomology

Department of Agriculture, Washington, D. C.

The speaker said in part: Before the Bureau of Chemistry and Entomology of the Federal Department of Agriculture undertook the co-operative project on fumigants at the request of the railroads of the country, persons storing foods or manufactured products subject to insect attack had a very limited number of fumigants available in promoting sanitation. These fumigants in general commercial use were carbon disulphid and hydrocyanic acid gas, with carbon tetrachloride used only as a last resort when the other two fumigants could not be used safely.

Carbon disulphid and hydrocyanic acid gas are two excellent fumigants. They are well known and their usefulness is established beyond a question of doubt. At the present time they enjoy a place in insect sanitation that is not likely to be lost. In certain fields of activity, each enjoys almost universal preference in spite of more recently developed fumigants. One cannot deny, however, that carbon disulphid is flammable and explosive in the presence of fire in any form, and that hydrocyanic acid gas is highly toxic to man. Explosiveness, flammability and high toxicity to man are three characteristics that work against the use of these two fumigants in congested city districts.

Of these three undesirable characteristics, toxicity to man is the least objectionable from a professional standpoint, for modern types of buildings and special fumigating vaults now in general use by business firms make possible the safe use of a gas highly toxic to man when the fumigation service is in the hands of experienced persons licensed by an intelligent, well informed public health service. There are too many instances of the safe, intelligent and successful use of hydrocyanic acid gas now on record to warrant the elimination of this fumigant from insect control work in congested areas. Where it can be used safely within city limits, hydrocyanic acid gas is probably still the most generally useful fumigant available.

The entomologist's ideal, however, has been a fumigant that is non-flammable and non-explosive, highly toxic to insects and still not particularly toxic to man and one that will not affect adversely the commodity fumigated. Such a fumigant has actually been developed during the past few years, is being recommended highly by the Department of Agriculture and is today enjoying a wide use and well deserved popularity in insect control work. It is the ethylene oxide-carbon dioxide mixture.

The vapors of ethylene oxide are in themselves highly toxic to insects, but are explosive when as high a dosage is used as 3½ pounds per each one thousand cubic feet of space fumigated. But when one part of ethylene oxide is mixed with about seven parts of carbon dioxide a non-flammable and non-explosive vapor is formed.

*Long paper F23i
Also Dec 34*

The vapors of ethylene oxide alone, or in combination with carbon dioxide, are only slightly toxic to man as he ordinarily comes in contact with them in insect sanitation.

The ethylene oxide mixture also has an advantage over hydrocyanic acid gas in that food products fumigated with it do not appear affected adversely in any manner. Foods fumigated with hydrocyanic acid gas do absorb some of the poisonous gas and this added deleterious substance is ruled against by the pure food laws. To be sure, thousands of tons of food products have been fumigated for many years, and are still being fumigated today, with hydrocyanic acid gas without observable injurious results to human health. Foods fumigated with hydrocyanic acid gas have been fed to animals without observable harmful results and fumigators have repeatedly eaten many foods just after fumigation without experiencing harmful results. However, the regulations of the Food and Drug Administration of the Department of Agriculture are made in the interests of the Public and must be considered carefully by all having occasion to treat foods.

The ethylene oxide-carbon dioxide mixture imparts no harmful or deleterious substance to any food so far as is today known. Foods fumigated seem changed in no way. Their flavor, taste or smell remain unchanged.

Because of the non-flammable, non-explosive nature of the ethylene oxide-carbon dioxide mixture, its slight toxicity to man, and the fact that it imparts no deleterious substance to a food product nor affects its odor, taste or smell, this fumigant can be used in many congested districts without fear of fire or explosion, without danger to human life and without the interruption of the daily routine of business except as the fumigation affects the immediate area under treatment.

Being about 17 heavier than air, and slower in action than hydrocyanic acid gas, the ethylene oxide-carbon dioxide mixture has not proved so satisfactory as a fumigant for large food warehouses and manufacturing plants which are often fumigated as single units. Many of these buildings are not tightly constructed and will not hold a heavier-than-air vapor long enough, at the concentration desirable, to penetrate the commodity, and kill the insects before leakage so reduces the concentration that the fumigant becomes inoperative. All said and done, one cannot deny that hydrocyanic acid gas is peculiarly valuable because it kills insects quickly and has a place in insect sanitation in large buildings and manufacturing plants not yet attained by any other fumigant except, in a few instances, chloropicrin.

But in the compartments of thoroughly modern warehouses, or in special fumigating vaults, or vacuum chambers where the temperature can be controlled and where leakage of vapors is negligible or lacking, the ethylene oxide-carbon dioxide mixture is proving a thoroughly desirable addition to the fumigants available in insect sanitation. It fills a great need long felt and it is believed that its usefulness will be extended particularly in structures where the element of safety to man is of prime importance.

Another recently developed fumigating mixture whose value has been proved by the Department, whose use already has found wide application, is the ethylene dichloride-carbon tetrachloride mixture. This also is the product of the research work of the Department of Agriculture. It consists of three volumes of ethylene dichloride with one volume of carbon tetrachloride. The mixture is marketed in tin cans or steel drums and can be best used at temperatures above 70° F. The vapors produced by evaporation of the liquid are heavier than air, non-flammable, non-explosive, only slightly toxic to man, but effective in killing insects in foods and other commodities. It should not be used for treating foods with a high fatty content be-

cause it affects their taste and odor. But for the destruction of insect life in congested districts where its use is well supervised it is filling a need long felt by those engaged in insect sanitation. The same objections to the use of the ethylene oxide-carbon dioxide mixture in large buildings, or loosely constructed storages, hold for the ethylene dichloride-carbon tetrachloride mixture. It is best used in very tightly constructed storages at a temperature of 70° F. or higher.

All things considered, the two outstanding fumigants which have been made available during the past few years as a result of the Department's research program, and the development work of the business world, are the ethylene oxide-carbon dioxide mixture and the ethylene dichloride-carbon tetrachloride mixture. The great factor in their favor is safety. They have their drawbacks which advocates of other good useful fumigants, such as chloropicrin, hydrocyanic acid gas, carbon disulphid and some of the formates, will be pleased to point out. Literature, or information in other form on the usefulness of any fumigant in insect sanitation will be cheerfully sent anyone inquiring of the Bureau of Entomology. We have information on many fumigants—to many to make mention of them here practical. I just wish you to appreciate that the research of the federal Department of Agriculture has made very important and practical strides in the direction of reducing the fire, explosion and toxicity hazards in the treatment of foods and other warehoused commodities. You have only to investigate briefly to locate many business firms that are today actually making practical use of these new fumigants.

THURSDAY MORNING SESSION

October 5, 1933

The second session was opened by General Chairman Henry J. Minear, Borden's, New York City, who presided. Chairman Minear introduced the first speaker.

The Safe Use of Ultra-Violet Radiation in Industry

By DR. M. J. DORCAS

National Carbon Company, Inc., Cleveland, Ohio

The speaker said in part: Within the past few years new types of artificial light sources rich in ultra-violet have been developed and some of these are more powerful than the sun both in kind or quality and degree. These new and powerful light sources are finding increasing application in industry where they replace the natural sunshine, enabling such processes to proceed independent of time or season. In other cases, the artificial sources are applied to processes that are new and never were operated in sunshine because these new powerful sources can accomplish things that are impossible for the sun to do. They are now used in the food industries, including milk processing plants, bakeries, sugar refineries and soda fountains, the leather, tobacco, chemical, photographic and other industries, all of which use the most powerful sources of ultra-violet that are available. There are also a host of highly specialized uses for smaller units of otherwise somewhat similar character.

Ultra violet radiation is a powerful agent and to some people a somewhat mysterious agent. It cannot be seen or heard and its physiological effects are not immediately

evident. In the absence of definite information, operators sometimes imagine that ultra-violet is a terrible thing and take unnecessary precautions that prevent proper application of the radiation or, on the other hand, treat it contemptuously or with no proper regard to its potential effects, and thus create an unnecessary hazard for themselves and others. Either of these extremes, usually based on lack of knowledge, is undesirable and costly to society and industry as a whole.

Ultra violet rays are generally considered by the physicists to be electro-magnetic waves or radiations of energy, as are the wireless waves, visible light, x-rays, and some of the radium radiations. Because of the classification with x-rays and radium some people have considered ultra-violet possibly as dangerous as x-rays or radium, and have therefore, acquired an unreasonable and unjustified fear. X-ray and radium both produce many effects on human bodies; although moderate exposures have no pronounced effects, with greater exposures to x-rays and radium the ultimate effect may be quite serious.

If such effects were to be the result of the use of ultra-violet rays, extreme precautions would be justified wherever they are used, but experience has proved that there is no occasion for anxiety in this direction if simple precautions are observed.

Another large but unrelated group of people exposed daily to such radiation for long periods are the testing crews and lamp trimmers who work in the control laboratories of the factories producing such lamps, and those who repair and service them after they leave the factory. These include the lamp trimmers, who for a couple of generations following 1870 looked after the carbon arc street lamps. In these industrial groups no delayed after-effects of the radiation are observed.

Most significant in this respect probably are those medical establishments that have used these ultra-violet generating arcs for many years in the practice of medicine. The outstanding institution in this respect is the Finsen Institute in Copenhagen where over a hundred patients daily receive treatments with these arcs. This establishment has used light in medicine for more than 40 years. In such hospitals there exists constant supervision of both patients and nurses. Some of the patients treated who suffer from chronic disease may be irradiated at intervals for years. The nurses are exposed daily—sometimes almost constantly to the radiation from some of these lamps. Ordinary precaution has proved ample to avoid any immediate injurious effect and the absence of unexpected physiological effects, that may appear after a long interval, may be considered to have been definitely established. Therefore, by observing rather simple precautionary measures, there should be but little difficulty in avoiding completely any accidental or harmful effects to operators using ultra-violet generating equipment.

Certain other effects that appear comparatively promptly do exist and should not be ignored. There are five such effects which may occur when a normal healthy person is exposed to a powerful light source.

First: All high powered light sources produce a certain amount of heat. Everyone is familiar with the fact that long exposure to hot summer sunshine may cause heat prostration or sunstroke. This is caused mainly when the radiation is allowed to fall for a long time on the back of the head, and is responsible for the peculiar type of head-dress worn in tropical regions. There is little likelihood of accidents of this type with arc lighting equipment. Individuals respond quickly to heat and it is almost certain that discomfort would cause an individual to move before any injury would occur. The usual precautions to provide shields and ventilation to limit exposure as much as possible will prevent injuries of this character.

Second: Most high powered light sources used for irradiation produce strong visible light as well as heat and ultra-violet radiation. The same feeling of discomfort experienced by anyone looking with unprotected eyes at the bright sun occurs when he looks directly at one of these light sources. There is a natural tendency to turn the eyes away due to the intense glare. If one stares at such a light source for any length of time without a protective screen for the eyes, a temporary disturbance of vision will result, which if exposure is prolonged, might result in a permanent eye injury. It is therefore, advisable to warn against the danger of looking at any bright light source for any length of time. This immediately suggests the use of appropriate goggles or other protective glass screens.

Third: Long continued exposure to short ultra-violet rays will result in the tanning of the skin of most persons. This tan or pigmentation is nature's way of protecting the skin against subsequent burning, and while deep tanning may be objectionable to some people, it cannot be classed as an industrial hazard.

Fourth: Prolonged exposures to light sources giving off ultra-violet rays may also result in erythema, or sunburn. This action is much the same as that produced by prolonged exposure to summer sunlight. The only noticeable effect at the time of exposure is the slight reddening of the skin and a slight sensation of heat and warmth. This immediate effect results from the heat radiation given off by the light source, and subsides in a few minutes after the end of the exposure. A few hours later, however, the effect of the ultra-violet becomes evident. The skin again begins to get red and feel warm. In a day or so in severe cases blisters may develop. Such cases should be treated by a physician because they are similar to sunburn or other severe burns. In a few days, however, such sunburns are healed and leave no permanent effect.

Fifth: The most commonly noticed of all effects of ultra violet are those of the eye. As commonly described, the effects are somewhat as follows:

After excessive exposure of the unprotected eyes to an open arc lamp during the day, one awakens during the night with the impression that the eyes are full of sand. No amount of rubbing seems to remove the trouble, however. The eyes are very painful and red and inflamed. Copious tears are shed and the condition gets worse for several hours. Sleep is impossible. Next morning the eyes still are inflamed and slightly sore, but in general the trouble has disappeared. This effect is known as "conjunctivitis." A physician can relieve the inflammation and the pain and prevent possibility of infection if he can be consulted during the hours that present the severe symptoms. If infection is prevented from developing in the inflamed eyes, no permanent injury results.

The eyes never acquire pigmentation, tan or other natural protective shields, as does the skin, and therefore the eyes must always be protected by some external means. If helmets or welding masks are worn, the eyes are protected by the glass eye pieces. If such protection for the whole head is not worn, goggles should be worn. The glass can be almost any kind of glass. Ordinary window glass or spectacle glass will absorb the conjunctivitis producing rays in most cases, but on account of the brilliant visible radiation usually present, the darkest grades of welding goggles that will permit the work to be seen should be used. Ordinary glasses provide considerable protection. They do not prevent stray radiation hitting the eyes at the sides of the eyeball, however, and goggles, to be safe under all conditions, should be completely enclosed and should not have ventilating slits so placed that they permit light to fall on the sides of the eyeball.

The problem would thus seem to be solved by using ordinary precaution to prevent acute temporary results on the skin and eyes of those who work about such light sources. Small intensities of ultra-violet continued for many hours, or extreme intensity for only short time, may result in an equal degree of sunburn, or erythema, and eye burn.

These injuries may be avoided by using protective devices wherever possible and by making sure that those who work near such lamps, or who may occasionally be in their vicinity, are aware of their nature and the possible effect of the radiation and accordingly govern themselves so that they are not exposed to the radiation in excessive amounts. Protective devices are a help but the constant attention of those who are in the same establishment to guard against careless practices is the most effective safety measure where ultra-violet radiation is employed.

The first precaution should be to locate the light step of the process in a separate room, large enough to house the arcs and associated apparatus and not large enough to permit any other process to be conducted in this room. Such rooms may be made of metal or tile since both are free from fire hazards and opaque to the ultra-violet rays. The necessary meter and control apparatus may be placed outside this room and windows of colored glass installed to permit observation of the process without necessitating the presence of anyone in the room.

Inside the ultra-violet room still further shielding of the arcs is possible. Usually this shielding is accomplished to a considerable extent by the apparatus itself, since the designing engineers have tried to utilize in the process as much of the light as possible and to reduce to a minimum waste from light scattered around the room. Simple metal screens will cut off most of the stray radiation.

Such screens protect those in the vicinity of the apparatus most of the time. There will be certain times, however, when it is necessary to start or stop, regulate, inspect or repair the apparatus or the ultra-violet arcs themselves and when it is necessary to work in the presence of the ultra-violet radiation itself. At such times the eyes should always be protected by suitable goggles and, if the exposure is of appreciable duration, face and hands be protected by helmet and gloves.

Static Electricity as a Source of That Fatal Initial Spark

By CHESTER J. ALGER

Corn Products Refining Company, Chicago

The speaker said in part: Static electricity is produced in industrial plants manufacturing food products by the operation of such equipment and machinery as transmission belts, pulleys, reels, bucket elevators, pneumatic conveying and dust collecting systems including spouting and fans, and in some instances, it is developed in grinding mills.

It has been my experience that belts and pulleys are the greatest producers of static electricity. Why this exists is explainable by the fact that it is not uncommon to find belts slipping when passing over pulleys. Also, it must be taken into consideration that after the belt has passed around the pulley, and in straightening out again, the friction between the plys of the belt in going over the pulley generates static electricity; smaller diameter pulleys develop more static than the larger diameter pulleys.

Since it has been established that static electricity is developed in industrial plants and that it can ignite dust, the next question is: what are we going to do about it?

In our industry, safety inspectors carry with them for the purpose of locating static electricity a mineralogical "staticscope" manufactured by a Chicago concern. This is a very sensitive instrument, and when static electricity charges are discovered, we proceed to eliminate them by proper grounding.

It has also been my experience that when the atmospheric humidity is extremely low, such as on a cold winter day, static electricity is made or developed on machinery that does not occur during the other seasons of the year. This in my opinion indicates the importance of making static electricity tests in the winter season. Also, mill and wooden construction type buildings are more subject to static electricity than other types of construction.

Other static electricity producers such as reels, bucket elevators, fans and dust collecting systems should be grounded to building steel or water lines by the use of a flexible stranded copper cable, both ends of the ground wires soldered in position.

It may be of interest to mention an experience relative to static electricity being discovered on the wooden frames of a set of reels. All the usual and customary means of grounding to discharge the static electricity were employed without success, and as a final resort the complete wooden reel housings were painted with aluminum paint which, due to its metallic base, completely dissipated all traces of static electricity after the painting had been done.

As a final word, let me warn you that if and when grounding is done, frequent inspections must be made to see that the ground wires have not been broken; otherwise, the possible ignition hazard of static electricity is increased.

Cutting Machines

By N. R. RONDTHALER

Vice-President, U. S. Slicing Machine Company, Chicago

Mr. Rondthaler spoke extemporaneously, making his interesting address from copious notes and illustrating what he had to say with stereopticon views. These pictures illustrated the development of safety devices in slicing machines and traced the slicing machine industry through some thirty years of activity. Unfortunately, these pictures cannot be reproduced here and no manuscript of the speaker's remarks is available.

Railroad Sidings

By G. L. RHYS

Employment Manager, John Morrell & Company, Ottumwa, Iowa

The speaker said in part: The hazard of a railroad siding or track is one which is recognized by everyone and also one where constant familiarity tends to breed contempt. In the National Safety Council's Safe Practice Pamphlet No. 48 a diagram is shown of a bridge over a track to take care of men coming from and going to work. This is excellent, but it is not always advisable. If such an arrangement is not possible it is well to have either a watchman or some type of automatic signal. And where men have been accustomed to depending upon a watchman or signals, there must be a continuous use of this means.

In the case of sidings within a plant, it is not often advisable to have a man continually on guard. It is often possible to use an automatic signal of some suitable type, but then again there is the matter of expense to consider on the siding which is very rarely used. One type of signal which is inexpensive is the klaxon or warning horn controlled by the main watchman, so that on the few occasions when the track is used the employee will receive an adequate warning. Often a gate can be arranged equipped with a light in event that there is occasion for night use.

The danger of men coming around the building and stepping directly in front of the track can be avoided by building a small railing forcing them to step around the corner far enough to get a view of the track.

It is also important to maintain tracks in good condition. Quite often railway sidings do not receive the attention which is necessary to keep them in safe condition. The switch crew can be of valuable assistance in this respect by reporting to the maintenance department any repairing or cleaning up which needs attention.

The danger of employees catching their feet in switches can be to a large extent eliminated by equipping switches with proper guards.

Many other hazards are incurred by men who work at loading or unloading cars. Men have their feet injured as the result of wheels of a tractor passing over them, the danger of spikes or wires and packing cases falling, and metal running boards or toeboards. These boards are sometimes nailed to the dock and the car so as to avoid slipping. One railroad superintendent makes a suggestion that countersunk holes be drilled in the toeboard and that after the board is placed both could be dropped so as to keep the board from slipping. Brackets can also be placed on the underside to avoid slipping of the board.

The same safety rules which tend to make your shipping department safer are also applicable to the men on the loading docks. Here again it is a matter of supervision and education, which to a large extent will cut down the accidents. An elaborate set of rules can be drawn up, but unless there is intelligent and constructive supervision, no definite accomplishment in the way of safety will result. It is often a wise idea to call the switch crew together and with them go over the hazards of the plant insofar as they are concerned.

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Man-Lifts

By R. E. DALSTROM

Supervising Safety Engineer, Lumbermens Mutual Casualty Company, Chicago

The speaker said in part: Everyone is familiar with the passenger elevator; but in flour mills and grain elevators there has developed the need for raising only one man at a time, and also the need for conserving space in the special type of building required by the milling and elevator industry. Quite naturally, therefore, the vertical conveying belt equipped with steps, known as the "man-lift" or employees' service belt, was evolved as a helpful solution to the problem. Consisting of a series of steps spaced about 16 feet apart on a vertically moving belt, it is like so many elevator cars, thus providing the necessary speed, although traveling only 80 feet a minute. The space required is only the combined width of two steps adequate to carry a man up and down, plus the diameter of pulleys at the top and bottom over which the belt travels. Needless to say, such a continuous moving device, that does not even stop to load and unload passengers, presents hazards far in excess of

modern passenger elevators which are equipped with every possible control for safety. A man-lift has to be boarded "on the fly", so to speak, and a special technique has to be developed through experience for workmen to go up and down safely.

In the installation of such an equipment it seems appropriate to mention a few points that should be kept in mind:

1. Make the floor openings just large enough to permit the average sized workman to step on comfortably, but not so small that a workman will not have sufficient clearance if he slightly protrudes any part of his body while riding. (The standard set by some states is 14 inches from the edge of the step to the edge of the opening.)
2. Provide an operating cable within easy reach of passengers for emergency stops.
3. Provide an effective safety stop which will instantly halt the man-lift if the passenger fails to get off at the top floor, and whenever possible have sufficient clearance between the top pulley and the roof (about 4 feet) so that workmen cannot be seriously injured even if the safety fails.

Once the man-lift equipment is installed, proper maintenance is of course essential. A competent mechanic should be delegated to inspect the elevator daily. These inspections should include: (1) checking step bolts for security; (2) checking condition of step surfaces; (3) testing safety device; (4) examining belt for wear.

After proper installation and maintenance are arranged, consideration should be given to the possibility of additional safeguards, and instructions to employees.

Railings and toeboards around the openings are an important safeguard. They should be arranged so that a workman cannot directly approach the opening of the man-lift, thus forcing him to hesitate and get properly set before stepping on it. Railings will also prevent workmen from accidentally walking into the opening. (Some state codes require a landing space inside of rails of at least two feet.) Non-slip floor surface inside of railings is essential for complete safety.

Two separate sets of handles are usually provided above each step—one set for the down-travel and one for the up-travel of the belt.

Employees should be instructed as follows:

1. Always face the belt and keep both hands on the handle when riding man-lifts.
2. Never carry material on the step and have no tools or other articles protruding from clothing.
3. Avoid use of man-lifts for carrying freight. Should this be absolutely necessary one man should be assigned to place it on the step and another assigned to take it off while employees on intervening floors should be warned so that they will not accidentally attempt to get on the step carrying the freight.
4. Keep both feet firmly placed on the step in such a way that no portion protrudes. (Crossing the legs while riding should be prohibited.)
5. Never ride on the same step with another employee. (Violation of this rule should justify discharge.)
6. Report defects immediately to the superintendent.

Conspicuously placed signs carrying proper instructions can be placed at each landing as a constant reminder to passengers.

Man-lifts are intended only for limited use by certain employees. It is therefore very important that definite steps be taken to confine their use accordingly. Visitors, children and other unauthorized passengers have been involved in more serious accidents than the plant employees themselves. By restricting the use of man-lifts to qualified employees, the major part of the accident prevention problem is solved.

Report of the Nominating Committee

General Chairman Mineur at this point presented a brief resume of the year's activities of the section, based upon reports from the chairmen of standing committees. He then read the recommendations of the Nominating Committee for officers of the section during the ensuing year, and officers were duly elected as follows:

General Chairman—T. A. Schendel, Premier-Pabst Corp., Milwaukee, Wisconsin.

Vice-Chairman—Frank Husse, Corn Products Refining Co., Chicago.

Secretary & News Letter Editor—Ruth E. Cade, A. E. Staley Manufacturing Co., Decatur, Illinois.

Chairman of Engineering Committee—Paul Goodnough, Quaker Oats Co., Chicago, Ill.

Chairman of Membership & Program Committees—W. C. Washburn, Sheffield Farms Co., Inc., New York.

Chairman of Poster Committee—Robert J. Fleming, Kellogg Company, Battle Creek, Michigan.

Chairman of Publicity Committee—C. W. Turning, Goddard & Heinselman, Minneapolis, Minn.

Chairman of Statistics Committee—J. J. Lyons, John F. Jelke Co., Chicago, Ill.

Chairman of Slides & Safety Films Committee—Paige Lehman, Pillsbury Flour Mills, Minneapolis, Minn.

Members at Large:

Henry J. Mineur, Borden's, New York.

Ralph E. Prouty, Aetna Life Insurance Co., New York.

Thomas Strobhar, Wagner-Taylor Co., Philadelphia, Pa.

William F. Barrett, Horn & Hardart Baking Co., Philadelphia, Pa.

W. P. Bell, California & Hawaiian Sugar Refining Corp., Crockett, Calif.

D. M. Clark, Society of Grain Elevator Superintendents of North America, Chicago, Ill.

Morris Cohen, Schulze Baking Co., Kansas City, Mo.

Alexander Dienst, The National Sugar Refining Co., Long Island City, N. Y.

C. W. Denipsey, Liquid Carbonic Corp., Chicago, Ill.

E. W. Green, Oahu Sugar Co., Ltd., Waipahu, T. H.

C. E. Griffin, The Axton Fisher Tobacco Co., Louisville, Ky.

Elmer Heimbach, Hotel Americus, Allentown, Pa.

S. B. Horrell, The Carey Salt Co., Hutchinson, Kansas.

Robert McDade, Atlantic Sugar Refineries, Ltd., St. John, N. B., Canada.

Adolph Pfeffer, Adolph Pfeffer Rice Milling Co., Houston, Texas.

G. L. Rhys, John Morrell & Co., Ottumwa, Iowa.

William A. Sullivan, Loose-Wiles Biscuit Co., Kansas City, Mo.

Vern D. Sutton, Postum Co., Inc., Battle Creek, Mich.

R. W. Upshaw, Anheuser-Busch, Inc., St. Louis, Mo.

ADJOURNMENT.



Marine Section

Officers 1932-33

General Chairman—FRANK H. COGAN, The Delaware, Lackawanna & Western Railroad Co., Hoboken, N. J.

Vice-Chairman (In Charge of Posters and Slides)—ROBERT F. HANA, Standard Shipping Co., New York City.

Vice-Chairman (In Charge of Publicity)—ARTHUR M. TODD, Consulting Marine Engineer, New York City.

Vice-Chairman (For the Pacific Coast)—BYRON O. PICKARD, Pacific American Steamship Assn., San Francisco.

Secretary—CARL W. CETTI, New York State Merchant Marine Academy, New York City.

News Letter Editor—HENRY BLACKSTONE, United States P. & I. Agency, San Francisco.

Chairman Program Committee—FERN WOOD, Moore & McCormack, Inc., New York City.

Chairman Membership Committee—W. E. STEWARDSON, Colombian Steamship Co., New York City.

Chairman Statistics Committee—BENJAMIN H. SELF, Travelers Insurance Co., New York City.

Chairman Engineering Committee—B. C. EDWARDS, Grace Line, Inc., Brooklyn.

Chairman Stevedoring Committee—F. C. GREGORY, United States Employees' Compensation Commission, Washington, D. C.

Members at Large—

W. P. BIGGS, Navy Department, Washington, D. C.

A. R. BUSH, International Flare-Signal Co., New York City.

E. W. FISKE, JR., Standard Vacuum Transportation Co., New York City.

C. H. FLATRENS, Eastern Steamship Lines, Inc., Boston.

E. P. FOLSIE, Shipping Federation of State of Washington, Seattle.

J. M. GRISER, Alabama Dry Dock & Shipbuilding Co., Mobile, Ala.

Wm. GROUNDWATER, Union Oil Co., Los Angeles.

E. C. HOLDEN, JR., United States P. & I. Agency, New York City.

J. S. HUNTER, The Atlantic Refining Co., Philadelphia.

W. P. KAIN, New York City.

W. A. KIOGINS, JR., A. H. Bull & Co., Inc., New York City.

R. K. KELLY, Tide Water Oil Co., New York City.

JAMES KENNEDY, Gulf Refining Co., New York City.

J. L. LUCKENBACH, American Bureau of Shipping, New York City.
 C. V. McCORMICK, Cities Service Transportation Co., New York City.
 H. W. PROOM, Black Diamond Steamship Corp., New York City.
 E. J. ROBINSON, JR., Newport News Shipbuilding & Dry Dock Co., Newport News, Va.
 J. K. ROBINSON, Sinclair Navigation Co., New York City.
 J. C. ROLLES, Standard Oil Co. of California, San Francisco.
 H. L. SEWARD, Yale University, New Haven, Conn.
 A. J. SMITH, Marine Office of America, New York City.
 J. H. TOMS, New York State Merchant Marine Academy, New York City.
 A. O. WOLL, General Petroleum Corp. of California, Terminal Island, Calif.
 JOHN WRIGHT, American Export Line, New York City.
 G. D. ZEN, Associated Oil Co., San Francisco.

TUESDAY MORNING SESSION

October 3, 1933

The first session of the Marine Section was called to order by Howard B. Fonda, Burroughs Wellcome & Co. (USA) Inc., who welcomed the delegates in the name of the Executive Committee of the National Safety Council. He then introduced General Chairman Frank H. Cogan, The Delaware, Lackawanna & Western Railroad Co., Hoboken, N. J., who presided.

Chairman Cogan made a brief report of the section's achievements during the year. He praised the work of all standing committees and especially complimented the section upon maintaining its membership in the National Safety Council during the past year. He said further: "It was only through the wholehearted support of both officers and members that we have been able to survive during this period of acute economic distress. I am pleased to report that the interest in safety has been manifested increasingly in all portions of the land. For example, we have had requests for the exchange of data from the west coast, the Gulf, the Great Lakes and all along the Atlantic seaboard, which has been of value to all."

The chairman then introduced the first speaker.

The United States Shipping Board Bureau and Maritime Safety

By CAPTAIN DAVID W. TODD

U. S. N., Retired, U. S. Shipping Board Bureau, Dept. of Commerce, Washington, D. C.

The speaker said in part: Safety at sea is dependent on well-found ships, proper operation of such ships in service, ability to summon assistance quickly when required, and proper provision for the rendering of assistance as effectively as possible. Modern science has contributed greatly to maritime safety during the last quarter of a century. It has given us radio, submarine signalling, echo depth-sounding, the gyro-compass, automatic fire detecting and fire extinguishing systems, and a multitude of other navigational aids and safety devices. Of all these appliances and instrumentalities radio, with its ramified applications to navigation, must take first place.

The sinking of the steamship "Republic" off our North Atlantic Coast on January 23, 1909, and the rescue of all aboard her, about 750 passengers and members of the crew, clearly demonstrated the practicability of this newly developed instrumentality and vividly indicated its life-saving potentiality which had not, up to that time been duly appreciated by the general public. The event gave impetus to the modern general maritime safety movement, which culminated in the signing of the International Convention for the Safety of Life at Sea by the principal maritime nations of the world at London, on May 31, 1929. The following year, on June 24, 1910, there was approved by the president and it became law, an act which provided that from and after July 1, 1911, it would be unlawful for any ocean-going steamer of the United States or of any foreign country carrying 50 or more persons to leave or attempt to leave any port of the United States for a port 200 miles or more distant therefrom unless such steamer was equipped with efficient apparatus for radio communications, in good working order, capable of transmitting and receiving messages over a distance of at least 100 miles, night or day, and in charge of a person skilled in the use of such apparatus.

At 11:40 P. M. on Sunday, April 14, 1912, the "Titanic," then the largest and finest vessel in the world, on her maiden voyage from England to New York, cutting the first pathway across the North Atlantic through a smooth sea and on a clear, starlit night, struck an iceberg. Two hours and forty minutes later, she disappeared from the surface of the sea, and left her 2,201 persons struggling in the icy waters of the North Atlantic Ocean 500 miles from the nearest land. The "Titanic's" distress call was picked up by the radio operator of the passenger ship "Carpathia," who had removed his coat and was preparing to retire, but while unlacing his shoes was listening in at his instruments with head phones on his ears, for a final minute or so before retiring. In the cold, gray dawn of the following morning, the "Carpathia" rescued 711 men, women and children from the "Titanic's" life boats; but 1,490 persons had perished.

The radio operator and the captain of the "Carpathia," also Mr. Marconi, himself, testified before an investigating committee that interception by the "Carpathia" of the "Titanic's" cry for help was purely accidental and providential; and Mr. Marconi stated that all ships equipped with radio should maintain continuous radio watch at sea. It transpired that the passenger ship "California" was but 14 miles from the "Titanic" when she sank, but the radio operator, having completed his hours of duty, had left his instrument for the night a few minutes before the "Titanic's" call for help was broadcast. It is quite probable that every passenger and member of the crew of the "Titanic" could have been saved if there had been a radio operator "listening in" aboard the "California" at the time of the disaster.

The "Titanic" disaster, naturally, profoundly stirred the world and threw into relief especially the necessity for better "safety of navigation" regulations, of "boats for all," and of continuous radio watch for proper protection of human life at sea, and it greatly accelerated the safety movement.

The disaster was quickly followed by the establishment of the North Atlantic Ice Patrol by Vessels of the United States Navy, which has been so effectively maintained for the last 20 years by our Coast Guard Service; by enactment of the U. S. "Ship Act of 1912," which provided that no steamer of the United States or of any foreign country navigating the ocean or the Great Lakes, and licensed to carry 50 or more persons, should leave any port of the United States for any port 200 miles or more distant therefrom unless equipped with efficient apparatus for radio communication.

and that the radio equipment should be in charge of two or more skilled persons skilled in its use, one or the other of whom should be on watch at all times while the steamer was under way.

The United States was the pioneer among the nations of the world in providing for increased safety at sea by making mandatory the equipment of merchant ships with radio apparatus and the maintenance of continuous radio watch board such vessels, and at the International Radio Telegraph Conference which convened at London on June 4, 1912, the United States Delegation aggressively advocated the making of provisions for similar international utilization of radio. However, the convention considered such work to be the function of a projected "safety of life at sea" conference which was to convene at London in the following year.

The world's first international convention for the safety of life at sea was signed on January 20, 1914. It embodied, substantially, the requirements of the previously mentioned U. S. radio laws; reaffirmed and supplemented the International Radiotelegraph Convention, and provided for increased safety in many ways. The United States delegation exerted a most potent influence and played a most conspicuous part in the framing of this treaty. Owing to the World War and other militating influences, this safety treaty was never put into effect internationally, but certain of its provisions have been adopted and put into force by individual countries from time to time, and the United States Government has for 20 years maintained the North Atlantic Ice Patrol provided for in it.

In 1927, representatives of seventy-nine nations of the world met at Washington for the purpose of revising and modernizing the London International Radio Convention, which, during the 15 year period of its existence, had become obsolete by reason of the tremendous development of radio and the many new applications thereof in navigation, international communication, education, amusement, etc. This convention provided for every necessary inspectional service, systematic collection and dissemination of meteorological information, efficient utilization of radio direction finding facilities, etc.; prescribed an international radio telephone distress call, comparable to the International Radiotelegraphic distress call "S O S", and a very definite and desirable procedure to be followed by ships, aircraft, and shore stations in handling routine radio traffic, distress and emergency communications; laid down the requirement that every ship or aircraft compulsorily equipped with radio apparatus in accordance with an international agreement must be able to send and receive signals of a certain kind peculiarly suitable for use in the event of distress or emergency on the international distress wave-length, and that all stations, coastal, ship, and aircraft in the mobile maritime service must, during their hours of service, maintain watch on that wave-length or frequency for two three minute periods each hour, beginning the 15th and 45th minutes after each hour, Greenwich meantime; and in general provided very satisfactory for international co operation in the use of radio for the protection of life and property at sea by international agreement.

The feasibility of using automatic radio receiving apparatus, in lieu of radio operators, for the purpose of automatically "picking up" distress calls and of calling operators to their instruments by means of warning signals aboard ships not maintaining continuous human radio watch, had been demonstrated, and the convention therefore also established an international "auto-alarm" signal and prescribed conditions with which such automatic apparatus should comply in order to be suitable for use in accordance with provisions of a new "Safety of Life at Sea" Convention which was to come into existence shortly. Apparently, automatic receiving apparatus of the kind referred to is destined to play an important part in future maritime history.

During the Washington Conference tentative arrangements were made for the holding of still another conference on safety at life at sea to revise the work of the 1914 convention. Great Britain extended an invitation to hold this conference in London on April 16, 1929. The spectacular rescues of the entire crews of the Italian freighter "Ignazio Florio" (in October, 1925) and the British freighter "Antinoe" (in January, 1926) by the Shipping Board passenger ships "President Harding" and "President Roosevelt" respectively, had contributed in no small degree to the beginning of preparations for another conference; and the rescue of the entire crew of the Italian freighter "Florida" by the Shipping Board passenger ship "America" 700 miles off the coast of Virginia in January, 1929, was not without its significance for those charged with the duty of preparing proposals for consideration at such a conference. The location of the three distressed freighters referred to was wholly attributable to the fact that they were equipped with radio apparatus wherewith they called for help when they were sinking; that the passenger liners which rushed to their assistance were maintaining radio watch when their distress calls were sent out; and that the suffering vessels were equipped with radio direction finders, used in conjunction with gyro-compasses, with which they unerringly "tracked down" the doomed vessels after erroneous estimated positions had been received from them. The estimated position reports received from these vessels were, respectively, 75 miles and 150 miles in error.

In addition to impressing the world with the skill and valor of American seamen and increasing greatly the prestige of our merchant marine, those outstanding rescues of foreign crews by American ships, effected in mountainous seas and in defiance of the fury of the elements, directed public attention to the necessity of a new international sea safety code which would provide adequately for more general utilization of recently developed products of modern science, particularly the radio direction finder, or radio compass, as it is sometimes called. This government made very thorough preparation for the projected safety conference. Instructions issued to this government's delegation on the eve of its departure for London stated that the delegation had the following responsibilities:

1. To uphold the prestige and dignity of the government of the United States.
2. To obtain the highest practicable standard of safety achieved for American nationals traveling in ships flying the flags of foreign nations.
3. To obtain an international standard commensurate with the high standard of safety now being constructed into American vessels, in order that these vessels may not suffer in commercial competition with foreign competitors.

The conference convened on April 16, 1929. Plenipotentiaries of eighteen of the principal maritime nations of the world were present. The general purpose of the conference was to revise the "Safety of Life at Sea" Convention which had been drawn up 15 years earlier, but which had not been put into effect, and by appropriate modification and supplementation as dictated by the accumulated experience of that period of time, to give the nations of the world a new safety code which would provide for and insure (a) the building of new ships, and improvement of existing ship, in such manner as would make them as seaworthy and accident proof as practicable; (b) their safe operation in service; (c) their ability to summon necessary assistance quickly when in trouble; (d) receipt of calls for assistance by ships, shore stations, etc.; and (e) efficient and proper rendition of assistance when required.

The new International Convention for the Safety of Life at Sea signed at the conclusion of the conference on May 31, 1929, by representatives of all the eighteen participating nations and now in effect in seventeen of the countries of the world, but

not in the United States, is a treaty which embodies advanced safety rules and regulations; takes advantage of the progress that has been made in science and invention and of the experience of all of the years that have gone before, especially those of the World War, when hundreds of passenger ships were lost, many of them under varying conditions that paralleled less frequent peace-time marine disasters; increases safety of transportation by sea in much the same way that increasing safety of transportation over land has been demanded and provided for; provided uniform rules for all which means, of course, fewer misunderstandings and increased good-will, on which foreign trade depends; and pledges the maritime nations of the world to co-operate by exchanging information and by taking every step necessary for promotion of safety at sea.

Another very important contribution to maritime safety was the international load-line convention signed at London in 1930 and now in effect in practically all maritime countries of the world, including the United States. That convention applies to all ships in excess of 150 gross tons in size, and lays down rules for effective closing of deck and hull openings, protection of crews, loading of cargo, etc. It is designed, in the main, to insure the general seaworthiness of the ordinary cargo ship.

Statistics indicate that the average annual loss of life in the United States Merchant Marine, for the last 10 years, with which British records generally agree, attributable to foundering, strandings, and collisions of vessels on ocean voyages, has been about 13 passengers and about 100 members of vessels' crews—very reassuring evidence of the fact that ocean transportation is about the safest mode of travel in the world. But that average can be very materially reduced, and the "Safety of Life at Sea" Convention, which is now before the Foreign Relations Committee of the United States Senate awaiting approval, provides a means for so reducing it. The convention has the endorsement of shipowners and ship-operators, marine insurance companies, and of the marine industry generally, and its ratification has been recommended by the Society of Naval Architects and Marine Engineers, American Bureau of Shipping, National Conferences on the Merchant Marine, Chamber of Commerce of the United States, Board of Trades and Merchants Associations, the heads of all Government Departments and agencies concerned, and the technical press, etc.

"Safety of Life at Sea" Convention Resolution

Upon the completion of Captain Todd's paper, the Marine Section of the National Safety Council formally adopted the following resolution, a copy of which was forwarded to Hon. Key Pittman, United States Senator, and Chairman, Foreign Relations Committee, U. S. Senate, Washington, D. C.:

Whereas, the United States Senate Committee on Foreign Relations have not as yet ratified the findings of the 1929 London Conference for the promotion of Safety of Life at Sea, and

Whereas, the Marine Section, National Safety Council, considers the findings of said conference to have great value, both from the humanitarian standpoint of protecting life, and also from the economic standpoint in the protection of the property of United States citizens, and

Whereas, the failure to ratify the findings of said conference has already occasioned some embarrassment to American shipping, and will cause increased embarrassment and possible foreign inspection of American owned vessels, be it therefore

Resolved, the Marine Section, National Safety Council, hereby urges the United States Senate Committee on Foreign Relations to immediately ratify the findings of the 1929 London Conference for the Promotion of "Safety of Life at Sea."

Analyzing Statistics to Promote Safety

By CHESTER P. WAITE

Assistant Supervising Engineer, The Travelers Insurance Company, Chicago

The speaker said in part: There are many kinds of accident records in use and many plants keep no records except what are required by the Labor Department of the state in which the employer operates. Each employer's individual injury records containing the essential data to prevent recurrences is of most value to the employer himself. The records should tell him what failures (mechanical or human) exist within his organization, and also show him the reasons for their existence, thus giving him an opportunity to correct what is wrong by appropriate executive action.

If these records by employers were available to them for examination, statisticians would then be able to prepare records showing why various types of accidents occur, which would automatically show what remedial action was necessary, inasmuch as the reverse of the true cause is usually the remedy.

For prevention purposes, the essential data required for each injury are as follows: location—plant, department, or operations; name of persons injured; date and time of accident; occupation of persons involved; description of the accident; what unsafe act was committed; why was it committed; what unsafe condition existed; and what remedial action taken or suggested to bring about permanent remedy. All these items have a bearing upon the effectiveness of the report, but the last four are the most valuable of the group.

By giving the exact location, a specific point of attack is furnished should a summary drawn off at frequent intervals show a high frequency at the same location. The location shows definitely where to go to stop accidents, and prevents misguided efforts.

Naming the person injured is of course, common, but to the prevention engineer the name can be of value should the same person become involved too often. Investigation of this person, his habits, his mental and physical condition, his training, may show him to be totally unfit for the task given him. To protect him from further injury, it may be necessary to remove him from the type of work he has been doing.

The date and time of accident are valuable to some extent, as it may show that there are certain hours in the day that employees are injured more frequently, often attributable to fatigue or operating conditions.

Including the occupation of the injured serves a two fold purpose. Preventive efforts can be directed to those employees performing the type of a task that is producing frequent accidents. And also information may be developed to show whether the injured was performing the task he was hired to do. For example, a truck driver replaced a hoisting engineer temporarily. Due to misinterpretation of the signal bells, he raised the load instead of lowering it.

The prevention engineer will be interested in the description of the accident by comparing what is said with the remainder of the report. The description should show as nearly as possible just what occurred, and as a result of the accident, what part was injured and how severely.

The information given thus far serves the accident prevention engineer an excellent and useful end. By applying it, accidents may be assigned to specific machines, occupations, men, hours of the day, days of the week, months of the year, type and severity. All of this is raw material that can assist the prevention engineer in his task of prevention.

My duties have made it possible for me to investigate hundreds of accidents for the true causes. Difficulty has been experienced in some instances in determining why the unsafe act took place. For within this scope appears such reasons as discipline, psychology, mental attitude, or physical conditions. Lack of proper instructions, failure to do as told, or instructions not enforced constitute the majority of reasons for the existence of the unsafe acts.

A trucking organization having a total of 3,200 trucks of various sizes (the majority being light delivery cars), country-wide in scope, has adopted a universal method of reporting accidents. Their report states the unsafe act committed, why it was committed, and the remedy. Periodically, all drivers are instructed what not to do—information not selected from general principles but selected from past performances of the drivers by correctly reported accidents. Major issues such as tampering with speed governors, not reporting defective equipment, following car ahead too closely, turning from improper lanes, lack of hand signals, and others, have slowly become eliminated. Men in charge knew why accidents occurred and knew what to tell their men what not to do. They also knew what instructions to check, which they do by observation and by reviewing the proper reported accident form. This procedure of furnishing valuable data is so simple it works. Assigning true causes is the most difficult part. The man in charge of the injured should have this responsibility. The management should make arrangements to have the foreman's report checked for accuracy.

WEDNESDAY MORNING SESSION

October 4, 1933

Orig. paper 77, 33

The Port Captain's Place in Safety

By CAPTAIN E. W. FISK, JR.

Port Captain, Standard-Vacuum Transportation Co., New York City

The speaker said in part: The port captain's position is unique, in that he is more favorably situated than any other official for the control and direction of safety measures in a shipping company. Safety, primarily takes root in the selection, assignment and supervision of personnel. Here the port captain reigns supreme. It should be the function of the port captain to personally select the members of the ship's crew and his selections must be based upon experience, general appearance, intelligence, ability, physical condition and adaptability.

The port captain by virtue of his training and occupancy of position of command, is the logical man to put the idea of safety across to the men, rather than someone selected at random from the office. Furthermore, seamen, like all other men, instinctively respect the one by whom they gain employment. Nor should it be forgotten that the port captain was appointed to that office by virtue of the qualities of leadership which to succeed he must possess. It is these very qualities of leadership upon which the effectiveness of safety so largely depends.

A vital factor in the contentment and efficiency of the personnel lies in the security or tenure of the position which the company is able to offer. If a man knows that his position is reasonably permanent, he reacts more favorably to the interest of the company and takes a great pride in performing the duties assigned to him. He is able to plan for the future and the uncertainties of unemployment do not beset him.

All of which naturally has a potent bearing on arousing and sustaining interest in safety or any other activities organized by the company.

Of first importance is the set-up of the safety organization. In the Standard Vacuum Transportation Company, this consists of safety committees on the individual ships, which have been functioning now for about three years. These committees consist of the master, who acts as permanent chairman, the chief officer, the chief engineer, the first assistant engineer, the steward and a secretary, generally the radio operator.

On coast-wise voyages, Canada and Mexico included in this category, the committee meets once each voyage. On foreign voyages the committee meets once a month. Each committee inquires into all accidents, and whenever possible personally examines the scene and investigates the causes leading to it. The master has his instructions to see that every injury, regardless of how trivial, must be reported in all details on forms provided for that purpose, and he is held responsible for any subsequent infections which may develop from an injury of which there appears no filed report. In cases where an injury is of such a nature as to call for immediate changes, either in equipment or in operation, the committee has the power to effect such changes temporarily until the vessel reaches port and the port safety committee has had an opportunity to scrutinize the circumstances and give its approval.

The committee also gives careful consideration to the suggestions emanating from its own members or from anyone of the crew. These suggestions, in the form of safe practices, are submitted to the port captain, who periodically prepares them as a bulletin known as "Ship Safety Committee Doings" and distributes them to each ship for posting on the bulletin board. The secretary keeps minutes of every meeting, a copy of which is referred to the port safety committee. The master, as chairman, also designates someone to change weekly the posters on the bulletin board, each slip prior to sailing being supplied with a sufficient number of posters, bulletins and other material sufficient for the length of the voyage.

Parenthetically, it is my personal opinion that both our committees afloat and ashore would function more potently if they included in their membership a representative from the deck and engine room of the lower ratings.

Believing as I do that the port captain should be the central authority with relation to safety, reports from the ship's safety committees should first pass through his hands. He should personally investigate the causes of the accident and examine the scene of its occurrence, therefore becoming thoroughly familiar with all the circumstances. He will thus be able to act most intelligently in connection with the recommendations from the ship's safety committee. His own recommendations will carry far greater weight with the port safety committee than would otherwise be the case. However, it is of course plain that this procedure is not applicable in collisions, where the Claims Department should necessarily take prompt jurisdiction.

The port safety committee, which has general safety supervision, is composed of the following: two representatives of the construction and repair departments, one representative each from the claims department, the harbor operating department, the deep sea operating department, lighterage department, office, and the port captain. The committee receives and reviews all personal injuries and other reports referred to it by the individual ship and these reports are then digested and assigned to sub-committees having direct jurisdiction of the matters concerned. The sub-committees in turn make their own investigations and submit their recommendations to the port safety committee.

Here again it seems to me, personally, that matters might be expedited by the direct reference of these reports to the official in charge, as for example, all accidents, personal injury and other reports, going directly to the port captain, who will personally investigate and transmit his conclusions at the subsequent meeting of the port committee. Waiting for action by the port safety committee is sometimes found cumbersome and tends to delays not in the best interest of an efficient safety program.

Recapitulating the duties of the port captain, having his direct supervision of safety always in mind, he should as frequently as possible visit each vessel on arrival either in the home or nearby port. The purpose of this visit is to make a thorough inspection of the vessel to satisfy himself that all safety regulations have been observed. He checks the condition of gas masks, examines life boats, safety bulletin boards, companion-way ladders, pilot ladders, safety signs, wire and rope gear and sees to the proper handling of the vessel's cargo. By his manifest interest in and attention to all safety matters aboard, he instills in the crews the belief that the management really is behind the safety movement.

Sea-faring men, as a whole, take a great deal of pride in their "floating million dollar homes", and esteem their own physical prowess and stamina. They consider that they stand a step or two above the poor mortals whose misfortune it is to find it necessary to work ashore. It is the hazardous nature of their employment which renders seamen more readily amenable to accident prevention precautions, than any other group of workmen. They recognize its importance and the ease with which their lives might be forfeited, or the affliction of an injury resulting in crippling them for life. It should therefore be no superhuman task for any steamship company to obtain success in safety, provided the essentials of leadership are present.

What the West Coast Is Doing for the Safety of Marine Workers

Original paper
7/1/32

By HENRY BLACKSTONE

Safety Engineer, U. S. P. & I. Agency, San Francisco, Calif.

The speaker said in part: During the year 1925 the realization of a definite connection between the rapid increase in accident frequency rates and mounting insurance costs, dawned on the west coast shipowners and others employers of marine workers, with the result that a joint meeting of all San Francisco marine employers was held early in 1926. Out of this meeting came an organized, voluntary effort by a group of shipowners to correct the conditions, methods and habits which were causing personal injuries to their employees. Byron O. Pickard was selected to manage this Bureau.

The committee succeeded in selling its ideas to the individual members of the Pacific American Steamship Association, the Shipowners' Association of the Pacific Coast, and the Waterfront Employers' Union of San Francisco. There were over 300 ships, operated by some seventy companies, included in the membership. It was estimated that about 10,000 seamen and nearly 5,000 longshoremen would be affected by the program. The Marine Service Bureau of San Francisco and the Longshoremen's Association of San Francisco Bay were asked to cooperate, and have cooperated since the inception of the department.

The department has extended its work to Los Angeles Harbor and to the Columbia River. At both Los Angeles and Portland there are resident safety engineers and

safety committees working with the shipping companies, all functioning under the management of the associations' chief safety engineer at San Francisco.

In June, 1932, the United States Protection and Indemnity Agency, Inc., extended its safety activities to the west coast and established an accident prevention department in the San Francisco office. The work of this department is confined primarily to accident prevention service to ships under insurance coverage in one of the companies represented by the Marine Office of America, but the safety engineer in charge cooperates with the accident prevention department of the San Francisco Marine Associations and is a member of their "Ships' Advisory Safety Committee", and chairman of the sub-committee on new constructions.

The "Ships' Advisory Safety Committee" is composed of a number of marine superintendents, port captains and superintendent engineers of the various steamship companies having headquarters at San Francisco. This committee meets periodically to discuss every day problems of accident prevention and to go into detail in the formulation of rules for safe practice aboard ship. The sub-committee on "New Construction" was formed to discuss changes and improvements that could be made in new ships with the view to eliminating many of the existing hazards.

In Los Angeles there is the "Tanker Safety Committee", composed of executives of the various marine departments of the oil companies stationed at that port. This committee is particularly active and has formulated and put into effect many excellent rules of safe practice aboard tankers and at marine terminals. In Seattle, there is a safety organization of the Shipping Federation of the State of Washington. This is really the pioneer safety organization in the marine field on the Pacific Coast having been organized prior to the San Francisco Marine Associations' Safety Department, but having to do with longshoremen exclusively.

The Pacific Coast Marine Safety Code Committee held its Fourth Annual Meeting in Seattle on October 21st and 22nd, 1932. In addition to amending and adding several rules to the Pacific Coast Code for stevedoring operations aboard ship (which has been in effect for more than three years), practically entire agreement was had with the American Steamship Owners' Association in New York on a proposed national code. Also, a new code for terminal or dock operations on the Pacific Coast was adopted, published and distributed. This dock code is the first, as far as is known in marine history.

From the above outline it can be seen that the field of accident prevention is well covered. The San Francisco organization covers nearly every marine operation in California and Oregon. The Seattle Organization covers practically all longshore activities in the state of Washington and the U. S. P. & I. Agency safety department serves the ships of eight companies as well as some dredging companies and other marine contractors. The activities of the latter department extend from Seattle to Los Angeles and include tankers as well as cargo and passenger ships.

For the calendar year 1932 the accident frequency rate for seamen, based on accidents per reporting ship, indicates a reduction of 45 per cent in disabling injuries as compared with 1928. The reports show that there has been a decided improvement in practically every reporting fleet. Based on a total of more than 36,000,000 man-hours reported, there were twenty disabling injuries per million man-hours worked. The frequency of disabling injuries to longshoremen, based on man-hours worked, is as follows: San Francisco Bay, 95; Los Angeles, 97; Columbia River District, 127 disabling injuries per million man-hours worked. In comparison with the 1931 frequency ratings, this represents decreases as follows: San Francisco, 30 disabling

injuries per million man-hours worked, or 24 per cent; for Los Angeles, 37 disabling injuries per million man-hours worked, or 27 per cent; for the Columbia River, 90 disabling injuries per million man-hours worked, or 41 per cent.

The severity of stevedoring accidents has also steadily declined, as is evidenced by the decline in the number of fatalities. In San Francisco Bay, a period of one year and four months has elapsed without a fatality, and in Los Angeles there had not been a fatality for two years and four months, to August 26, 1933. On the docks there has not been a fatality in California for three years. In Los Angeles Harbor, in 1932, a severity rating of 3.58 lost-time days per 10,000 man hours worked was established, which record will probably stand for years. In San Francisco Bay, the severity rating for the year was 13.87, while in the Columbia River district it was 32.77 lost-time days per 10,000 man-hours worked, giving an average for the three districts of 17.12.

First aid instruction in Los Angeles and San Francisco has increased in popularity, there having been 841 longshoremen graduating in San Francisco Bay and 1,898 in Los Angeles Harbor. The training is practically 100 per cent for registered longshoremen in Los Angeles Harbor. Weekly classes are being continued in both harbors. One company in Los Angeles Harbor has organized a first aid team that has received more than 100 hours of concentrated training. Two companies in Portland are striving for a 100 per cent status.

The work of the three accident prevention departments mentioned, covering the activities of longshoremen and seamen employed in San Francisco, Los Angeles Harbor, Columbia River, and Puget Sound, is along parallel lines and consists of the following principal phases:

1. Inspection of gear, working places, methods of operation and habits of men.
2. Investigations, analyses, and reports of accidents.
3. Development of minimum standards for methods, gear, habits and working conditions.
4. Education or selling of safety to executives and workmen through: (a) safety letters; (b) first aid courses; (c) posters; (d) dinner and other group meetings; (e) company and group safety meetings; (f) personal contacts; and (g) articles in trade journals.
5. Public relations contacts (workmen's organizations; state industrial accident commissions; federal agencies interested in safety and compensation, etc.).
6. Cooperation with National Safety Council and other national and state safety forums.
7. Reducing the cost of injuries through work with claims agents and insurance carriers; recommendation of plans for insurance, medical and hospital services.
8. Recommendations on proposed legislation affecting the compensation for injuries and state and federal codes.
9. Administration of departments, development of policies, and meetings with safety committees.

Most of the steamship companies have appointed an official known as "safety contact executive" for the company, and to this executive is assigned the duty of working with the safety engineer. Some of the companies have a shore safety committee, consisting of the marine superintendent, superintending engineer, and port steward. This committee, together with the safety contact executive, reviews the accident reports and minutes of the ship's safety committee meetings, and issues letters and bulletins for the benefit of the fleet.

Marine Safety in the Gulf Ports

By FRANK E. AMES

Manager, Safety Dept., Lykes Bros.-Ripley Steamship Co., Inc. and Affiliated Companies, New Orleans, La.

The speaker said in part: This paper will be confined to the personnel of freight vessels and those connected with the stevedoring activities of the discharging and loading cargo. Here we have two distinctly different classes of labor with which to deal.

When the early efforts toward accident prevention were applied on board ship, our sailor man did not take kindly to the idea. Since the officers were mostly graduates of the fore-castle, their reception of this so-called new "fad" was also much the same. Consequently, the road to education in accident prevention on board ship has been a long up-hill pull, but I am pleased to say that it has now "caught on", so to speak, and results are being obtained which a few years back would have been considered impossible. Your sailor man is a hard headed creature, but once he is convinced that the scheme or method is workable and of value to himself and his mates, he is for it all the way. It is by appealing to this characteristic of the seaman that mental opposition is being gradually removed and the rank and file are becoming safety-conscious. In our experience we have found that the conference method has proved the most direct and reasonable means of reaching these men, and consequently on all of our vessels safety leaders have been developed who, being sold on the idea, quickly inoculate their associates and the thought spreads until the majority of the crew find themselves safety-minded without being conscious of the fact.

Seagoing is an occupation wherein the accident hazard is ever present and yet, as a result of limited training, we have during the first half of this year, a record of forty deep-sea voyages wherein there was a man-hour exposure of 1,188,000 hours without an injury of any nature; and on thirty-nine voyages there was a man-hour exposure of 1,155,000 hours with but nineteen minor injuries. These figures demonstrate that a maximum degree of safety on seagoing vessels can be attained, but in order to do so it is essential that the safety work be thoroughly organized on each vessel and its execution in the hands of an officer who is himself thoroughly sold on the idea.

A study of our records plainly shows that the injury record of each vessel is an exact barometer of the interest in safety work shown by the master and other officers; this is a further proof that an absolute minimum of injuries can be reached by constant and intensive training. Such results cannot, however, be anticipated unless the safety movement has the unqualified support of the management and a constant manifestation of interest on the part of those whose duty it is to promote and execute the safety program of the owners. It is most essential that the men be trained, not alone along the lines of safety, but with the view of inculcating in them a spirit of loyalty to the house flag under which they sail, and to their individual vessel. To do this, they must have fair treatment, clean and comfortable quarters, and sufficient wholesome food. Surrounded by these conditions, the sailor man is found to be tractable and willing to do his part in accident prevention; and this policy serves to reduce the turnover of the unlicensed personnel, which in itself is a long step in accident prevention.

We now come to the question of stevedoring and the class of labor employed in

that activity. In the gulf, as in other districts, the labor is, of course, an entirely different class than the seagoing personnel of the fleet and is composed largely of colored men, probably in the proportion of 30 per cent white to 70 per cent colored. As a class, they are a carefree, happy-go-lucky people, easily controlled by those foremen who have been brought up on the waterfront with them, but poison to one who is not acquainted with their ways and unaccustomed to handling this type of labor. They are naturally careless, and it has taken much time and patience to open their minds to the idea of personal safety. But when the idea is once accepted by them, they render valuable assistance in spreading safety propaganda. Realizing their characteristics, we have appealed to this class of labor through bulletin boards, posters and warning signs, as well as in group talks on safety by the stevedore foremen. It has been found that severe disciplinary measures have a marked effect.

The white labor employed as longshoremen compares favorably with that found in north Atlantic ports; in general, it is more migratory than the colored workman and difficult to handle from the standpoint of safety. He requires more of a personal appeal than his colored co-worker.

It is the custom in the gulf to handle cotton and lumber with a single whip, using skids from the hatch coaming to the deck; three bales per draft is the rule and it is not uncommon for a cotton gang of eighteen to truck and stow 180 bales per hour by this method; when an entire hold is being worked the hatch is doubled with two whips and an average of 360 bales per hour pouring into the hold presents a very real accident hazard. In fact, it is in the loading of cotton that most of our injuries occur, especially when teamwork is in process. In certain ports the custom of rotating longshore gangs has served to impede safety work for the reason that, since many stevedore contractors are satisfied to pay the workmen's compensation premium rates on their payrolls, as required by law, they are not deeply interested in safety work, as they feel in any event they are obliged to pay a fixed sum and therefore are not concerned about accidents for which the underwriters will have to pay. This attitude works a real hardship on those who operate under a different business policy. Where rotation is in order, it is most difficult to implant the safety idea in the minds of the men. They migrate from one company to another and lessons regarding safety are quickly lost when working under a changed environment.

In an endeavor to overcome this, Safety Councils have been established in some of the large ports. The council is sponsored by the Association of Master Stevedores and a maritime committee of the steamship operators and the International Longshoremen's Association. Monthly meetings are held and all stevedores, foremen and the longshoremen are invited to attend. Safety in regard to working conditions on the docks and ship is the only subject considered. All in attendance are requested to express their views and one or more principal features are provided. These meetings are gradually assuming the status of an open forum, and although there is some question as to the ultimate benefit to be derived from mass gatherings of this nature, it is hoped that they will serve as an avenue through which the passive resistance of certain elements may be overcome.

In general, a man's thoughts on any subject are based upon his experience and knowledge, and to my mind, there has been a wealth of experience gained by the stevedore foremen and longshoremen which would be of great value in the solution of the problem of accident prevention, if it may be brought out and intelligently applied. It is for this reason that the meetings of the safety councils are open to a discussion of the causes of accidents to longshoremen, their frequency and what

steps may be taken toward reducing them to a minimum. Statistics prove a higher frequency of accidents among longshoremen than to seamen, railroad freight handlers, steel workers and almost all other industrial workers engaged in the so-called heavy industries.

Why are accidents to longshoremen more frequent and serious than in other heavy employment? To what extent does the physical condition of the men have a bearing? To what extent does the general attitude of the individual toward safety affect the frequency of injuries?

Our view is that the frequency of longshore accidents is largely due to lack of interest on the part of the men, careless habits that are not corrected by the foremen and an attitude that if injured they will receive compensation. Also, that many of the men are of very limited experience and that no one has taken it upon himself to instruct these men in the rudiments of longshore work. I cannot see where stowing cargo in the hold of a vessel presents a greater hazard than handling material in any other industry. We seldom hear of failure of ship gear causing an accident, but we have careless and improper slinging of cargo, and once the cargo is landed in the hold, there are all kinds of injuries, no matter what the commodity may be.

In our opinion, the answer to the first question is poor or questionable supervision. It is an accepted fact in industry that adequate supervision is the cheapest commodity purchased for a job. Are we getting what we pay for? The record says we are not, and we can never make the industry pay for longshoremen or bring longshore labor up to the standard attained by other heavy industries until we give more thought and action to the type of foremen and other supervisors connected with stevedoring activities.

Consider, now, the second phase of the question: "Does the general physical condition of the individual have any bearing?" In my opinion it has a very material bearing on the stevedoring results obtained, both as to output of tonnage and injuries. Under existing conditions, it is a delicate question to handle, but it should not be so. It is inhuman to place a man's safety in jeopardy, even though the man himself is willing to assume the risk. Under present laws, his employer assumes the expense resulting from an injury, the primary cause of which is that he was physically unfit for the duties to which he was assigned. And why should we assign unfit men to the task of handling cargo which in itself contains hazards that require men to be physically fit? It is because we have not given proper thought to the subject. Just because a man is sent to us for work is no good reason why we should accept him, unless he can meet with our specifications. You will not receive a package of cargo on the dock in a damaged condition without taking an exception. Why accept a longshoreman? You are assuming infinitely more risk on the longshoreman than on the cargo and yet, in general, we accept one and reject the other.

Since it is the commendable aim of all stevedore officials to handle the maximum of tonnage at a minimum cost, the fact should not be lost sight of that the expense accruing on account of injury to longshoremen rightfully belongs to the final cost of handling cargo; that every injury, no matter how slight, which represents an expense is actually just so much additional to the per ton cost of handling the cargo on the job where the injury occurred. It is plain that the per ton costs may increase rapidly and in exact proportion to the injury sustained.

It goes without saying that if the men themselves, the longshoremen in the gangs, are not interested in their own safety, nothing that we can do will serve to lessen the accident toll. If a man deliberately assumes a "don't care" attitude or is so

mentally deficient that he fails to observe the first law of nature, there seems to be no hope except to eliminate such a man from the gang, for the sole purpose of protecting his fellow workmen, if for no other reason.

The policy of creating safe working conditions and accident prevention must start from the top of any organization, but the actual fulfillment or accomplishment of the policy must be worked out by the men in cooperation with their foremen and supervisors. The desire to work safely and in an orderly manner must be present in the mind of each workman, if results are to be obtained. It cannot be a halfway desire—it must be an individual fundamental purpose. Those who do not or will not assume this attitude are a menace to the job.

Although these remarks have a pessimistic note, it would be unfair to overlook the results accomplished by many of the stovedore supervisory forces and longshoremen of our organization who in the face of unsatisfactory conditions have loyally fought to uphold our safety standards. With a safety campaign inaugurated on January 1, 1933, the efforts of six months produced one unit, which, although small in numbers, worked 10,000 man-hours without an injury. Our largest unit reduced its accident frequency 44 per cent below its record for the last half of 1932, and three other major units show a reduction of 30 per cent, 27 per cent, and 9 per cent for this period. Based on these figures, all is not lost, and we feel justified in taking a more optimistic view of future possibilities.

Report of the Nominating Committee

The report of the Nominating Committee was then called for and officers for the ensuing year were elected as follows:

General Chairman—Frank H. Cogan, The Delaware, Lackawanna and Western Railroad Co., Hoboken, N. J.

Vice-Chairman (in charge of posters and slides)—Robert F. Hand, Standard Shipping Co., New York, N. Y.

Vice-Chairman (in charge of publicity)—Arthur M. Tode, Consulting Marine Engineer, New York, N. Y.

Vice-Chairman (for the Pacific Coast)—A. O. Woll, General Petroleum Corp. of California, Terminal Island, Calif.

Secretary—E. C. Holden, Jr., United States P. & I. Agency, Inc., New York, N. Y.
News Letter Editor—Henry Blackstone, United States P. & I. Agency, Inc., San Francisco, Calif.

Engineering Committee Chairman—B. C. Edwards, Consulting Engineer, New York, N. Y.

Membership Committee Chairman—W. E. Stewardson, Colombian Steamship Co., New York, N. Y.

Program Committee Chairman—J. S. Hunter, The Atlantic Refining Co., Philadelphia, Pa.

Statistics Committee Chairman—Benjamin H. Self, Travelers Insurance Co., New York, N. Y.

Stovedoring Committee Chairman—F. C. Gregory, United States Employees' Compensation Commission, Washington, D. C.

Members at Large—

Frank E. Ames, Lykes Bros.-Ripley Steamship Co., New Orleans, La.
W. P. Biggs, Navy Department Safety Engineer, Washington, D. C.

C. F. Blackton, Erie Railroad Co., Jersey City, N. J.
A. R. Bush, International Flare-Signal Co., New York, N. Y.
E. W. Fiske, Jr., Standard-Vacuum Transportation Co., New York, N. Y.
Charles H. Flathers, Eastern Steamship Lines, Inc., Boston, Mass.
F. P. Foisie, Shipping Federation of the State of Washington, Seattle, Wash.
J. M. Griser, Alabama Dry Dock & Shipbuilding Co., Mobile, Ala.
Wm. Groundwater, Union Oil Co. of California, Los Angeles, Calif.
Wm. F. Jones, Gulf Refining Co., New York, N. Y.
W. P. Kain, Marine Surveyor, New York, N. Y.
R. K. Kelly, Tide Water Oil Co., New York, N. Y.
J. L. Luckenbach, American Bureau of Shipping, New York, N. Y.
Daniel J. Murphy, Murphy, Cook & Co., Philadelphia, Pa.
Byron O. Pickard, Pacific American Steamship Assn., San Francisco, Calif.
E. J. Robeson, Jr., Newport News Shipbuilding and Dry Dock Co., Newport News, Va.
J. K. Robison, Sinclair Navigation Co., New York, N. Y.
J. C. Rohlfis, Standard Oil Co. of California, San Francisco, Calif.
H. L. Seward, Yale University, New Haven, Conn.
Arthur R. Savage, Peninsular & Occidental Steamship Co., Port Tampa, Fla.
A. J. Smith, Marine Office of America, New York, N. Y.
J. H. Tomb, New York State Merchant Marine Academy, New York, N. Y.
Elliott Vandewater, Capt., Office of the Chief of Engineers, Washington, D. C.
John Wright, American Export Line, New York, N. Y.
G. D. Zeh, Associated Oil Co., San Francisco, Calif.

Marine Non-Safety Pays No Dividends

Orig. Paper—By CARL F. VANDER CLUTE
2732
Proctor in Admiralty, New York City

The speaker said in part: The causes of personal injuries on board ship amply demonstrate that parsimony is a false economy. Some operators economize, or at least so they believe, in failing to furnish sufficient equipment, using old and spent equipment, defective blocks and tackle, failing to furnish safeguards of one kind or another and a million other items which many times could be furnished at a nominal cost. Common sense economy helps insure the voyage, but parsimony is one of the unnecessary perils of the venture.

I shall endeavor to prove to you that parsimonious economy in safety work pays no dividends, by referring to actual cases that have reached the courts and the dockets of operators.

In the case of J. W. Phitany versus J. S. Packard Dredging Company, the facts were as follows: Phitany, a man of the age of 70 years, was employed as pilot on a tug owned by the dredging company. The tug, which had been undergoing repairs, was about to be returned to service. In order to have a dock trial, the tug was being shifted to the deep water end of the dock. The pilot at this time was in his room, the captain ashore. During the shifting operation a six inch hawser, with an eye in one end and a large hook in the other end, was used as a spring line. Such a line was customarily used for towing dump scows. The eye of the line was placed over a bit on a vessel alongside. The line lead through a chock

and the hook was attached to a cleat. While in this shape the engines were turned, and the strain on the line caused the hook to slip and fly. It struck the pilot, who, upon hearing the engines turn, came on deck, mortally wounding him.

It was contended that the vessel was unseaworthy, due to the lack of sufficient lines and to improper appliances. In this respect the trial judge charged the jury as follows:

"I charge you that the duty to furnish a reasonable number or quantity of safe tools or lines and appliances is an absolute one imposed on a ship owner. If you find that the defendant did not furnish reasonably safe appliances and equipment, the fact that deceased may have known of the insufficiency would not be a defense. I charge that the defendant is chargeable with furnishing an unseaworthy vessel, that is, a vessel unseaworthy because it may not have been properly equipped, even though knowledge of the faulty equipment was had by deceased. That it is the duty of the defendant to furnish a vessel that is properly equipped, and that duty could not be delegated or assigned, that is, passed on to someone else."

A verdict of \$12,500 was returned. How many proper six-inch lines could have been bought for \$12,500? Was it economy to permit the tug to be short of line? Certainly that was expensive parsimony.

In *Griffiths versus Seymour Midland Petroleum Corporation*, we have another instance where the expenditure of a few dollars would have prevented an accident and resulting lawsuit.

The libellant was a marine engineer on a tug which was tied up alongside of an oil barge. Both vessels were controlled by the respondent. The barge was constructed with a passageway running fore and aft between tanks, through which anyone desiring to cross the barge was forced to walk in order to reach the small open deck forward or similar deck aft. After dark the libellant desired to go ashore; he took no flashlight; he climbed onto the barge, went forward through the passageway, and fell through a hatch leading to the lazaret. This hatch was about two feet square and was in the path which libellant had to use. It was customarily kept closed. There was a low sill around it. Libellant suffered injuries consisting of a chipped bone which incapacitated him for about four months.

It was held that the respondent was negligent in leaving the open hatchway unlighted and unguarded in the pathway of anyone crossing the barge or going forward or aft. It was further held that if it had been necessary to leave the hatch open, a rope guard should have been put up. The injury was not very severe, but good fortune was responsible for that, not the care, caution or investment of a few dollars for the much needed rope guard. The award was \$1,000.

The *Phoenix* is another case which only "Lady Luck" prevented from being a \$20,000 award instead of \$2,000.

A rope ladder was used to the fullest extent, to wit, until it broke. It is a sure test of the usability of a ladder, regardless of age. When it breaks it is too old for future use. The testing medium, the human body, is, however, exceedingly expensive testing material.

The libellant, being unemployed, got a position aboard the S. S. "Phoenix." Upon her arrival, he boarded her by means of a Jacob's ladder hanging over her side. The chief mate hired him as a seaman, assigning him to the 4-8 watch, and granted permission to go ashore for his duffle. He started ashore in the same manner he had boarded the vessel, by the Jacob's ladder, the only means available. It broke under his weight, causing him to fall. In falling, he struck the side of the deck

and fell in the water, from which he was assisted by some of the ship's crew. For the injuries he sustained, suit was brought.

It was held the ladder was unseaworthy, in that it was worn out and old, and not sufficiently strong to hold the weight of an ordinary human body. Such unseaworthiness of the ship was the proximate cause of the libellant's injury and its condition was known to the ship's officers, or if not known, could have been known and discovered by the use of reasonable and ordinary diligence.

It might be said that at times safety appliances are provided, but the members of the crew do not use them. This is undoubtedly true. The remedial procedure in this respect is through education, one means of which is the well developed system of posters made available by the National Safety Council and which should be used to the utmost. A picture is one of the best means of making an impression on the mind, especially on some of the minds we come in contact with in ship crews. It is for the individual's benefit to make use of safety equipment available. It is to the advantage of the ship owner to make the safety equipment available, not only to avoid loss of man hours through injury, but to save money.

The case of *Brittingham versus Ore S. S. Company* is illustrative of the aforesaid. The libellant claimed damages for the loss of sight of the left eye. He was first assistant engineer and was assisting two members of the crew under the personal direction of the chief engineer in chiseling a broken set screw out of a binder or collar surrounding a nut, in order to remove it from a valve stem. The negligence claimed was the failure of the respondent to supply the injured man with goggles or other protective appliance for his eyes. It was shown that the injured man himself had charge of the glasses and goggles supplied by the ship, and kept them in his room. The libel was dismissed by the lower court and affirmed upon appeal.

The furnishing of goggles to the ship saved the owner from having a judgment taken which quite likely would have been comparable to that of the Nobel case mentioned heretofore. The ship owner may fulfill all the requirements resting upon him in so far as safety appliances are concerned, but in the prevention of accidents, how can he escape the human frailty, the weakest link in the machine, the disregard of safety by the employee? Education is apparently the only answer.

Hanson versus Luckenbach S. S. Company. Hanson was a seaman aboard one of the defendant's ships which was lying alongside a wharf. A life boat had been taken off a deck load of lumber stowed on the after deck, and the chain which had made it fast fell over the side in a bight, held at either end. The lumber rose 9 feet above the deck, and a space between its side and the gunwale was not more than a foot, at least so the plaintiff said, and the jury to which the case was tried might so have found. The bight, hanging over the ship's side, between it and the wharf, was about 120 pounds, and the boatswain wished it stowed on deck. He ordered the plaintiff to go down from the deck load into the narrow space and overhand the chain, laying it alongside of him as he came aboard. The plaintiff obeyed and got the chain partly over the rail, when for some reason it slipped from his hands and again went overboard, catching his thumb in its passage and causing the injury for which he sued. It was left to the jury to say whether the defendant furnished a safe place to work and if not, whether this was the cause of the injury. The jury returned a verdict of \$1,600.

In the "Antietam", the plaintiff was a wiper. He was painting a bulkhead between the engine and fire rooms. He was on a plank, one end of which rested on a frame at the ship's side, and the other on the side of the port boiler; the plank was

not fastened in any way, nor was there a hand rail or guard of any kind. The ship was at sea and rolling. Plaintiff claimed that some hot water fell upon his back, the ship lurched, the plank slipped, and he fell to the engine room floor, sustaining injury.

It was held that the vessel's officers were negligent in failing to secure the plank or provide a guard line. But the unsafe condition was apparent and should have been remedied by the plaintiff himself who was guilty of contributory negligence.

It is almost possible to hear, in reference to some of these cases, the remark "Why should we worry, our insurance takes care of all that." But some companies do not carry insurance, and others are self insured. Those carrying insurance must consider the premiums. A few disastrous verdicts and the premiums at the next renewal, which are based upon the company's experience, show a marked increase. Insurance companies are not eleemosynary institutions. If the policy is not a paying proposition, they soon find means to make it so, or get off what is a bad risk.

The Marine Section Safety Contest

The last feature of the session was the presentation of trophies of the National Safety Council to winning units in the Marine Section Safety Contest, which extended from January 1 to June 30, 1933. The outstanding facts of the contest were presented by General Chairman Frank H. Cogan.

Fifty-four units registered in the Marine Section Second Annual Safety Contest, as compared with thirty-five units registered in the first contest. During the contest 36,571 persons worked a total of 40,322,460 man-hours, for an average of 1,103 hours per person. The average frequency rate for the contest was 14.037, which is an increase of 11 per cent over the 1932 rate of 12.619. Thirty-five units completed the contest with a frequency rate below the average, and nine of these units completed the contest with a perfect accident record. During the period of the contest there were 566 disabling injuries, only two of which were fatal and three permanent partial. This compares with five fatalities and nine permanent partial injuries out of a total of 437 disabling injuries, in the 1932 contest.

Lew R. Palmer, conservation engineer, Equitable Life Assurance Society, New York City, and vice-president of the National Safety Council, presented the trophies to the winning companies, and also certificates to other companies deserving special merit. With a few genial and appropriate remarks, Mr. Palmer presented trophies to the following:

Division I Liners—Colombian Steamship Co., Inc., New York, N. Y.

Division II Tankers—Venezuela Gulf Oil Co., New York, N. Y.

Division III Harbor Equipment—Eric Railroad Co., Jersey City, N. J.

Division IV Stevedoring—Lykes Bros.-Ripley Steamship Co., Inc., Tampa Stevedores, New Orleans, La.

Division V Shipbuilding and Repair Group A—United States Navy Department, Mare Island, Calif.

Division V Shipbuilding and Repair Group B—The Delaware Lackawanna and Western Railroad Co., New York, N. Y.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Meat Packing, Tanning and Leather Industries Section

Officers 1932-33

General Chairman—HENRY D. TEFFT, Institute of American Meat Packers, Chicago.

Vice-Chairman—HARRY W. EXINS, Brown Shoe Co., St. Louis.

Secretary—JOHN LAHERMAN, Armour & Co., National Stocks Yards, Ill.

News Letter Editor—A. C. MICHEFER, John Morrell & Co., Ottumwa, Ia.

Chairman Publicity Committee—J. L. NELSON, Tanners' Council of America, New York City.

Chairman Program Committee—HUBERT L. CLOVER, International Shoe Co., St. Louis.

Chairman Poster Committee—LOUIS E. KARR, The E. Kalu's Sons Co., Cincinnati.

Chairman Membership Committee—C. B. MAGRUDER, The Wm. Seidelerberg-T. J. Kurdle Co., Baltimore.

Chairman Engineering Committee—HAROLD M. TOOMBS, Armour & Co., Chicago.

Chairman Statistics Committee—E. J. McCANN, Jacob E. Decker & Sons, Mason City, Ia.

Members at Large—

N. L. BRAINARD, Swift & Co., Chicago.

E. E. DREWS, Libby, McNeill & Libby, Chicago.

A. B. DRUMMOND, Chicago.

T. H. JONES, American Hair & Felt Co., Chicago.

W. F. McCLELLAND, Armour & Co., Chicago.

DEAN MONEYMAKER, International Shoe Co., St. Louis.

R. R. ROACH, Geo. A. Hormel & Co., Austin, Minn.

H. G. SCHAFFNER, Schaffner Bros. Co., Erie, Pa.

FRANCES E. SILBAUGH, Oscar Mayer & Co., Madison, Wis.

MONDAY AFTERNOON SESSION

October 2, 1933

The Meat Packing, Tanning and Leather Industries Section was called to order by G. T. Hellmuth, Chicago North Shore & Milwaukee Railroad, member of the Executive Committee of the National Safety Council, who welcomed the delegates in the name of the Council and introduced General Chairman Henry D. Tefft, Institute of American Meat Packers, Chicago, who then presided. Chairman Tefft presented

a brief review of the activities of the section during the past year and outlined some of the objectives desirable during the coming year. He then introduced the first speaker.

Are We Making Progress in the Meat Packing, Tanning and Leather Industries?

By E. J. McCANN

Employment Manager, Jacob E. Decker and Sons, Mason City, Iowa

The speaker said in part: The steady reductions in both injury rates, characteristic of recent years, did not continue in our section during 1932. There was an improvement of 15 per cent in the frequency rate but we suffered a severity rate 14 per cent higher. Sharp increases in the frequency and severity of permanent partial disability injuries account for the upward reversal.

In this connection, it may be that serious hazards have been receiving less attention than minor ones, due to the greater financial outlay necessary for their correction. It is possible, also, that more liberal interpretations of the compensation laws have had an adverse influence.

The 1932 records of all reporting companies average 25.50 in frequency and 1.13 in severity. These rates are based on the records of 74 plants with exposure of almost 139,000,000 man hours; the number of hours worked is slightly less than for plants reporting for 1931 but more plants are included than ever before.

Small establishments had more injuries in proportion to exposure than large or middle-sized plants. Frequency rates averaged 23.26 for the largest organization; 30.12 for middle-sized units; and 39.16 for the smallest. This experience is similar to that of 1931. But small plants, in spite of their high frequency rates, have the lowest average severity rates, 0.65, compared with 1.14 for the middle-sized and 1.16 for large units. The better showing of the small plants in severity is a tremendous improvement over 1931 when the experience rate for small plants was over twice the rate for the industry as a whole.

The injury record of tanning and leather companies during 1932 was highly creditable to the industry. The frequency of disabling injuries was down 26 per cent and a large decline of 41 per cent occurred in severity, in comparison with 1931. Reductions were made in the frequency and severity of all types of injuries with the exception of fatalities which remained unchanged.

Shoe manufacturing companies as in 1931 easily lead the industry in safety. Their frequency and severity rates are much below corresponding ones for tanneries. The records of large and small plants in each group vary considerably; large shoe manufacturers have slightly better records than their smaller competitors, but in tanneries small plants have the lower rates.

An inspection of individual records shows many possibilities for improvement, particularly in tanneries where frequency rates varied in large organizations from 5.09 to over 56.00, and severity from 0.08 to 2.55. Plants with rates above the average for their size and type should determine the reasons for their adverse records and take steps to improve them. Improvement in frequency but continued high rates in severity over a period of years cannot be considered a satisfactory showing because while minor hazards are being eliminated, it is evident that some serious ones are being overlooked and that these are resulting in costly injuries. Now is the time to survey operations, equipment and safety activities carefully because in the event of a pick-up in business, plants with good records will find it very difficult to reduce their rates.

Nomination and Election of Officers

The Report of the Nominating Committee was presented by H. L. Clover, International Shoe Company, St. Louis, Mo., in the absence of Dean Moneymaker, the Committee Chairman. Officers were elected as follows:

General Chairman—Harry W. Ekins, Brown Shoe Co., St. Louis, Mo.
Vice-Chairman—John Lauerman, Armour and Company, National Stock Yards, Chicago.

Secretary—E. J. McCann, Jacob E. Decker & Sons, Mason City, Iowa.
News Letter Editor—A. C. Michener, John Morrell and Co., Ottumwa, Iowa.
Engineering Committee Chairman—Harold M. Toombs, Armour and Company, Chicago.

Membership Committee Chairman—A. A. Siereweld, The E. Kahn's Sons Co., Cincinnati, Ohio.

Poster Committee Chairman—Philip G. Rhoads, J. E. Rhoads & Sons, Wilmington, Del.

Program Committee Chairman—Wilson Palmer, United Shoe Machinery Corp., Boston, Mass.

Publicity Committee Chairman—Hubert L. Clover, International Shoe Co., St. Louis, Mo.

Statistics Committee Chairman—J. L. Nelson, Tanners' Council of America, New York, N. Y.

Members at Large—

N. L. Brainard, Swift & Company, Chicago, Ill.
E. E. Drews, Libby, McNeill & Libby, Chicago, Ill.
T. H. Jones, American Hair and Felt Co., Chicago, Ill.
W. F. McClellan, Armour and Company, Chicago, Ill.
Dean Moneymaker, International Shoe Co., St. Louis, Mo.
R. R. Roach, Geo. A. Hormel & Co., Austin, Minn.
H. G. Schaffner, Schaffner Bros. Co., Erie, Pa.
Frances E. Silbaugh, R. N., Oscar Mayer & Co., Madison, Wis.
Henry D. Tefft, Institute of American Meat Packers, Chicago, Ill.

Safety Organization and Its Effect on the Cost of Injuries

By FRANCES E. SILBAUGH, R. N.

Oscar Mayer & Co., Madison, Wis.

The speaker said in part: The first essential in safety work in an organization is a working safety committee. To secure results in the accident prevention work, the full cooperation of the management is then necessary. If you have this you invariably have each and every foreman willing and anxious to have his department free from mechanical hazards, and his men equipped with guards, goggles, box-toed shoes, and all safety equipment necessary for safe working conditions.

Then, too, if the foreman who is vitally interested in production and the costs of production, feels that he has the full cooperation of the safety committee, he takes considerable pride in living up to the high standards set for him. Safety is nothing more nor less than carrying into execution the correct methods of doing things.

In the Oscar Mayer plant we have compiled a booklet on "Safety Rules" for

the government of all employees, approved by the Wisconsin Industrial Commission. All men and women employed by this company must report to the nurse before taking up their duties with the organization. In this way contact is made with the first-aid department, a rather superficial examination, vision tested, teeth and throat conditions noted, then a short talk is given by the nurse on the accident prevention work we are doing. A small safety button and a book of rules is given to each new employee with a request to help us in our safety work.

Where the individual has a physical defect, diseased tonsils, decayed teeth or poor vision, these factors are noted, and in each case the man or woman is urged to correct the condition as soon as possible. It sometimes takes a month or two to complete the work where finances are low and time must be given for adjustments.

We have no idea how many very serious accidents have been averted by the use of knife guards and knife sheaths. Very frequently workmen come into the medical department in our plant and say, "I saved a finger today by having my mesh glove on"; or "I saved myself a lot of grief by having a guard on my knife this afternoon."

No one is allowed to carry knives through departments or hallways without having them encased in a knife sheath. Box-toed shoes, especially in the ice department, prevent many fractures. Goggles for welding and goggles for long distance driving come in for their share of credit for keeping down the cost of production and conserving man power.

Workmen in all departments are urged to report to their foreman hazards existing in any part of the plant. They, many times, are aware of hazardous conditions extremely important to the welfare of workmen which may have been overlooked by the foremen or members of the safety committee.

The old type of foreman, who ruled his men through fear, has no place in present day industry. The up-to-date foreman asks for cooperation and gets it. Then, too, men have a certain pride in their own ability to accomplish results. When they feel that their foreman looks to them for high standards of production and depends upon them to do their work the safe way, even though it may not be the quickest way, they will not care to turn out poor work or be absent from their job without permission.

We feel that education in safety work has decreased the accidents in our plant 82 per cent in the past three years.

A nurse contributes much to the safety program in an organization by making use of each opportunity as it presents itself. An intelligent understanding of the employees' problems and the motives and desires of the management is essential in industrial nursing.

When an accident happens where a workman is injured, the responsibility does not end with giving first-aid and getting the man safely to the hospital and under the care of the doctor. The accident has happened in the organization of which the nurse is part, and it behooves her to know the how and why and be able to show a clear record of the cause and the nature of the injury. The nurse or doctor should visit the scene of the accident, find out just how it happened, and help with investigation for the purpose of eliminating similar ones.

No real safety organization was established in the Oscar Mayer plant in Madison until July, 1929, when a large insurance company took over the insurance. They asked for and established a first-aid department with a graduate nurse in charge who was familiar with industrial nursing and its problems. A safety committee was

also organized, mechanical guards installed, and a real campaign for safe working conditions got under way.

As a result, I might quote you the following figures: Frequency rate, or number of accidents per million hours worked, 1928, 266.98; 1929, 115.0; 1930, 43.0; 1931, 48.0; 1932, 26.4. Severity rate, number of days lost per 1,000 hours worked, as follows: 1928, 6.75; 1929, 1.01; 1930, 0.3; 1931, 2.06; 1932, 0.3.

In 1931 the costs of accidents were boosted, due to the loss of an eye for industrial use by one of those mechanics who, although suffering from repeated small accidents, never seemed to learn that safety equipment must be used continuously if accidents are to be avoided. In 1932 we also had another serious accident through lax supervision. More rigid enforcement of rules and making men understand that instant dismissal would follow the disregarding of safety rules would eliminate much suffering, lost time and needless expense.

With all our hard luck our accidents in 1931, however, figured only 18 per cent of the accidents in 1928. Our frequency has decreased 90 per cent and the severity 96 per cent. We firmly believe that accident prevention pays in better work, in increased production, health and happiness for all.

WEDNESDAY MORNING SESSION

October 4, 1933

The newly elected general chairman of the section, Harry W. Ekins, Brown Shoe Company, St. Louis, Mo., assumed the chair and presided over this session. He invited all members of the section to participate in a progressive and highly profitable campaign for better accident prevention during the coming year. He then introduced the first speaker.

Safety in Meat Packing Establishments

By M. F. O'MEARA

General Superintendent, Armour and Co., Omaha, Neb.

The speaker said in part: It used to be my impression that knife cuts were the main cause of injuries sustained in a meat packing establishment. But an analysis of our loss of time accident records shows that four major causes account for 60 per cent of our accidents.

Knife Cuts: Injuries from knife cuts average a little over 20 per cent of the total over a period of three years and nine months. In 1930 we suffered 28 injuries from this cause, but these injuries were reduced to 8 for the nine months of this year.

A year or so ago we made a survey of all knife operations in the plant and found that there are very few that do not permit the use of a guarded knife. We now have a policy of encouraging the use of guarded knives wherever practical. Most of the resistance from this policy comes from our old-time butchers, but we are gradually breaking down this resistance.

In my opinion encouragement of employees to use guarded knives is the only means to bring accidents to a minimum from this cause, and our experience since we adopted that policy would be to bear out such a statement.

*Orig paper
p124*

Infections: For the year 1930 we had 24 cases of infection causing loss of time; for the nine months of 1933 we have only had four similar cases. Nearly all of our infection experience has been nothing more than neglected minor injuries, which could have been avoided had light scratches or cuts been properly treated immediately after they happened.

There is no excuse for a loss of time accident from a minor injury. We have been very insistent that our employees have all cases of slight scratches or minor cuts given first-aid treatment promptly and the records would indicate that we are receiving very splendid cooperation in this connection. It is purely an educational proposition.

Injuries from Slipping: I am surprised at the number of lost-time accidents suffered through employees slipping on wet floors or on greasy platforms and stairways. The danger of injuries from this cause is widespread in packing establishments, since they have occurred on killing floors, in curing cellars, on the pork cutting floor, in car icing, and in sausage manufacturing departments.

The best means that can be taken to minimize the danger of slipping is the regular use of a clean-up hose on killing floors, and keeping the floor as clean as possible. The use of safety treads and plenty of light on stairways will minimize the danger of slipping on such stairways. Sprinkling a little coarse salt on greasy floors prevents slipping under those conditions. The use of rubber boots, which is the general type of footwear used on these particular occupations, after the soles and heels of the shoes are worn smooth, increases the danger of slipping to that extent.

Toe Fractures: Toe fractures are caused by dropping something heavy on the toe. Our worst experience with this type of injury was with employees handling frozen meat cuts. We have had it happen also to employees removing boiled ham from containers, as well as from ice buckets and trolleys falling from a rail by being pushed through an open switch. Also from dropping cakes of ice on the toe.

We have for some time been encouraging the use of safety shoes and we believe that the widespread use of safety-toed shoes by employees where there is a possibility of dropping something on the toe is entirely responsible for our elimination of toe injuries during this current year.

Miscellaneous Injuries: Miscellaneous injuries account for about 40 per cent of our accidents. Our experience with elevator accidents shows that they arise from three causes, mechanical defects, improper doors on landings, inexperienced elevator operators. With proper inspection for mechanical defects and proper protection of all floor levels and only experienced operators allowed to run the elevators, elevator injuries can be almost entirely eliminated. All of our elevator operators are furnished with a book of instructions which they are obliged to follow rigidly.

Many times accidents have been caused because gears and moving parts of machinery were not properly guarded. It is very essential to the safety of the operators that all machines throughout a packing establishment be properly guarded. It is important in installing new machinery to see that proper guards are attached before the machine is put in service.

To avoid eye injuries, goggles should be provided in all cases, both in the mechanical shops where emery wheels are used for grinding tools and on grinding wheels on the killing floors where the danger of bone splinters flying into the eye prevails.

The danger of injury from an emery wheel exploding can be prevented by having a proper guard placed around the wheel. Another general hazard is due to mechanics, who may be working on overhead shafts or rails, leaving loose timbers.

bolts and similar material lying on the beams when the job is finished, and these may fall off and injure employees passing or working below. Injuries through falling off platforms can be prevented by proper guard-rails.

It was customary some years ago to have periodical safety campaigns. Certain weeks or months were set aside for clean-up campaigns. There is an old saying that "a clean plant is a safe plant." But the days of the periodical clean-up in safety campaigns are past. Thanks to the efforts of the Institute of American Meat Packers, the spirit of competition instilled in the industry has substituted a continuous safety campaign for the former periodical campaign. Machinery has been set up in every establishment for the control of safety.

At our home office in Chicago, we have a general safety inspector and at each of the outside plants some individual is appointed as safety inspector for that particular plant. The general safety inspector makes regular visits to the various outside plants, makes a thorough inspection of the plant from a safety standpoint, leaves his recommendations on any conditions that need correction, as well as instruction, that they be corrected.

On our Plant Conference Board, we have a safety committee. The chairman of this committee is our safety inspector, and being of a mechanical frame of mind, he is peculiarly fitted for the duties of safety inspector, and inasmuch as his regular duties bring him in contact with all parts of the plant, he has an opportunity of observing any accident hazards that might exist. In all cases where accidents have happened, the safety committee makes a thorough investigation of the circumstances surrounding the accident and makes recommendations as to the best means of preventing a similar recurrence. The credit for our present excellent standing in accident prevention is due to the splendid work of our Safety Committee, coupled with the whole-hearted cooperation they have received from the workers. Our safety standing was made possible, not by a temporary effort, but by a safety-consciousness that has been fostered by the continual educational program.

Why the Lack of Accidents in the Boot and Shoe Industry

*Orig. paper -
Sh 73*

By J. W. LAKE

Vice-President, Pedigo-Lake Shoe Co., St. Louis, Mo.

The speaker said in part: If safety rules and regulations were not given due and full consideration by the management of the shoe industry, and if safety of the employees was not regarded as one of the most vital and important factors of management along with other principles of safety and consideration, no doubt our record for safety would not be as good as it is. However, safety rules and regulations require preparation and if preparations are not sufficient unto themselves and are not in themselves conducive to good safety records, safety rules and regulations should be executed and carried out to the fullest. The best proof of the proper preparation and execution of safety rules and regulations is a good safety record.

You say that you have safety rules and regulations too, and that you also carry out your plans for safety. If so, why is your record not as good as that of our industry? If this is the case, it is my opinion that you should look to your machinery manufacturers for assistance and also you should give cooperation to the manufacturer of machinery for your industry so that he might be in a better position to help you in your safety problems.

You probably are not acquainted with the fact that much of the machinery furnished for the industry, particularly the heavier more hazardous types of machines, are rented or leased from the United Shoe Machinery Corporation. This corporation has for years consistently endeavored to design their machines having in mind the safety of the operators, applying all practical suggestions toward that end, and whenever machinery in use develops dangerous defects, whether this is discovered by the management of a factory and reported to them or whether they discover it themselves, they immediately make changes to overcome the trouble. Thorough instructions are furnished with each machine. Road men are trained in the operation of new machines, workers are instructed by road men representing the company. The worker's attention is drawn to unavoidable hazardous conditions which may exist.

In short, these designers of shoe machinery have followed a very thorough and complete plan of engineering revision in the design and construction of their machines in order to make them as nearly accident-proof as possible. They have kept in mind the fundamental facts that an accident is always costly and that the value of their machines to the shoe manufacturer is vastly increased when their machines are made fool-proof and accident-proof by the elimination of all hazards. Shoe production costs are kept at a minimum, also, because the worker himself realizes that in the operation of the machine he is in no danger and can therefore work with maximum speed and accuracy.

In conclusion, permit me to suggest a very practical plan, one that has proved highly satisfactory. In my company I am actually in a position to come personally in contact with the same safety problems that you encounter daily, and I feel qualified to recommend this safety plan. Name it the safety board. Make one of the officials of your company chairman of the board permanently. However, be sure that he is safety-minded. The other members of the board should comprise every department head whether or not they are officials of the company, and each should be a man in direct charge of a department. Select a president for each quarter year, a vice-president to act for the president in his absence. Also a permanent secretary to be appointed by the chairman of the board whose duty it shall be to keep complete records of all the meetings and safety reports. Selection should be arranged on a rotating basis, so that each department head is selected president before any one of the department heads is selected a second time. In this way everyone of your department heads will soon become safety-conscious.

Hold regular safety meetings and as a group the Safety Board should make a regular tour of inspection from roof to the cellar of the plant. The president of the board, of course, being one of the department heads, will make a joint report of inspection to the chairman of the board in writing, along with other suggestions and recommendations for corrections toward safety, retaining a copy for himself for reference, and will cooperate with the chairman of the board by seeing to it that the properly approved recommendations of the board are carried out.

Of course, it is necessary to see to it that no ill-feeling or animosity is generated between department heads. The plan must be worked on the basis of good business and fair play. However, men in charge of departments are or should be big enough to be able to understand that the plan is for the best interests of safety, and therefore, is part of their responsibility as men in charge of production departments as well as members of the safety board. It is obvious, of course, that any safety plan, where the factor of safety is not the first consideration, will not get results and therefore will not be a success.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Metals Section

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 J. M. WOLTZ, The Youngstown Sheet and Tube Co., Youngstown, O.

MONDAY AFTERNOON SESSION

October 2, 1933

The first session of the Metals Section was called to order by J. I. Banash, President of the National Safety Council, who welcomed the delegates in the name of the Executive Committee of the Council. He then introduced General Chairman Robert L. Schmitt, Louisville Car Wheel & Railway Supply Co., Louisville, Ky., who presided. In presenting a "Resume of the Year's Activities" the chairman covered briefly the activities of each of the section's committees and commended their faithfulness to duty. He then introduced the first speaker.

The New Deal in Safety

By J. RUSSELL CRAIG

Safety Director, Pennsylvania Indemnity Corporations, Philadelphia, Pa.

The speaker said in part: The executive of today who makes accident prevention of secondary concern is short-sighted and narrow in his entire business outlook because it plays a very important part in the yearly profit and loss statement. One safety director, in preparing a report for his chief, showed in 1932 the frequency rate and severity rate of his company in comparison with five competitors. This was excellent but he did not go far enough. He should have, in addition, placed beside these the estimated difference in dollars and cents. One company, which had an outside safety personnel, made a review of its accidents and costs before organizing a safety department, and was amazed to find in this new interpretation of their annual statements that if the accident costs had not existed, their annual statement instead of showing a net loss would have shown a net profit.

Right here is a good time to bring up the question of so-called accident-prone employees. In reality, a company should have no such group as those called accident prone employees. If it does, then it is managerial fault rather than the fault of the men. Physical examinations help to place a man in a position which will be a stepping stone to a higher job and create in the organization a booster for the company. In a very definite respect, the Westinghouse and Electric Manufacturing Company has had the new deal in safety because of such planning. Examinations and executive participation have resulted in the hiring of over 3,000 employees who have been with the company for 20 to 50 years.

In a real sense "The New Deal in Industry" means more men working fewer hours. Efficiency throughout the entire organization is necessary because waste is not only prohibited but must not occur, as the margin of profit cannot carry it, which means waste is evaluated higher than heretofore. Accidents cause waste. Improper hiring causes potential waste because of costly training. Improper training or lack of training causes waste. Any training whether organized in classroom style

or personal instructions by foremen not having accident prevention as the basis, will be both costly and wasteful.

Does the foreman, your keyman, realize this and has the management prepared the foreman to meet and solve this problem? True, your foreman by now should have passed through or at least know of the various stages and successful methods of accident prevention in years gone by, but is he ready for the "New Deal in Safety?" If not, may I recommend "the National Safety Council Course in Foremanship Training?"

Waste is seen in improper methods of training which not only waste material but cause accidents resulting in damaged machinery and man power. The "New Deal in Safety" as well as in industry demands a new and better method of choosing foremen unless already in use. As pointed out by H. W. Darr, of the Bethlehem Steel Company, "seniority has no place in the choosing of a foreman. A man's ability and aptitude are the governing factors. A majority of men would never be good foremen if God permitted them to equal Methuselah in age. In selecting men for foremanship positions we try to impress upon their minds three things, viz: they are responsible for the quality of material produced; they are responsible for the equipment required in the production of any commodity; and, most important, they are responsible for the safety and welfare of the producer—man."

The third major problem I wish to mention in this "New Deal for Safety" is, more leisure time for the entire industrial personnel—which brings their employees into a new and more intensive accident exposure. The answer to this very important problem is the development of active community safety programs by industry.

If your plant has 3,000 employees it is reasonable to assume it represents between 8,000 and 15,000 persons dependent upon those on your payroll. Anything seriously affecting any number of these persons reacts on some one or more of your employees. Consider the effects of worry, loss of sleep, added expense and illness as reflected in the attitude of employees while at work. The community has learned of industrial accident prevention success and unconsciously looks to industry to lead the way in community safety activities.

In many places, and I dare say in most places, there are more employees killed and injured outside of the plants than inside. What a challenge this is to industry to take the lead in community safety activities. Many of these men killed or injured outside of the plant are lost to industry, not only as factors in immediate production schedules, but men for whom time and energy have been spent in hiring and training them. Some of these men, no doubt, were entitled first to disability benefits if not killed outright, and then entitled to death benefits, costing many thousands of dollars. To whom shall this loss be charged? New men must be hired which cost unexpected expense for their training. Who shall stand this expense?

Community safety should include community health programs because safe thinking will prevent unhealthy conditions which result in indirect causes as well as direct causes of accidents. Sickness in the home brings a strong pull on the mind and energy of the working man. This results in reduced producing ability and if continued may lead into causing accidents to himself and others. Ill health in the employee many times has been the beginning of a disease on which industrial diseases are attached by compensation boards. Continued exposure to unhealthy conditions at home undermine the health of the employee which only takes a slight strain to cause a serious injury which otherwise would not have developed.

All of these are items of cost—and who pays? Let me suggest where you may help.

The Jones and Laughlin Steel Company, through their poster contests in safety poster making for their employees, extended the offer and prizes to the members of the families of employees, also.

The Westinghouse and Electric Manufacturing Company which has been doing an excellent health program for years, offers employees, without cost, periodic physical examinations. They do not prescribe any medical treatment beyond first aid but if anything is found wrong, recommend them to their family physician. Their medical department, including an x-ray outfit is available at a nominal charge to employees and members of their families.

The effectiveness of this community health work is seen in the report that in normal times as high as 2,000 visits a month to the homes of their employees are made when sick. They have also assisted in the establishment of annual clinics of various kinds—dental, baby, and pre-school child clinics. This work is genuine and sincere, and its effect is further seen in the giving of over 60,000 health certificates in the schools of Allegheny and Westmoreland Counties in Pennsylvania.

Many companies are members, not only of the National Safety Council, but also of local councils. If you have no local safety council in your neighborhood, get behind the organization of one. This suggestion comes because safety councils can guide the work of community safety better and reach more people than a company, and at the same time it gives the smaller company a chance to learn and practice safety within its own plant as well as to contribute to community safety programs.

Correlating Safety with Plant Operations in a Steel Mill

By F. M. GILLIES

Assistant General Superintendent, Indiana Harbor Mill, Inland Steel Co., Indiana Harbor, Ind.

The speaker said in part: One of the major problems in instructing plant personnel in safety is to have some definite means which will assure the management that the workmen are thoroughly instructed so that they can keep clear of the hazards they must encounter daily. This problem is distinctly important in the steel plant where the roster of employees consists of such a great number of nationalities with varying degrees of education and intelligence. Assuming that the great majority of the foremen are Americans, and only speak the English language, and conceding the fact that the foremen must be instructors, it is obvious that unless the particular foremen have convenient interpreters, much of their instruction will not be perfectly understood. The plan of printing signs in various foreign languages has been in vogue for many years, but these signs necessarily deal only with danger warnings in prominent locations; and the rest must be understood by the men as best they can. Most of the major steel plants have books of safety rules in the language of the men who make up their greater percentage of foreigners, but this again only expands the idea of signs, and at the best does not deal with detailed work and temporal situations.

We are definitely confronted with an obstacle here, and, in my experience, a great many accidents occur from this cause alone. The effect on the foreman who is giving safety instructions to ears that he knows are recording imperfectly, is most discouraging and influences an attitude of doing the best he can and hoping for luck. Even in the case of an available interpreter, the second-hand instructions are very,

often distorted, and so from both angles we recognize a problem most difficult. Therefore, I believe that the problem of the management is an educational one and each steel plant should carry on a program to teach the English language to those foreigners who have not mastered it. This problem of English classes can be turned over to the safety director and personnel for teaching can be readily and economically obtained. Limiting the employment to English speaking people, or those who are willing to attend classes where they can learn English, gives any plant a good control over this situation.

Assuming now that we are on a basis where every employee is fundamentally educated enough in our language to understand our various methods, we can set forth with a program from all angles. The first and most popular angle is to bring safety to the front, and this can be accomplished best by advertising. The type of safety advertising most familiar to us is the sign or the poster, but this can be definitely overdone. One sign placed at a strategic point, or where it would be generally observed, is worth a hundred cluttering up a wall or a mill entrance. Bulletin boards in each department of the plant have had quite a spree in recent years; and a great variety of slogans, posters, photographs of Babe Ruth and other celebrities in sports and the columns of newspapers, have been used indiscriminately. All of these, perhaps, have a certain value. But my recommendation, in order to get the same attraction, and to arrive more quickly at my subject matter, safety, is to drive from a different angle. Photographs can be used, large clear photographs properly gotten up of various types of work done in the department in which they are exhibited; one picture showing the improper way, the other the safe way of men actually employed in that department. This plan utilizes one of the best ways of promoting newspaper sales that one of the larger newspapers in Chicago has employed in recent years. People are always anxious to see themselves in a photograph. That in itself should attract men to the boards. Once looking at the photograph, they cannot help but observe the safety lesson graphically shown there. The idea of promoting personal interest by turning over part of the bulletin board for a week at a time or a month to various groups in the department to make their own bulletins, never fails to attract and to interest the employees.

The safeguarding of men and equipment, in order to be properly controlled in each department of a large steel works, must be uniformly adhered to. To have a specially rigid requirement, we will say, in the coke plant or transportation department, and to have less rigid standards in the blooming mills, brings about an unsatisfactory plant condition. And this condition can exist in spite of a good safety man at the head of the department. Such variable results are unsatisfactory generally to proper handling of the subject because dissatisfaction arises among the working personnel who feel that they are needlessly oppressed in the strictly run department in comparison to their friends who do not have to toe the mark as closely in the more lax department.

The best way to eliminate these irregularities is to standardize the foremen's education on the subject of safety by carrying on a foremen's training course. This has been done by a number of steel companies with excellent results. However, a point of discussion does arise as to what kind of a course to give and how often to repeat it. I believe that for six weeks of every year we should maintain a foreman's training course and the subject of safety should be treated each year, but I do feel that we cannot treat entirely with safety for six sessions and make it sufficiently interesting to maintain an enthusiastic attitude. I therefore suggest a general foreman's course each winter which treats generally with the business of acquainting

this supervising personnel with all the intricacies of the company's business and intimately informing them of all the varying commercial problems that arise from year to year. One of the sessions can be given entirely to safety, while all of the others will indirectly affect safety by increasing the general interest and enthusiasm of the individual foreman in plant operations. In this way we can standardize safety practices and we then can hope to have a well balanced application of safety effort in all departments.

One of the most generally used and most practical methods of enforcing safety is by disciplining those who are guilty of infringement of the safety rules. Just as in any other plan for law enforcement, the problem is to insure strict adherence to the law, and all punishment is designed to gain this result or serve as an example to others who may at times feel that it is unnecessary to live up to the law. It would be pleasant to be certain that an intelligent warning to a man who had violated his safety rules would guarantee against a repetition, but experience has proved that too often this warning has had influence for only a brief period. My belief is that education is our only hope for the safety millennium and a perfectly safe performance of all work can never be realized prior to the time when our safety education is complete; in the meantime positive and direct punishment seems the only practical plan. We cannot put a man in jail for a safety violation, although he may deserve it, but we can punish to what we feel is our best extreme, and that is by laying men off. It is simple for a supervising head to send an employee home for several days or a week. It has more authority than a judge because there is no possibility of appeal, and so with the exercising of this authority must go considerable conscientiousness of judgment. A working man disciplined unjustly will not become a safe worker, and therefore, the management must take a hand in the administration of punishment. We have a regulation in our plant requiring that department superintendent personally investigate every minor accident that occurs under his charge. This investigation brings in the foreman under whom the accident occurred and also all witnesses. In this way the department head has a thorough knowledge of the accident and he orders the punishment for the offense, and this guarantees us against possible unfairness.

The foreman has more influence on safety progress than any man in a working organization. He is our best safety bet. We must look to him to do the work, to know the men, to note the regard for safety in his men, and to observe the conditions that his men work under. We must depend on the foreman to get our results and to properly make certain of them. We must penalize him for failure to carry this end out. Here is our best spot to put the penalty of discipline for accidents that occur in his department caused by proved carelessness or laxness on his part. This will awaken him to his responsibilities and produce results. Knowing that plant management stresses the foreman's responsibilities so strenuously, has a tendency to cause the management to modify discipline if there is a way out, but this should not be done. If the foreman is the right sort he wants to do his work as well as it can be done and if he has neglected the safety phase it should be forcibly brought to his notice; with this in mind, our method of dealing with lost time accidents is to have them investigated by the assistant general superintendent of the plant. The investigation is complete and thorough, and fair, and if in the findings the foreman is proved negligent, he is disciplined.

The steel industry for many years has not had a very high standard of qualification for employment. While the department head and his assistants were naturally favor-

able toward employing the most proficient men they could, years of immigrant labor, plus long hours, and much work which was quite irksome, had not developed a very good standard for the general classification of semi-skilled and unskilled workmen. These requisites have improved somewhat since the adoption of the eight hour day in 1923, but our methods of selection still, I am afraid, have continued on much the same basis for the last 30 years.

Therefore, I am of the belief that some sort of test should be required. And along with the mental side must be considered the physical side. A man in bad health from one cause or another, or one with disabilities not easily detected, is more prone to get hurt than one well equipped in good general health. There has been quite a variation in this regard in the various large plants, as far as requisites are concerned. Some have no examinations, others only cursory ones, and some, I understand, are quite thorough. While I question the value of a very thorough examination, I believe that a general examination should be held which will bring out physical defects, or conditions such as bad eyes or impaired hearing, bad heart or lung conditions, or infectious diseases which bring about general run-down conditions. Refusing employment to men who cannot pass an examination of this kind cannot help but have its beneficial results in the safety record.

The practice of rewarding departments, groups, or individuals who have been successful in completing a period in which satisfactory or outstanding safety records have been made, has been in practice to a lesser extent in some industries. I am of the opinion that there is merit in the plan generally, for we know that one of the greatest fundamentals in securing unusual performance is a reward of one kind or another. Cash rewards are the only kind I consider. The idea of a watch fob, or other decoration, is all right as an emblem, and may distinguish the receiver of the reward, but money will secure more certain results. It is impractical to attempt to distribute a nominal sum to a large group of employees, for unless extreme generosity is used the sum given to any one workman would be too small to have the desired effect; so I recommend that these rewards be given to those men who, I have said previously, are our best safety bets—the foreman should receive the reward.

Injury Experience in the Metals Section During 1932

By L. H. KAEBEL

Keystone Steel and Wire Company, Peoria, Ill.

The speaker said in part: Last year I was able to tell you that the frequency and severity of 1931 lost time injuries in all branches of the Metals Section reached two low levels. Our results during 1932, unfortunately, were not so favorable. The steady improvement from 1929 to 1931 in the injury rates of companies in the non-ferrous metals group and in foundries was followed by higher rates in these industries during 1932. While rates in the steel, railway car and equipment, and machinery groups dropped still further during 1932, decreases over the previous year were generally smaller; frequency in the machinery industry was down 45 per cent in 1931 and only 15 per cent in 1932, and the corresponding decreases in severity were 21 and 3 per cent. This is true for American industry as a whole, which, according to the Council's figures, reduced frequency 18 per cent in 1931 against 16 per cent for 1932, and severity 13 per cent in comparison with only 6 per cent for 1932. The 1932 reductions for all industries were considerably exceeded by our railway car and equipment plants

but, with the exception of a larger reduction in severity by our steel mills, we fell behind in average improvement for all industries.

Serious injuries in most divisions of the section declined only slightly in frequency and severity, except in the steel industry, where improvement was marked. The foundry and non-ferrous metals groups had unfavorable experience with both fatalities and permanent partial disabilities. None of us, as a matter of fact, have been able to eliminate serious injuries as rapidly as temporary disabilities since 1926. I emphasized this point in my talk last year and I want to reiterate it again this year. Since members from the steel industry constitute the largest single group in the section, I will cite their experience during the last six years to show the problem which confronts us with respect to serious injuries. Fatalities decreased sharply between 1926 and 1928, rose almost to the 1926 level during 1929, and then fell off about 51 per cent in intervening years through 1932. Permanent partial disabilities, on the other hand, have not decreased below the 1926 level and have declined only 33 per cent since 1929. The industry, however, has reduced the frequency of temporary disabilities in each year since 1926—the total reduction being 65 per cent. The experience of steel plants with serious injuries has been similar to that in the cement, public utility, and other industries which have done outstanding accident prevention work.

A comparison of the 1932 injury records of thirty-one important American industries shows that the divisions of the Metals Section are doing a good job in safety work, particularly from the standpoint of frequency. Machinery manufacturers led the section by ranking fifth in the list of thirty-one industries; non-ferrous metals plants rank eighth; steel plants rank eleventh; railway car and equipment companies rank fourteenth; and foundries were the only group to fall in the lower half of the list, ranking twenty-fifth. None of our industries, however, improved their standing over 1921 in severity. Machinery manufacturers, as in frequency, had the lowest rate, 0.84, and rank ninth in the list of thirty-one industries; manufacturers of railway cars and equipment were twelfth; non-ferrous metals plants followed in sixteenth place; steel mills occupied nineteenth place; and foundries were farther down the list in twenty-seventh place.

The accident experience of American industry as a whole shows definitely the superiority of safety work in large organizations, but in the industries represented in the Metals Section, this is true only in the steel industry. While large organizations have lower frequency rates in most of our divisions, small plants generally excel in severity. Frequency rates for machinery manufacturers, for example, rise from 6.32 for large units to 8.24 for middle size, and to 14.49 for small units; but severity rates were 0.62 for large; 0.65 for middle size; and only 0.35 for small organizations. Frequency rates in the steel industry, on the other hand, range upward from 7.87 in large organizations to 25.62 in small ones, and severity rates vary from 1.77 to 2.66. The comparatively high frequency rates in small plants are a potential source of danger because there is a greater likelihood of a serious accident when injuries, even though minor, are numerous. This situation can be corrected quite readily because our experience in the last six years proves that frequency can be reduced easier than severity.

There are, unfortunately, numerous large organizations with high injury rates in all branches of the section. Frequency rates among the big steel mills, for example, varied from 0.57 to over 26.50 in 1932 and severity rates ranged from 0.05 to 5.03. Injury rates in large foundries with machine shops vary even more widely, and this is true in other branches of our section. It is apparent, therefore, that marked reduction in frequency and severity are necessary to bring the records of high rate plants in line with the averages for their size and type.

Many safety engineers are wondering whether the low frequency and severity rates from the last two or three years can be maintained, considering the increase in operations of 1933 and the possibility of further expansion in following years. Our 1933 reports to headquarters in January will furnish us, when compiled, with this information. Every member of the section, therefore, should be sure to send his 1933 record. In the meantime, however, our experience during 1927, 1928, and 1929, when industrial activity was increased, indicates that all safety engineers need to be on their toes, because most of us were barely able to hold our own in those years.

WEDNESDAY MORNING SESSION

October 4, 1933

Safety in the Railway Car Industry

By P. A. LOVELY

District Safety Supervisor, The Pullman Co., St. Louis, Mo.

The speaker said in part: I believe you will all agree with me that an accident prevention program, to be absolutely successful, must come from the big office and with a deep sincerity of purpose. The management may prove this sincerity of purpose by making or having made a thorough inspection of the plant and surrounding and correcting all dangerous or hazardous conditions that are found. They must realize that their first duty is to put the house in order and while correcting all dangerous conditions as walks, floors, stairways and platforms, as well as the safeguarding of all machines and making everything as fool-proof as possible, the employees will be taking their part by beginning to show an interest. Some will ask a question "what is it all about?" And those in the know, of course, will reply "well, the big boss is going safety crazy." But this is the result of sowing the safety seed, which with the proper care and encouragement will grow. Of course, there will be differences of opinion and some will say "safety is the bunk" but the majority who are always willing to listen to reason will begin to play their part.

Then, the management calls in the foremen for a special meeting about safety. I believe one of the main things is to make the foremen understand they will be held directly responsible for any accidents which occur in their individual departments. If this is done, it will take away the foreman's alibi that the prevention of accidents is the safety man's job. Safety, my friends, is every man's job and if your accident prevention program is to be a success every one must play his part.

We will all agree that hazards are humanly created through failure to think and that accidents are prevented by human sound thinking. Therefore, we have a human problem to deal with. The real hazards, as I see them, are defective equipment, unsafe tools, unsafe clothing and footwear, faulty instructions and failure of the supervisory forces to see that duties are performed in accordance with existing instructions. Too much cannot be said about the necessity of thorough supervision.

In my experience, I have found that 90 per cent of the employees will accept safety from an educational point of view, leaving 10 per cent of that indifferent type which will not accept safety or, in fact, any other policy of the company. Discipline will serve a purpose with this element but it does not furnish a cure for the attitude.

Orig. paper
Pg 27

Safe Operation and Maintenance of Pressure Vessels

By E. R. FISH

Chief Engineer, Boiler Division, The Hartford Steam Boiler Ins. Co.,
 Hartford, Conn.

The speaker said in part: The safe operation of a pressure vessel at any time is dependent on several factors. First of all, it must have been built of the proper materials which are adapted to the uses to which the vessel is to be put. If the substance to be contained in the vessel is such as to affect some kinds of metal, then another kind must be chosen. Even though the destructive effects may be relatively slow, it may be only a question of time before a point is reached when the vessel is no longer safe to operate. New alloys of different kinds are being developed and some are now available so that long life under safe conditions, for almost any kind of product, can be assured.

Workmanship in the original construction of a pressure vessel is of great importance. Good workmanship in fabrication not only contributes to long life, but helps to avoid exasperating troubles during operation, such as leakages and minor failures of various kinds, which require interruptions of operation to make repairs. Troubles due to improper material and workmanship may be avoided by purchasing from reliable makers, under proper specifications, supplemented with shop inspection. By shop inspection is not meant merely the presence of an inspector when the final hydrostatic test is made, for that kind of a test does not, by any means, serve as a final criterion of the character of either the material or workmanship. The inspection should cover the whole period of fabrication or, at least, inspections at sufficiently close intervals for the inspector to be able to determine the character of the work being done. This is particularly true in the case of welded construction now becoming so widely used.

Supplementing the structure of the container and contributing in no small extent to the safe operation thereof are the necessary control and protective devices. These, of course, must be suited to the needs of each specific case, and will vary between wide limits. Almost without exception there must be some means to guard against over pressure. Safety valves, relief valves, or some frangible arrangement that will break at a predetermined pressure, are generally used.

Pressure indicating instruments are very necessary and may be in the nature of the usual form of steam gage, graduated for the necessary range of pressures, or a manometer.

Liquid level indicators are essential for that equipment in which it is necessary to know the amount of contents in the vessel. Devices of this kind are particularly needed for those vessels where injury to the structure might result by reason of an excess or lack of the substance.

Temperature indicating and control apparatus are required in many operations, both to prevent dangerous operating conditions from arising as well as to safeguard the proper carrying out of the manufacturing or treating process.

Pressure control devices, such as reducing valves, are frequently necessary for the proper operation of the principal piece of the equipment.

Inlet and outlet valves of various kinds and sizes are needed in varying numbers on practically all pressure vessels. The use of valves not adapted to the purpose to which they are applied may result in failure and subsequent endangering of lives and property. There have been many illustrations of this kind. Only valves which are known to be of a design adapted to the purpose should be allowed. For instance, a

choice may lie between a slow opening valve, one of the globe or gate type, one with fixed or rising spindle when the opening has to be carefully gaged, or the open or closed position of the valve be evident from a distance, etc.

Many of the control and indicating devices are mainly for the guidance of and to help the human operators on whom dependence must be placed for the safe operation of the equipment. It is essential, therefore, that at least the one in charge be made thoroughly familiar with the reasons for the various pieces of apparatus and the function which each performs. The safety with which any piece of apparatus can be operated depends to a very great extent upon the intelligence with which the equipment is handled. Only those who can be relied on who have a complete understanding of all the principles involved, both as regards the dangers which may arise to improper operation, and those which may arise through the possible failure of the various parts of the whole apparatus to properly function. Particularly in the case of the more dangerous processes, no one should be permitted to be in direct responsible charge who has not been thoroughly schooled and trained in all the details of the care and operation of the equipment.

Because of the many and varied sources of deterioration that cause weaknesses of various kinds to develop, pressure vessels, or machinery of any kind for that matter, have to be maintained in order to keep them in the proper operating condition. It seems logical and proper that a brief résumé of the causes or weaknesses in pressure vessels be given so that the means for the prevention of failure may be more readily appreciated. The principal sources of weakness are corrosion, erosion, and fatigue due to changes in shape caused by temperature and pressure differences.

There are several kinds of corrosion, some of which are entirely preventable while others are inherent in the nature of the process. All vessels made of the customary low carbon steel are susceptible to ordinary every-day rusting, which is invariably caused by the presence of moisture. This kind of corrosion occurs both internally and externally and may be expected or be wholly unanticipated. Corrosion which may be definitely provided for is that caused by the action of the contents of the vessel and is always taken into consideration in the original design. The packing industries suffer greatly from this cause and many vessels used in packing house operations are being constantly replaced. Oil refineries also suffer very greatly from corrosion in their refining processes and many phases of the chemical industry have the same trouble.

Erosion is not so great a source of deterioration as corrosion but there are many cases where vessels have reached the dangerous state due to wear. Rotating parts used for mixers and scrapers on the interior of vessels very frequently, through wear or some misadjustment, scrape the sides of the vessel which inevitably sooner or later wears the part to a considerable depth. Often parts of such apparatus become loosened or separated entirely and in being pushed around and around cause serious wear.

The strength of the walls of pressure vessels may be very seriously affected over a period of time through the action of the changes in pressure which usually take place and which are repeated many times in the life of the vessel. It is practically impossible to so design a vessel that there are not some changes in the shape when the pressure changes, even though these distortions may be very minute. Modern codes governing the construction of vessels take into consideration this factor and if the requirements of these codes are carefully followed much trouble from this source may be avoided; in fact, it can be almost entirely eliminated.

A great many vessels are subject to rather wide changes in temperature. If the changes take place uniformly throughout the whole structure, not much damage can result. When a part of the structure is at one temperature and other parts at other

temperatures, stresses are set up due to these differentials. These cannot well be measured as to magnitude, nor can their distribution be accurately predicted or easily ascertained. Repeated many times, they are likely to ultimately have a serious effect upon the strength of the metal.

The effect of both temperature and pressure changes in shape causes the so-called "fatigue of the metal" which may ultimately result in a crack or failure of some kind. Everyone is familiar with the simple phenomena of the readiness with which a soft ductile piece of wire will break when continuously bent backward and forward at the same place. This cause of failure is widely recognized and is taken into account by many industries who endeavor to ascertain the metal best suited to their purpose by making tests in specially constructed machines to determine the relative resistance to fatigue of metals of different constituents.

In order to maintain pressure vessels of all kinds in continuously safe operating conditions, constant vigilance is necessary. In order to properly exercise this vigilance, equipment must be installed so as to be relatively easily accessible. There must be no part which cannot be sufficiently closely examined to make sure that it is not deteriorating. In short, the condition of the structure must not be taken for granted. Not infrequently parts of vessels are imbedded in concrete as a convenient method of support. Because of the differences in the coefficients of expansion, a little space will develop in the course of time between concrete and steel and it is practically inevitable that dirt and moisture will find their way into these interstices. There are many cases where pressure vessels are placed so close to walls or other pieces of machinery that proper inspection is not possible. Sometimes it is found that, although means of access to the interior of vessels has been provided by the manufacturer, the vessel has been so installed that the opening is so obstructed that a man cannot get inside to make an inspection.

Persistent leakage, the cause of which is not perfectly obvious and which does not yield to simple methods of repair, should be regarded as almost positive evidence of the presence of serious corrosion or cracks. Many dangerous cracked riveted seams have been discovered by correctly diagnosing this indication of weakness. Objectionable accumulation inside the pressure vessels is, in many industries, inherent to the process and may or may not endanger the process itself or the safety of the container. The extent to which accumulations should be allowed to gather oftentimes has to be determined by cut-and-try methods. They should, of course, be removed at sufficiently frequent intervals to prevent the dangerous condition from arising.

As an illustration of this kind of phenomena, and one which is not generally known or anticipated, may be cited the troubles in connection with air pressure tanks. Many of the failures of air tanks have been because of internal combustion explosions due to the presence of explosive gas mixtures. These gases frequently are due to the presence of oil carried over from the compressor and which gathers on the inside of the air tank. Being fairly hot, the more volatile substances are vaporized and form an explosive mixture. If ignited in some way, and how it happens is oftentimes very obscure and hard to explain, a detonation occurs. It is not practicable to provide metal sufficiently thick or strong to resist the extremely high and wholly unanticipated pressures that result from such an occurrence. It is really important that high grade lubricants be used in air compressors and that care be taken to keep the receivers well drained.

The use of telltale holes, that is, holes drilled part way through the wall of a pressure vessel, are of great advantage in those cases where wasting away of any kind

is anticipated. These holes are drilled in the surface opposite that on which the wasting occurs, to a depth that is the minimum thickness of plate that can be allowed before the vessel is retired from service. When the attrition reaches the bottom of the telltale hole it becomes evident, either by the leakage of the substance on the inside, or in the case of jacketed vessels, by the leaking of steam. Usually deterioration of this kind cannot be repaired.

Of almost as great importance as the pressure vessel itself are the various indicating and control devices with which it is, to some extent, usually equipped. Automatic instruments do get out of order. Those protective devices which function only at very long intervals, if ever, must be kept in condition so that they will certainly operate when the crucial moment arrives. In order to be sure that your automatic controls will not easily get out of adjustment and therefore fail to operate when they should or the protective devices clog up so they will fail to operate when they should, they must be examined and tested at frequent intervals. The only possible way to determine whether a safety valve or relief valve is in operating condition is to cause it to operate occasionally, and most equipment of this kind is provided with try levers for this purpose. Connecting pipes of indicating equipment, such as level indicators, are apt to become stopped up for one cause or another, and must be actually looked into to see whether they are clear. Automatic feeding devices become clogged up so that they do not work and an internal examination is the only way to see that they are kept free. The compact and general condition of electrical equipment, on which controls of any kind are dependent, must be kept clean and free from accumulation of dirt and moisture.

Nominating Committee Report and Election of Officers

The Report of the Nominating Committee was then called for and the following section officers were elected for the ensuing year:

General Chairman—E. F. Blank, Jones & Laughlin Steel Corp., Pittsburgh, Pa.

Vice-Chairman—J. A. Voss, Republic Steel Corp., Youngstown, Ohio.

Vice-Chairman—H. W. Darr, Bethlehem Steel Co., Bethlehem, Pa.

Secretary and News Letter Editor—A. Berquist, The Youngstown Sheet and Tube Co., East Chicago, Ill.

Engineering Committee Chairman—J. E. Culliney, Bethlehem Steel Co., Bethlehem, Pa.

Health Committee Chairman—Dr. R. C. Engel, The Corrigan, McKinney Steel Co., Cleveland, Ohio.

Poster Committee Chairman—W. D. Speight, Keystone Steel & Wire Co., Peoria, Ill.

Program Committee Chairman—C. M. Allen, The American Rolling Mills Co., Middletown, Ohio.

Publicity Committee Chairman—A. M. Lytle, The Newton Steel Co., Monroe, Mich.

Statistics Committee Chairman—C. E. Ralston, Pittsburgh Plate Glass Co., Pittsburgh, Pa.

Slides and Safety Kinks Committee Chairman—J. A. Oartel, Carnegie Steel Co., Pittsburgh, Pa.

Foundry Committee Chairman—F. G. Bennett, The Buckeye Steel Castings Co., Columbus, Ohio.

Membership Committee Chairman—R. A. Chaffin, Continental Steel Corp., Kokomo, Indiana.

Railway Car Builders Committee Chairman—P. J. Brand, Pullman Car & Manufacturing Corp., Pullman, Chicago, Ill.

Members at Large—

- L. S. Adams, Hubbard Steel Foundry, East Chicago, Ind.
- C. M. Allen, The American Rolling Mill Co., Middletown, Ohio.
- J. A. Coltrin, National Radiator Corp., Johnstown, Pa.
- H. M. Croghan, Inland Steel Co., Indiana Harbor, Ind.
- G. A. Davis, Illinois Steel Co., Chicago, Ill.
- John P. Eib, Illinois Steel Co., Joliet, Ill.
- E. A. Ellis, Wheeling Steel Corp., Wheeling, W. Va.
- W. T. Filmer, The Youngstown Sheet & Tube Co., Youngstown, Ohio.
- A. C. Gibson, Spang, Chalfant & Co., Inc., Pittsburgh, Pa.
- Charles W. Hanko, Pittsburgh Steel Co., Monaca, Pa.
- S. E. Hawkes, MacWhyte Company, Kenosha, Wis.
- H. G. Hensel, The Youngstown Sheet & Tube Co., Chicago, Ill.
- W. J. Ireland, Kohler Co., Kohler, Wis.
- W. A. Jarvis, The Chase Companies, Waterbury, Conn.
- F. A. Lawerman, Republic Steel Corp., South Chicago, Ill.
- T. H. McKenney, Illinois Steel Co., South Chicago, Ill.
- D. V. Medalie, Interlake Iron Corp., Chicago, Ill.
- W. E. McGraw, H. H. Robertson Co., Pittsburgh, Pa.
- Robert L. Schmitt, Louisville Car Wheel & Railway Supply Co., Louisville, Ky.
- J. K. Stafford, Mississippi Valley Structural Steel Co., Decatur, Ill.
- J. M. Woltz, The Youngstown Sheet & Tube Co., Youngstown, Ohio.

Orig. paper - 7822
Health Hazards in the Foundry

By CAREY P. McCORD, M.D.

Medical Director, The Industrial Health Conservancy Laboratories, Cincinnati, Ohio

The speaker said in part: Over and over again it seems necessary to restate in many guises such well established foundry fundamentals as the following:

1. Excessive heat is a hazard common to all foundries.
2. Excessive heat means high loss of valuable chlorides from the body and calls for replacement. The use of salted drinking water is now better established as desirable than ever before. More rather than less salt is advocated for the normal foundry worker exposed to high temperatures.
3. Molten metal emits chemical rays at times harmful to the eyes. Goggles fitted with glass barring these rays prove their worth to the workmen in many plants.
4. Metal fume fever fortunately is fleeting in its known effects, but no less is real. It is more often found where zinc enters the metal mix.
5. Sudden and extreme variations in temperature may be the lot of foundry workers—notably so in winter. The body makes adjustments to these quick changes with admirable facility. No less, these burdens are conducive to respiratory diseases, including pneumonia. Pneumonia reaches highest frequency among foundry men.
6. Lead poisoning is far from rare in the foundry.

7. Carbon monoxide may be found in harmful quantities.

8. Antimony, nickel, cadmium, manganese, phosphorus, arsenic, and sulphur may on occasion find their way into the crucible and thus make possible the development of ill health traceable to such causes.

9. In core making, many binders have led to skin diseases.

10. If metal grinding, polishing and buffing constitute a part of the foundry's activities, a long list of additional hazards may be cited, ranging from the action of chrome polishing materials to tenovitis from the drag of the buffing wheel.

11. Last, but foremost, is the hazard of dust. At the present moment concern over health hazards in the foundry may be divided in the ratio of 99 per cent for dusty lung diseases and 1 per cent for all others combined. While this disproportion may not be warranted, it appears desirable that I devote the major portion of my comments to selected items related to dusts and the diseases produced by dusts.

Confronted with any new and outstanding hazard in industry, the tendency is to exaggerate the requirements for control. This notably was true when benzol first came into wide industrial application. Now the conditions under which benzol may with safety be used are so well delineated that where these conditions are provided benzol poisoning is unknown. A similar course is predictable for the silica hazard in foundries.

As the major problems connected with dusty lung diseases and their causations become harnessed by the specialist, opportunity is provided for the consideration of many secondary aspects of dust and dusty lung diseases. I propose now to comment on five of these slightly less significant matters—important in my opinion to the employment manager, the safety engineer, and the plant physician.

1. How shall the foundry operator protect himself against cases of dusty lung diseases originating in other plants?

Many foundry operators are faced with suits or other form of claims that undoubtedly are related to previous employment in other foundries or other dusty trades. Since silicosis may require and usually does require many years for its development to the point of disability, it naturally follows, by way of example, that 16 years of previous foundry exposure is more blamable in the causation of silicosis than two years of similar exposure in present employment. Yet the present employer is likely to find himself saddled with full responsibility.

Lately I have had opportunity to examine well made film negatives of applicants for work, without admitted previous exposure in industry. These persons were found to live and drive on dusty country roads made of flint. Approximately 50 per cent of these young adults presented sufficient involvement in their films to be rated as "suspicious" in relation to pneumoconiosis. Given a few months exposure in a foundry anyone might hold himself eligible for claims against his employer alleging dusty lung disease.

The answer to the problem is definite. Every prospective employee for any dusty portion of a foundry should be x-rayed by a competent maker and interpreter of chest films. For the good of the prospective workman and for the good of the operator, any applicant exhibiting any x-ray evidences of any degree of involvement resulting from the action of dusts or the presence of other pulmonary pathology in well established degree, should be denied employment in any dusty exposure. Expensive as x-rays may be, they are likely to prove one of the most economic steps that may be taken in these days of wholesale litigation, synthetic testimony, unskilled physicians, and plaintiff-prone juries.

2. What shall be done with the workers known to possess dusty lungs?

In late months many employers in dusty trades have procured routine x-ray examinations of all employees. Out of every hundred undisabled men, properly examined, a fair percentage is likely to present some degree of clear-cut pneumoconiosis. What is to be done with such men? Many are not disabled. Some are outstandingly hale and hearty. Shall they be told of their state? Many are likely to develop mental quirks and neuroses. Some will take an unfair advantage of the employer through claims. A small consensus of mature and fair-minded opinions as to appropriate action for this very time may be epitomized as follows:

Seek to eliminate further exposure to the dust hazard. Do not apprise any undisabled workman of his condition. Make repeated x-ray examinations at about six months intervals. If advancement of the condition appears, then take action suited to the individual case. Otherwise keep these men at some work.

3. Are negroes more susceptible to dusty lung diseases than whites?

I know of no large series of cases arising under identical conditions in this country among whites and negroes that prove the negro to be more readily involved by dusty lung diseases. The negro is more susceptible to tuberculosis than his white fellow workman. His housing is likely to be on a lower plane. His exposure to tuberculosis is prone to be greater than in the case of the average white man. On account of this background, the negro at this time is rated as a greater risk in the foundry than whites under conditions of equal exposure.

4. How necessary are dust counts in detecting hazardous work points in a plant?

The dust counter has established itself as the best available yardstick for the determination of different quantities of dust in the atmosphere. Like so many instruments in its class, the dust sampler and counter has been glorified far beyond its real merits. Opportunities for errors are legion. Legal standards based on present dust counting methods are utterly futile. Notwithstanding many pitfalls, however, the dust counter is a most valuable instrument. It finds its greatest usefulness in discriminating between much dust and little dust; improving the efficacy of preventive measures and devices; in the determination of the carriage of fine dust into non-dusty departments; in the detection of unsuspected dusty work points.

5. In litigation what medical defense may be involved?

Without presuming any qualifications in the domain of law, the plant physician, the safety engineer or the employment manager may be called upon to furnish attorneys all possible information in preparation for trials. Below I am listing a number of items that are in prospective use or have been used in various instances:

(a) Denial of the existence of dusty lung disease: Recently in the examination of a sample of 202 films of men exposed and unexposed to dust, one was singled out as exceptionally free of even usual amounts of fibrosis. This film was examined as an unknown, as were all others. Later it was pointed out that the workman from whom this film was made was a litigant demanding a large sum of money on account of an alleged silicosis. Similarly, about four out of every five litigants alleging dusty lung disease are in fact free of such diseases. The claims are spurious and may be proved so by appropriate examinations carried out by qualified investigators.

(b) The denial of disability or prospective disability: A large number of workmen whose lungs show some signs of dusty action are not incapacitated and no proof exists that real disability is an early prospect.

(c) The denial of neglect: Many of the true cases of dusty lung disease have been developing over long periods of years such as 15, 25 or 40. Since the medical pro-

fession has professed scant knowledge of these diseases during these periods, it is unreasonable to believe that the industrialists could have possessed more. Inevitably it follows that operators of dusty industries may not be presumed to have possessed earlier and greater information of these occupational diseases than physicians, industrial hygienists, state health departments, state factory inspectors, and other agencies devoted to health conservation. No industrialist may be charged with neglect for failure to supply protection against an insidious disease unknown or little known to the medical profession. Even at this time the average physician possesses the most meager information as to these conditions.

(d) The origin of the dusty lung disease in previous employment: Manifesting it is unjust that a few weeks of employment in some one foundry should be held responsible for a well established dusty lung disease when antedating this employment, there have been years of exposure to similar work in other plants.

(e) The origin of the dusty lung disease from causes other than industrial employment: In some localities over the country it seems probable that sufficient dust may arise from roads, farm work, etc., to induce characteristic involvement of the lungs.

(f) The actual quantity of dust present in an industry is below any reasonable threshold of probable production of damage: The mere fact that an industry or department is classified as a dusty operation is not in itself proof of the possibility of development of pneumoconiosis. The nature and extent of protective devices may fully exculpate the plant as a practical hazard. Dust count methods have certain undeniable limitations, but this form of testing along with tests of the efficacy of ventilating apparatus may be utilized on occasion wholly to eliminate any justification for contention that the air dustiness prevails.

(g) Diseases other than pneumoconiosis fully may account for abnormal state in the lungs, or other chest contents: At least ten other diseases may so stimulate pneumoconiosis as to permit confusion and error. Among others are fungus diseases, tuberculosis, especially disseminated tuberculosis, cancer, syphilis, pleurisy with calcifications, certain types of unresolved pneumonia. In addition, claims are known to have arisen alleging pneumoconiosis when in fact the pathology centered about such unrelated conditions as aneurysm, mediastinal tumor, anaphylactic asthma, valvular heart disease, etc.

(h) Silica is not a poison: In some states claims at law must be based upon acts applicable only to poisonous substances. What constitutes a poison is a matter of definition. At the present time, the best thought as to the action of silica within the lungs is unfavorable to acceptance of it as a poison. Primarily, silica action is physical rather than chemical.

(i) Pneumoconiosis does not constitute an accidental injury: In some instances it has been contended that dusty lung states are accidental injuries. Such specious arguments ordinarily are put forth in effort to obtain compensation in political states where no provisions are made for occupational diseases. To the contrary, every valid concept prompts a recognition of the pneumoconiosis and occupational diseases.

These several defense items are of course not set out as having any element of the panacea. However, on occasion some one or more may play a helpful part in defeating some of the cases now pending, richly deserving defeat.

THURSDAY MORNING SESSION

October 5, 1933

At this session the trophies of the National Safety Council awarded to winners in the Metals Section Annual Safety Contest were scheduled for presentation. General Chairman Schmitt first called attention to the outstanding points of the contest as follows:

A total of 208 units participated in the contest, which ran from July 1, 1932, to June 30, 1933. During the twelve-month period approximately 118,000 employees worked 222,997,701 man-hours for an average of 1,890 hours per person. The average frequency rate during the contest was 9.534. This represents a 4 per cent increase over the 1932 rate of 9.194; but a 14 per cent decrease over the 1931 rate of 11.117.

The formal presentation of the handsome awards to first place winners, consisting of bronze plaques, was then made in the name of the National Safety Council by C. B. Scott, president, Bureau of Safety, Chicago, and past president of the National Safety Council. Trophies were presented to the following companies:

Steel Mills Division Group A—The Corrigan, McKinney Steel Co., Cleveland, Ohio.
Steel Mills Division Groups B and C—Republic Steel Corp., South Chicago Plant, South Chicago, Ill.

Rolling, Finishing and Fabricating Division Group A—Pittsburgh Steel Products Co., Alleport Plant, Alleport, Pa.

Iron Foundries Division Groups A and B—Mackintosh-Hemphill Co., Garrison Plant, Pittsburgh, Pa.

Steel Foundries Division Groups A and B—Haynes Stellite Co., Kokomo, Ind.

Heavy Machine Shops Division Groups A and B—C. Hager & Sons Hinge Manufacturing Co., St. Louis, Mo.

"Safety Kinks" and "Your Hour"

The remainder of the session was devoted to two highly interesting features. The first was a presentation, by John A. Oartel, chief of Safety Bureau, Carnegie Steel Company, Pittsburgh, Pa., of his annual collection of "Safety Kinks—Illustrating the Handling of Materials by Hand." The feature consisted of a long series of lantern slides and was accompanied by a running fire of comment by Mr. Oartel in his characteristic manner. Unfortunately, it is impractical to reproduce these lantern slides in the Transactions and without the pictures no description of the devices would be intelligible.

The second feature was the annual event entitled "Your Hour" led by T. H. McKenney, supervisor of Labor and Safety, Illinois Steel Company, South Chicago, Ill. This feature, enlivened in characteristic manner by Mr. McKenney, was participated in by a large number of the section delegates. Since the remarks were all extemporaneous, and no record of them is available, they cannot be reproduced or summarized in the Transactions.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL

Mining Section

Officers 1932-33

General Chairman—THOMAS F. LIGHTFOOT, Koppers Co., Pittsburgh.

Vice-Chairman—FRANK B. DUNBAR, Mather & Co., Mather, Pa.

Vice-Chairman in Charge of Engineering—P. M. ARTHUR, American Zinc Company of Tennessee, Mascot, Tenn.

Vice-Chairman—J. W. ALT, Calumet & Hecla Consolidated Copper Co., Calumet, Mich.

Vice-Chairman—WILLIAM G. MEYER, Hudson Coal Co., Scranton, Pa.

Secretary and News Letter Editor—DANIEL HARRINGTON, United States Bureau of Mines, Washington, D. C.

Chairman Statistics Committee—W. W. ADAMS, United States Bureau of Mines, Washington, D. C.

Chairman Entertainment Committee—J. T. RYAN, Mine Safety Appliances Co., Pittsburgh.

Publicity Committee—M. R. BUDN, Explosive Engineer, Wilmington, Del.

R. DAWSON HALL, Coal Age, New York City.

Chairman Poster & Slide Committee—J. J. FORKES, United States Bureau of Mines, Pittsburgh.

Chairman Program Committee—LEE LONG, Clinchfield Coal Corp., Dante, Va.

Members at Large—

W. H. COMINS, National Lead Co., St. Francois, Mo.

M. F. FARLIE, The Mining Corporation of Canada, Toronto, Ont., Canada.

C. W. GIBBS, Harwick Coal & Coke Co., Pittsburgh.

H. C. HENRIK, Phelps Dodge Corp., Bisbee, Ariz.

R. N. HOELER, Pennsylvania Compensation Rating & Inspection Bureau, Harrisburg, Pa.

GEORGE MARTINSON, Pickands, Mather & Co., Hibbing, Minn.

D. D. MOWATT, Utah Copper Co., Salt Lake City.

HOWARD I. YOUNG, American Zinc, Lead & Smelting Co., St. Louis.

TUESDAY MORNING SESSION

October 3, 1933

The first session of the Mining Section convened with Frank J. Lanahan, Fort Pitt Malleable Iron Company, in the chair, who welcomed the delegates in the name of the Executive Committee of the National Safety Council. He then introduced

General Chairman Thomas E. Lightfoot, Koppers Coal Company, Pittsburgh, Pa., who presided. Chairman Lightfoot then introduced the first speaker.

Orig. paper - NS 17 - Mining
Report of the Secretary
 By DANIEL HARRINGTON

United States Bureau of Mines, Washington, D. C.

The speaker said in part: For the first eight months of the present year the mines of the United States have had the longest consecutive freedom from major explosion disasters in the past 50 or more years. Seven persons were killed and one injured in an explosion in a bituminous coal mine in Pennsylvania on the morning of September 11, 1933, this being the first major explosion in any mine, coal or metal, in the United States since December 23, 1932. There is no record of any continuing period of immunity from major disasters in our mines even approximately this in length.

The first eight months of 1933 show a lower fatality rate in the coal mines of the United States than for the same period of 1932 or for the full year 1932. But 627 persons were killed in the coal mines of the country to September 1, 1933, in the production of slightly less than 240,000,000 tons of coal, the fatality per million tons being only 2.62; for the first eight months of 1932, there were 684 killed in the production of about 216,000,000 tons of coal, with a fatality rate of 3.17 per million tons produced. It is noticeable that there were fifty-seven fewer deaths in the first eight months of 1933 than in the first eight months of 1932 and there was an increase of about 24,000,000 tons in the 1933 period.

Tentative figures available as to coal mine fatalities in 1932, placed the total at 1,166 against 1,463 in 1931. West Virginia had the largest number of fatalities, 263, a decided improvement over the 351 for 1931. Pennsylvania anthracite came second with 245 fatalities, also a much better showing than the 383 of the previous year. Pennsylvania bituminous was third with 158 or considerably fewer than the 210 in 1931. Fourth place went to Illinois with 114, an increase over the 92 of 1931, and fifth place to Kentucky with 101, a slight decrease from the 110 of the previous year.

The health and safety of the approximately 1,000,000 persons in the United States engaged in the mining and quarrying industries unquestionably are improving during recent years in spite of the numerous unsatisfactory conditions now confronting those industries.

Orig. paper 466500 **Safety**

By CHARLES E. BOCKUS

President, Clinchfield Coal Corp., and President, National Coal Assn.,
 New York City

The speaker said in part: At a time when the selling price of a product is less than cost, when red figures show up month after month, and that has been the unfortunate history of a great majority of the coal producers for the past three years, it is not hard to curtail the amounts paid for safety work. I say it with real pride, however, that in many of the companies this temptation has been resisted. Nor should we forget that in periods like the recent past when mines are operated only one or two days in the week, the most careful inspection is of the highest importance, both as regards top conditions and ventilation. Increase in mechanization has helped reduce

certain classes of accidents. The working of men in groups under direct supervision is undoubtedly the reason for this. On the other side of the picture, you will find experienced miners who state that the amount of noise from conveyors or loaders is a handicap. Mechanization should be coupled with intensive inspection of the top at all times.

How much do coal mine accidents cost?

First, the actual cost to the operating company in payments made under Employers' Liability or Compensation Laws or in damage to property. That item is put first, not because it is either the largest or the most important, but merely because it is the easiest to measure with the yardstick of business—dollars and cents.

Second, the loss of wages directly due to the enforced idleness of those who have been injured. That can be determined with relative accuracy by those employees who keep careful records and follow up their accident cases to the end. But even in those circumstances there has to be some estimating, for a man, after a severe injury, may have to return to employment in some position not compensated for so well as was the place he held before. This, measured in "cash loss" is the largest item of the four.

Third, the loss, and it is a serious one, that comes from the shattering of the morale of any organization where there are frequent injuries to the workers, and the effect is particularly marked after a fatality.

Fourth, the loss of effectiveness of any worker who has suffered a serious accident. A man who has passed his youth may be discharged from the hospital as recovered completely from damage done; but it is only in exceptional cases that he can ever be really restored to the physical and mental condition he enjoyed before his injury. I know of no way the losses under the last two headings can be even approximated, but they are actual and material.

Last year accidents cost our company directly more than did the salaries of all our mine foremen and their assistants; more than the total expense under either of the items, hoisting and loading, or ventilation and drainage. Please do not misunderstand me; by cost I mean what was paid out in 1932 irrespective of the year in which the accident occurred. But our cost of accidents that happened in 1932 was of itself more than the charges for ventilation and drainage. What it cost our employees under my divisions, two, three, and four, is a question. I am sure of this: Under all the headings I have mentioned, the burden was far more than double the direct expense to the employer.

Greetings from South Africa

By J. W. STRAW

Safety Inspector, Roan Antelope Copper Mines, Ltd., Luanshya, Northern
 Rhodesia, Africa

Mr. Straw made a short extemporaneous talk without manuscript, and unfortunately no adequate record of his remarks is available. In many respects his talk was a personal one. He commended the work of the National Safety Council and emphasized the profit which his company has received from material and service rendered by that organization. Suggestions by the Council have been widely used in the organization of accident prevention campaigns on the properties of the Roan Antelope Copper Mines, and have been very instrumental in keeping down the accident toll.

Mr. Straw stated that during the past year accidents have been decreased on his properties by 66 per cent.

orig paper
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Physical Examinations Re: Accident Prevention

By WILLIAM C. MAYS, M.D.

Plant Physician, Elkhorn Piney Coal Mining Co., Stanaford, W. Va.

The speaker said in part: I am of the opinion that if each individual working in and around the mines were classified according to a standard classification, this based upon a physical examination, and pronounced physically fit for his duties, that your accident record would be surprisingly decreased. Your compensation costs would hit a new low level, and the few accidents you would have would not carry such a high percentage of disability, time for recovery would not be as long, hardships would be reduced, happiness restored, and more able men would be sent back to their duties in the mine.

The "I don't-care attitude" of many an underground worker is largely brought about, in my opinion, by illness and disease that is slowly but surely sapping his vitality, and has a tendency to render him less safety-minded than if he were enjoying good health. He is not so apt to obey the rules and regulations that guide him in his daily duties, is more apt to indulge in unsafe methods that will eventually place him on a hospital cot, and his name on the list of the injured and disabled. He cannot be a safe and efficient worker if his vitality is low, his body harboring disease, his capacity for quick thinking dulled or deadened, his locomotion impaired by deformity, and his muscular tissues incoordinating.

A few words about the kind of examination given and just how it is conducted. First, all the information obtainable is recorded on an employment card, not only about the man himself, but his family history as well, diseases he has had, operations if any, acute illnesses, diseases of childhood, all accidents suffered, amount of compensation paid on each, the amount of time required to get back to work, name and age of dependents, a description of the man, all amputations carefully charted, scars noted, weight and height recorded, place and time of birth, and where last employed and in what capacity. He is then taken to the examination room where all clothing is removed, body carefully inspected with particular reference to deformities, skin eruptions, glandular enlargement, hernias, condition of joints, and scars from previous injuries.

Following this inspection, the main examination is begun, and the entire body very carefully and thoroughly gone over, with particular reference to the condition of the heart, lungs, thyroid, teeth, gums, eyes, and ears, condition of the spine, its flexibility, and the free movement of all movable joints, feet for flatfootedness and hammer toes. After this the blood pressure is taken and a specimen of blood for blood test, and the urine for urinalysis. The man is either passed for duty or rejected. If passed, he is classified, and assigned to the particular kind of work his physical condition is best suited for, and where he is able to perform his duties with greater safety to himself and with less danger to others.

For convenience in classification, the first four letters of the alphabet are used: A, B, C, D, and only A and B men are allowed to work inside the mine in any capacity; Class C and D men perform the duties of outside men only, the D class to take the less dangerous of these duties.

Not many weeks ago I asked a certain physician who annually examined many men and who is affiliated with a large company who are large producers of coal in the field, and also where the accident rate is very high, if he thought a thorough physical examination was a factor in the prevention of accidents and injuries in and around mines. His reply was "No." By questioning him further about his examinations, I found that he rejected only men who were suffering from serious heart lesions, and advanced tuberculosis, with no classification or shifting of occupations at all. It was on his job that an epileptic was found employed in the capacity of a motorman; also a man 58 years old with hardening of the arteries and a blood pressure quite high who was employed as a loader and extra brakeman; and many others in equally as serious a condition of health. I did not wonder, therefore, at his accident rate being high. Why this company required a physical examination of employees at all I am unable to understand. All examinations of this kind are of no value whatever, only a waste of time and do more harm than good, as the examination serves only to build up a false impression in the man, that he thinks he is enjoying a perfect state of health or else he could not pass the examination.

Permit me to review briefly the injury record of a mine employing on an average 600 men and producing daily about 2,800 tons for a ten-year period, or from 1918 to 1927, inclusive, when no physical examination of men was required. Note the following: 1918, 128 accidents with five fatalities; 1919, 142 accidents with four fatalities; 1920, 110 accidents with four fatalities; 1921, 126 accidents with six fatalities; 1922, 135 accidents with four fatalities; 1923, 101 accidents with five fatalities; 1924, 107 accidents with three fatalities; 1925, 116 accidents with five fatalities; 1926, 127 accidents with six fatalities; 1927, 132 accidents with four fatalities.

Thirty-one of the forty-six fatalities in this ten-year period were found to have imperfections and disease of sufficient degree to severely handicap them in their duties underground. A physical examination would have eliminated them and a classification would have shifted their duties to a place where danger of injury was negligible.

At the end of this ten-year period, in 1927, it was decided by the officials to require each new employee to undergo a rigid physical examination before he was employed, and at the same time the classification and examination of old men (men who were working) was also begun and their duties shifted as they could be brought in for examination. This examination was not compulsory on the part of the old men, and it took some time to get all to the examining room, but all were finally gone over in the course of a few months. This mine at that time was still producing about the same tonnage, 2,800 tons daily, and the number of men working was nearly the same, but the lost-time accident was not considered on a basis of seven days, as formerly; if the injured man lost one day it was charged as a lost-time accident. This, of course, had a tendency to run the record up somewhat; but now please compare the five years following the beginning of examination and classification of these employees with the previous ten-year record: 1928, 45 accidents and one fatality; 1929, 39 accidents and one fatality; 1930, 44 accidents and two fatalities; 1931, 49 accidents and two fatalities; 1932, 35 accidents and one fatality.

Not a single permanent disability was charged in the period after examination was begun and the highest award given was a 40 per cent disability. Not a leg or a hand was lost, only one eye, a few fingers (four in all were amputated), and 80 per cent of the injured were back at their usual occupations in less than 60 days, 10 per cent in three months, and 10 per cent in less than one year.

How Can Interest in Accident Prevention Be Best Maintained?

By LT.-COL. HENRY A. RENINGER

Special Representative, Lehigh Portland Cement Company, Allentown, Pa.

The speaker said in part: While each section and each industry has its own peculiar problems, the matter of sowing the seeds of safety in the various departments of a company and maintaining that interest not only with the executives and department heads but with superintendents and foremen, is very much the same.

Let me call your attention to the Safe Practices Pamphlets published by the National Safety Council. These pamphlets are a compilation of experience in accident prevention gathered from all types of industry and over a period of twenty years. They are not federal, state or insurance requirements or national codes, but they are common practices and experiences of all types of industries, and, if followed out, will do more to help the safety engineer, the superintendents and foremen, in their accident prevention work, than anything I know of. I also want to refer you particularly to pamphlet No. 67, entitled "Maintaining Interest in Safety," which is a complete discussion of my subject and covers it far more thoroughly than I can do here.

Most of our big industries have awakened to the fact that today they must have their presidents and vice-presidents understand that they cannot afford to operate without a safety program. But it is not enough to have them merely interested—they must issue a blanket order to all departments and all operations that safety is a part of the company's program and must be carried out by all employees in the company; and that it is just as important to prevent accidents as it is to produce the company's products.

It is important that the comptroller of a company be interested in safety from the financial standpoint, and he should be furnished with the reports showing the cost of accidents, cost of compensation, insurance, etc. These reports should also be given to the treasurer, and when you can show them reports of several years of experience where your insurance premium is coming down and your cost of compensation is lower, then they will not hesitate to approve any bills that may come in for safety work.

Naturally, your engineering department should be vitally interested in safety, and to maintain their interest it should be the duty of the safety engineer to furnish them with reports and charts showing accidents, days lost, man-hours, and days lost per 100,000 man-hours. Anything new in safe practices pamphlets, any new state codes affecting construction, fire prevention, good housekeeping or anything that comes under their jurisdiction, should be brought to their attention.

To maintain the interest of the higher executives, I wish it were possible to get the president or vice-president, general manager, superintendents and any other high officers to attend this Safety Congress each year. If they would spend three or four days at a gathering like this I am sure their eyes would be opened and they would get a picture of accident prevention activities and their importance that could be given to them in no other way.

Safety committee meetings sometimes become dry and uninteresting. Many safety committees are organized merely for the purpose of taking care of plant inspections relative to safeguards. We believe that a safety committee should be the one func-

tioning body or organization in a plant to handle any and all problems whether they relate to plant hazards, machinery, or construction; and we also believe that it is their duty to look after fire prevention and fire protection. Sanitation and health hygiene should also be a part of their work. Where you give your safety committees some real authority and some real definite work to do you can maintain their interest.

Safety contests properly run will maintain the interest of the organization. An outstanding example of this is the Portland Cement Association yearly contest for the trophy awarded by the Cement Association to those mills who go through the year without a lost-time accident. This contest has been running since 1923 and there is just as much interest and enthusiasm today in the cement industry as there was in the very beginning. If a safety contest is conducted for one month during the year, this will interest and inspire the men for a time, but we cannot expect a campaign of a month to give the men sufficient enthusiasm to carry through the balance of the year.

We find that the material furnished by the National Safety Council is needed to keep the interest of the men, the foremen and the superintendents. All of our plants receive copies of the *National Safety News* each month, also each plant has a complete set of the safe practices pamphlets, the foremen and members of the safety committees get a copy of *The Safe Worker* as issued each month, and every truck driver of the organization receives a monthly copy of *The Safe Driver*, and all the plants are supplied with the poster bulletin service of the National Safety Council. In addition to these, of course, various local poster bulletins are made up and used.

Another important item of service by the Council is the safety calendar, and I urge all organizations to make use of this in a large way. I make it my business to go into many of the homes of workers at our plants, to see how they are kept with regard to sanitation, fire prevention, etc. I cannot recall any one of these homes that did not have a copy of the safety calendar on its wall. During this depression we considered doing away with the safety calendar, but before we took that step we consulted with our safety committees in our various plants. Such a howl was set up by the safety committees that we felt we could not afford to stop the safety calendar. Any accident that happens in the family of an employee has an indirect effect on our company. We believe that the safety calendar keeps safety in the minds of the mother and children and if we can avoid one accident in the saving of one life in the family of any of our employees, we have saved many times the cost of a calendar.

WEDNESDAY MORNING SESSION

October 4, 1933

The session was opened by the reading of several brief reports presented by chairmen of standing committees. The chairman then called for the presentation of the Nominating Committee's Report, which was given by W. H. Comins, National Lead Company, St. Francois, Mo., and officers for the ensuing year were elected as follows:

General Chairman—P. M. Arthur, American Zinc Co. of Tenn., Mascot, Tenn.

Vice-Chairman in Charge of Membership Coal Mines—F. B. Dunbar, Pickands, Mather & Co., Mather, Pa.

Vice-Chairman in Charge of Membership Metal Mines—J. W. Alt, Calumet & Hecla Consolidated Copper Co., Calumet, Mich.

Vice-Chairman in Charge of Engineering—W. G. Metzger, Hudson Coal Co., Scranton, Pa.

Secretary and News Letter Editor—Daniel Harrington, U. S. Bureau of Mines, Washington, D. C.

Entertainment Committee Chairman—J. T. Ryan, Mine Safety Appliances Co., Pittsburgh, Pa.

Poster and Slide Committee Chairman—J. J. Forbes, U. S. Bureau of Mines, Pittsburgh, Pa.

Program Committee Chairman—R. N. Hosler, Coal Mine Section, Pennsylvania Compensation Rating & Inspection Bureau, Harrisburg, Pa.

Publicity Committee Chairman—M. R. Budd, Explosives Engineer, Wilmington, Del.

Statistics Committee Chairman—W. W. Adams, U. S. Bureau of Mines, Washington, D. C.

Members at Large—

W. H. Comins, National Lead Co., St. Francois, Mo.

M. F. Fairlie, The Mining Corp. of Canada, Ltd., Toronto, Canada.

C. W. Gibbs, Harwick Coal & Coke Co., Pittsburgh, Pa.

H. C. Henrie, Phelps Dodge Corp., Bisbee, Ariz.

T. E. Lightfoot, Koppers Coal Co., Pittsburgh, Pa.

Lee Long, Clinchfield Coal Corp., Dante, Va.

George Martinson, Pickands, Mather & Co., Hibbing, Minn.

D. D. Moffatt, Utah Copper Co., Salt Lake City, Utah.

M. W. Price, Jeddo Highland Coal Co., Jeddo, Pa.

L. T. Sicka, St. Joseph Lead Co., Boone Terre, Mo.

Howard I. Young, American Zinc, Lead & Smelting Co., St. Louis, Mo.

By paper
Following Through With Safety

By THEODORE MARVIN

Editor, The Explosives Engineer, Wilmington, Delaware

The speaker said in part: The explosives industry is thoroughly cognizant of the importance of having its products correctly and safely employed, and it expends time and money to develop products capable of utmost efficiency in application, but which also can be handled and used safely. Ordinarily, one considers explosives as one of the greatest potential hazards in mining, quarrying, and construction. Yet, because of the attitude of the explosives industry, that it must do its part to see that explosives are correctly and safely used, the following achievements have been made:

1. In the last six years, two and one-half billion pounds of commercial explosives have been transported on railroads of the United States and Canada, with no loss of life, with no accidents resulting from the explosives, and with total property loss of less than \$100.

2. In 1930 the fatality rate per million man-hours underground for explosives in this country's bituminous coal mines was .048 (or one death every 20,833,000 man-hours). The non-fatal injury rate was .733 (or one injury every 1,360,000 man-hours underground exposure).

3. In keeping with these records for consumers of explosives are the operating and safety achievements of explosives manufacturers themselves.

These achievements in controlling the dangers inherent in explosives did not "just

happen"; they were accomplished only by intensive attention to absolutely every detail involved in the design, making, storing, moving, and use of the different types of explosives and blasting supplies.

Following through with safety for the explosives industry involves many activities, some of which might advantageously be employed by other manufacturing groups. For instance, there is the Institute of Makers of Explosives. Many of its committees are continuously at work on safety subjects such as transportation, explosive containers, fumes, magazine construction, storage conditions, general safety education, and elimination of blasting cap accidents. Approved regulations for moving and using explosives are printed on cards and in booklets for distribution to users.

A number of explosives manufacturers individually publish data on safety in handling explosives. Their salesmen, service men, and technical experts are available at all times to advise customers with respect to selecting the most efficient explosives for a definite job and how to employ it with maximum safety.

I have said that the explosives industry recognizes its obligation to users of its products, and I believe consumers concur that a good job is being done to advance the cause of safety in their properties. But the full force of this effort cannot be utilized unless users of explosives wholeheartedly co-operate; therein is the only obligation of the buyer which explosives sellers ask. To obtain this co-operation many mines and quarries supply capable explosives engineers and safety engineers. Many of these men have been specially trained and are capable of supplying detailed rules for safe and efficient use of explosives in their company's work. In some organizations, instructions for the correct and safe handling of explosives comprise almost a full sized book. For the usual operator, however, single rules of the proper handling of explosives and blasting supplies—practices which would practically abolish explosives accidents if correctly followed—is available in printed form. I refer to the safety rules of the Institute of Makers of Explosives. By placing in effect suggestions applicable to each particular job, most properties can improve their blasting practices and their safety standing.

By paper
Discipline—Accident Prevention (Anthracite)

By CADWALLADER EVANS, JR.

General Manager, The Hudson Coal Company, Scranton, Pa.

The speaker said in part: The question of discipline naturally divides itself into two parts: (1) Discipline enforced upon officials; (2) Discipline enforced by officials upon the workmen.

The question of disciplining officials is a very important one, and at the same time very delicate. We have adopted no set standard, but endeavor to judge each particular case upon the facts developed. There is, however, an exception to this, of course, in such major offense as neglect of duty, intoxication, etc. In such cases discharge is mandatory. Except for the major offenses just mentioned, our disciplining of officials takes several forms: (1) Placing them on undesirable jobs, such as steady night shifts; (2) demotion; (3) discharge.

Discipline of this nature has been enforced on officials because they allowed unsafe working conditions to exist, or because they failed to properly teach their men to protect themselves, as a result workmen being injured. Discipline has also been imposed because of the failure of the official to find gas, which was afterward discovered

without much difficulty. I understand that some of our neighbors in the anthracite business also discipline officials by suspension for a couple of weeks (or for as much as a month) without pay, but we have only resorted to discipline of this sort in one case, and that was several years ago.

Always in the case of demotion, we endeavor to transfer the affected official to a different mine. This is not the general practice in the anthracite region, but we believe that it is wise, because it gives the demoted official a different atmosphere in which to work, and there is therefore less danger of breaking that individual's morale.

Let me insert here a few words about a change in our program put into effect a little over two years ago which has produced beneficial results. Formerly the only written reports of injuries were in those cases which resulted in death, or those resulting from explosions of gas. We determined to revamp our methods in an endeavor to stimulate a more active interest in injury prevention on the part of our subordinate officials. One of the practices which we adopted was to require each sectional foreman to make a written report, addressed to me, and forwarded through the mine foreman and superintendent, covering every injury resulting from a fall of roof or rib. The sectional foreman is required to write this report in his own hand and is asked to tell how the injury occurred; to review the injured man's past record and to make suggestions as to how similar occurrences could be prevented. These reports are handed by the sectional foreman to the mine foreman, who endorses his comments on them; then to the colliery superintendent, who endorses his comments; and then direct to me. We scrutinize these special reports very carefully and do not send them to the Safety Department for filing until we have satisfied ourselves that the individuals connected with the handling of the report have given us all of the facts, and have clearly stated the surrounding circumstances; and we endeavor to make sure that all concerned have learned a lesson which each injury carries.

In order to make sure that the lesson is thoroughly learned, it is our practice to send these reports back with inquiries asking for more and clearer information, or pointing out the individual responsibility of the officials through whose hands the report has passed. Many times such reports have been sent back to the colliery two or three times, and on each occasion the sectional foreman is required to personally answer the questions which are asked.

Our company has been administering discipline to its miners, miners' laborers, and its company men over a long period of time. This discipline has been administered not only for major offenses, such as theft, intoxication, neglect of duty, etc., but also for losing time, loading dirty coal, failure to follow instructions, etc. Some years ago we adopted a standard discipline for various offenses beginning with a reprimand, going next to suspension for various lengths of time, and finally discharge; and our records show that this "standard discipline" has been adhered to fairly closely, but it had not, however, had much effect upon our injury records which continued to be bad.

Under our standard each employee is given a hearing before his mine foreman or superintendent, or both, before he is suspended or discharged; and only the superintendents have the authority to discharge. Until 1930 our sectional foremen did not have authority to suspend their workmen, but merely had authority to send an offender to the mine foreman, who decided upon the discipline and administered it. We came to the conclusion that this plan tended to weaken the authority of the sec-

tional foreman so a few years ago we changed our program and we now authorize the sectional foreman to administer instant discipline; that is, he has the authority to suspend any of his workmen for any offense for which he thinks suspension is justified.

Automatically, when a man is suspended he is told to report to the mine foreman either that afternoon or the next morning. The mine foreman and sectional foreman have an opportunity to discuss the case before the individual reports for his hearing, so that the sectional foreman can fully acquaint the mine foreman with the reasons which caused him to enforce instant discipline. This gives the mine foreman an opportunity to enlarge the discipline if he thinks the case justifies it; and has, we believe, tended to strengthen the authority of the sectional foreman and to improve the attention to which individuals pay to the question of safety. We regard this authority as an obligation on the part of the sectional foreman and we believe that if we can just get him to regard it as an obligation we have definitely increased the chances of safe operation in his section.

We believe that our sectional foremen should be teachers as well as disciplinarians, and we carefully instruct our mine foremen that they shall not increase the discipline which the individual sectional foreman has enforced it, in their opinion, the sectional foreman has in any way failed to teach the man how to take care of himself, but shall instead place part of the blame upon the official himself. We believe that improved results have followed from this change in our practice, and that our men in general follow out the instructions which the sectional foremen give them more carefully than they did under prior conditions.

It is obvious that any improvement in average performance at a colliery can only be accomplished by the improvement of the individuals who go to make up the average; and believing this, we have for several years maintained at each one of our mines in a separate folder a personal record of each employee. This record is started as soon as he is registered, by filing his registration card, and it is built up from time to time by including in the file a written record of every offense that the man commits, together with the resultant discipline. In it also, we keep a record of the injuries which each man sustains. Having such a file our colliery officials are in position to talk turkey to any man after he returns to work following an injury, or on account of having been disciplined, because they have assembled in one folder all of the facts concerning the man's record. This method has resulted in pointing out clearly those men who are reckless or careless.

After a man is able to return to work following an injury, he is required to go to the mine foreman for a personal interview. The mine foreman then has available the man's complete record; talks to him about the causes of the injury from which he is recovering, and endeavors to impress upon him the necessity for working more carefully in the future. In many cases, men who have been injured due to their own carelessness, have been suspended, such suspension taking effect after they are returned to the work by the doctor.

A large proportion of our coal is loaded mechanically and we have, therefore, many machine operations in which there are employed from three to ten laborers; and in some of our mechanical operations there are as many as 25 to 30 men at work. In the past we have enforced discipline in such cases only on the individual who is found to be disobeying instructions, or to be working under unsafe conditions, and inasmuch as this seldom included the leader in the place we found that we were making little or no improvement. As a consequence of this we are now holding the leader in the place responsible for the offenses of his subordinates, and at times we

suspend the entire crew for the failure of one of them. We believe that this is having a beneficial effect upon improving the attention which all of the men pay to safe practices.

Each month each one of our colliery superintendents forwards to our central office on a special form a recapitulation of the discipline administered during the preceding month, with a brief history of each case. Each colliery superintendent also keeps a comparative record of the performance of each sectional foreman, showing the injuries which have occurred in that sectional foreman's territory and the discipline to which he has subjected his men. Those injuries are divided into several classes, such as roof falls, gas, transportation, explosives, etc., and with such a record the superintendent is obviously able to show his sectional foreman when certain safety hazards or unsafe practices are escaping the sectional foreman's attention. We use similar statistics in following up sectional foremen who have "bad" injury records, for we consider that our sectional foremen are responsible for preventing their workmen from taking unnecessary chances, and we know that they can do this by proper teaching, and by the application of discipline when teaching is disregarded.

This is the lesson that we are endeavoring to get across to our subordinate officials, and we expect them in turn to pass it on to every man for whom they are responsible.

Safety and Health in the Metal Mining Industry

By A. H. FINDEISEN

Mining Engineer, Industrial Commission of Wisconsin, Madison, Wisconsin

The speaker said in part: The basis of modern production with respect to both machines and men is standardization. While it is important that processes in machine operations be standardized, it is just as important that consideration be given to the operations of men from a viewpoint of safety and health, both of which are essential to maximum efficiency.

There are two principal factors to be considered in the prevention of metal mine accidents. (1) The mine management must be convinced that most accidents are preventable and must be determined to institute a thoroughgoing program to keep the accident rate as low as possible. (2) Safety must be considered a major operating problem. The executives must therefore be charged with the responsibility of setting up a program and arrange and revise the details of operation or practices to improve safety conditions. The management also has a direct responsibility to see that only safe methods of mining are chosen and that due consideration is given the safety of all operations, including the laying out of new work and installation of new equipment. Certain mining methods used in some mines are more hazardous than those used elsewhere, and greater precautions must be chosen to prevent accidents. Unsafe methods or dangerous practices cannot be made safe by merely employing a safety engineer. Safety and operation problems cannot be separated, and must be planned and educated by the entire mine organization which includes the following: (1) Safety Department, (2) Executive Staff, (3) Engineering Department.

Various forms of safety organization are employed at different times, apparently with equally satisfactory results, and even though the same form of organization may be used at different mines, vastly different results are obtained. The success of accident prevention measures apparently depends largely upon the attitude of the management and the personnel of the organization, rather than upon the form of the organization. Any form of organization, if functioning properly, is bound to produce

satisfactory results, whether it be an elaborate one in connection with the large mines or a simple organization in a small mine.

Accident prevention can best be assisted by each company preserving complete records of accidents classified according to cause and rates per thousand or ten thousand shifts. A systematic method of recording accidents and the employment of graphs and charts will be helpful to the safety department in analyzing the causes of accidents. Brief monthly reports should be issued analyzing the accidents for each department. They are necessary for discussions by committees and provide good material for posting on bulletin boards.

Discipline and sufficient supervision are important agencies in the prevention of accidents. Discipline means training and education. No mine can operate successfully unless the management has received proper training. No safety program can be carried out successfully unless all officials are properly trained and are in favor of carrying out all safety standards. It is folly to employ a safety engineer and mine inspector or to purchase safety bulletins if it is done because the insurance company or state authorities insist on it, or because rebates are held out as inducements.

Statistics show that at least 20 per cent of all accidents are the result of lack of supervision and proper instructions on the part of the foreman. If a foreman is not willing to accept this responsibility, requiring as it does sufficient education to properly instruct the employees, then he does not meet the requirements of his position.

Education and enforcement of operating rules pertaining to the safety of employees are important agencies for overcoming accidents caused by carelessness. If practical working rules are issued, the wearing of protective clothing encouraged, and safety devices installed wherever necessary, the management has placed itself on record as being wholeheartedly in favor of safety. There will be little, if any, reduction in accidents, however, unless strict observance of safety practices is demanded and enforced through strict and competent supervision.

A brief outline of safety methods pursued by one successful company in the Lake Superior district, as described in one of the circulars issued by the United States Bureau of Mines, is as follows:

1. Maintenance of bulletin boards and service in prominent places in and about the mines.
2. 100 per cent training in first aid and a liberal percentage of trained apparatus men.
3. Safety education for children in the public schools of the district.
4. Education in foremanhood.
5. Educational campaign on safety rules of company to individual workers when visited by bosses and safety inspectors.
6. Instruction of operating rules by new employees.
7. Investigation of near accidents or accidents not involving injuries.
8. Safety committees.

Probably most mining companies employ capable men as bosses, but their effectiveness as safety men is reduced to a considerable degree if the territory under their jurisdiction is too extensive or too many men are placed under their charge.

Probably one of the most important functions in a mine is the prevention of failures to equipment and the detection of worn or defective appliances which may cause accidents as well as loss of production. The system employed by one large iron mining company, as reported by the Bureau of Mines, includes a periodical safety inspection of each mine made by a committee of three, including a safety engineer, a

superintendent, and the head mechanic from a mine in a different district, and this may be semi-annual. Inspections are made of the conditions of wire rope. Where conditions are continually changing, such as on equipment which is used for transporting men into and from the mines, inspections are made every day. Other inspections are made weekly and monthly. A form of report is provided for inspection tests on mechanical equipment, such as jolting ropes and so on. The results of other inspections are reported in writing. Accidents or near-accidents are all investigated and reports made. Accident investigating committees are composed of the mine captain, safety engineer and electrician or other mechanics selected according to the danger of the accident. Fire inspections of the complete mine are made after each shift, and inspectors carry a one quart carbon tetrachloride extinguisher. A mine inspector is employed to make daily inspections of all working places and installation.

Good order and good housekeeping are now generally recognized as essential to safety as well as safeguarding and other features and if the safety movement is to reach its highest point of efficiency, the workers must be taught the importance of good order. Housekeeping in and about a mine has a psychological effect on the workmen as well as preventing a source of tripping or stumbling, fire hazards and defective or misplaced tools.

Clean and unobstructed areas about shaft collars and stations are maintained to guard against accidents and fire. Good order prevails among men entering or leaving cages. Riding with tools or material on cages is a forbidden practice; riding on cars unless especially provided for the purpose is forbidden. Refuse zones are provided at hundred foot intervals in haulageways and marked with colored lights. Block signal systems are provided along haulageways to prevent collisions. Cleanliness involves almost every activity in a mine from the cage house to the working place. Cleanliness and good housing are only one more argument for the necessity of operating rules.

Physical examinations are necessary in order to prevent the spread of disease; to place men in positions suitable to their physical conditions; and of importance, the detection of industrial diseases and elimination of causes. Industrial diseases are now being considered by legislatures for enactment as amendments to the compensation laws. Wisconsin has already provided for benefits to victims of industrial diseases.

THURSDAY MORNING SESSION

October 5, 1933

Wm. J. Baker
Bob McNeill

Bonus Payments or Rewards for Safety Records

By EUGENE McAULIFFE

President, The Union Pacific Coal Company, Omaha, Nebr.

The speaker said in part: On the property of the Union Pacific Coal Company a continuous effort was made for years toward accident reduction without much apparent result. A very substantial increase in safety work expenditures was made, commencing with the year 1923, the cost per ton for labor and material employed in safety work during the ten year period, 1923 to 1932, ranging from 22 cents to 5.5 cents per ton. In addition to the measures taken to prevent explosions, large sums were spent in establishing haulage clearance, in making safe the underground and

surface electrical insulations and the haulage tracks, etc.; and numerous attempts were made to inspire a safety spirit, a competent safety engineer employed, with local and general safety meetings, prizes consisting of books, flags, framed paintings, house silverware, watches, etc., awarded the individual and district producing the best results, but withal, little definite improvement was being made.

Early in 1931, a somewhat enlarged system of awards was decided upon and the men were promised two automobiles as prizes for the best performance shown during the last half of 1931. The mines were then separated into safety districts, a foreman placed in charge of safety work in each district, and an accurate record of lost-time accidents and man shifts by districts was established. Cash prizes were promised to foremen of the districts winning the automobiles and all men passing through the six months period without a lost-time accident were given an equal chance to secure the automobiles. When the time for making the award arrived, some 1,500 men and their families met in the Oldtimers Building at Rock Springs, and after brief complimentary talks, with an appropriate short musical program, the work of selecting the winners was undertaken.

With the plan well established in 1931, it was repeated in 1932, the competition, however, being carried through the year instead of for six months, as previously outlined, even greater enthusiasm shown on the occasion of the second award. Briefly, the safety results may be outlined as follows: Year 1930, 8 fatal accidents and 276 non-fatal accidents; year 1931, 6 fatal accidents and 157 non-fatal accidents; year 1932, 1 fatal accident and 60 non-fatal accidents. There was, of course, a small decrease in the number of tons mined each year but this had little effect on the record. The number of man shifts worked per lost time accident in the first half of 1933 increased approximately 52 per cent over the first half of 1932, evidencing the fact that the good work is still continuing, but with room for further improvement.

The automobiles, representing a substantial and usually coveted prize, plus the separation of the men into small groups, made it possible to establish not only a better sense of personal responsibility, but a definite sense of rivalry, every employee attempting to police not only himself but his neighbor, the unlucky individual receiving a minor accident sometimes being given but a limited measure of sympathy. The added morale established made it possible to induce 100 per cent of the employees to take the U. S. Bureau of Mines' First Aid examination, and a marked disposition to attend the weekly and monthly safety meetings was evidenced.

Wm. J. Baker - W895 Safety and Compensation By W. H. NICKELS, JR.

Chairman, Industrial Commission of Virginia, Richmond, Va.

The speaker said in part: The ultimate cost of safety reflects itself pecuniarily in medical and compensation payments in the compensable cases, and in medical costs and depreciation of working morale in the non-compensable cases. Any worth while safety program is predicated upon equal consideration of both classifications. Also, the serious and non-serious accidents receive parallel consideration on the part of executives charged with responsibility of safeguarding the cost of operation and the welfare of those employees engaged in the business, trade or occupation.

The manifest general purpose of workmen's compensation acts is to compensate the injured employee for loss of time by accidents or to remunerate his dependents

for the loss of his services in fatal cases, the object being to place the pecuniary responsibility upon the industry wherein the accident causing the injury or fatality arose. It is universally conceived, at this time, in the light of the progress made in accident prevention work, that the incentive to safeguard accidents, as a means of minimizing pecuniary loss, is subordinate to the underlying human interest in conserving life and limb. A combination of the two reasons fulfills the legislative intent underlying all acts toward reducing, for the common good, both the frequency and severity of accidents to a minimum degree. Also, the financial welfare of the employer and social organization benefits to a degree commensurate with the effectual accomplishments of safety first.

In a resumé of the objects to be attained by workmen's compensation, they may be summarized as follows:

1. To furnish certain prompt and reasonable compensation, limited in amounts and time, to the injured employee, which should consist of—
 - (a) Medical and surgical treatment and adequate hospital service immediately after injury, and for a limited time thereafter, to cure and relieve from the effects of such injury and to restore the sufferer to the ranks of producing labor.
 - (b) Such limited compensation or financial aid to the injured workman, based upon his wage income, as will maintain him and his dependents above want until he recovers from his injury or can develop a self sustaining capacity.
 - (c) In the event the accident results in death, then such limited aid to those dependent upon him for support as will keep them above want until they can develop a self sustaining capacity.
2. To utilize for the benefit of injured employees and those dependent upon them the vast sum of money wasted under the old system of employers' liability.
3. To inculcate and cherish more friendly and co-operative relations between employers and employees.
4. To encourage the introduction, maintenance and use of preventive devices and preventive discipline so as to reduce the number of accidents to a minimum.

Accident Prevention on the Witwatersrand Gold Mines

By EDMUND STEINBERG

Secretary to The Prevention of Accidents Committee, Johannesburg, Transvaal, South Africa

The speaker said in part: We in South Africa follow closely and with keen interest the activities of the National Safety Council. The vast amount of data, literature, bulletins and other information relating to safety issued by your Council has in the past been of great assistance to us.

The Witwatersrand Gold Fields which represent the mines situated along a distance of some 80 miles east and west of Johannesburg, were first discovered in 1886. For years the Witwatersrand has been regarded as the leading gold producer in the world. About 48.5 per cent of the world's output of gold was last year produced on the Witwatersrand. There are thirty-four producing gold mines which employ some 23,000 Europeans and 225,000 natives. Of this labor force, some 11,000 Europeans and 185,000 natives proceed daily underground. The tonnage of rock hoisted during the year 1932 was approximately 41,000,000 of which about 34,500,000 tons were sent to the mills. The gold recovered amounted to approximately 11,000,000 fine ounces

valued at approximately 46,500,000 pounds sterling, which translated into gold dollars, is equivalent to some \$220,000,000.

As you can imagine, with a native labor force of some 225,000 who are in most cases raw and uneducated aborigines, accidents are inevitable. The success so far attained by the Prevention of Accidents Committee in its untiring efforts to keep down accidents has been truly remarkable.

The Witwatersrand mining industry may be regarded as one of the world's pioneers of the safety movement, which originated in Johannesburg in 1913, and was stimulated by the result of investigations into the indiscriminate and apparently reckless contraventions of the mining regulations. The Prevention of Accidents Committee then consisted of four members. Its personnel now exceeds twenty-six and includes the Government Mining Engineer, Chief Inspector of Mines, Chief Inspector of Machinery, Director of Native Labor, heads of groups, consulting electrical and mechanical engineers, mine managers, medical men and representatives of every branch of the industry.

In 1913 the death rate due to accidents on the Witwatersrand gold mines was 3.11 per 1,000 employed for Europeans, and 3.89 for colored persons. Year after year since then this rate has been reduced, by safety education and by elimination of sources of accidents wherever possible, and the comparative rate for last year was 1.33 per 1,000 for Europeans and 2.47 for natives.

This reduction in the fatal accident rate is most encouraging. It must be remembered that the natives working on the Witwatersrand mines are drawn from various tribes throughout the Union of South Africa and from Portuguese East Africa. Most of the tribes speak their own languages and differ in customs and habits. It must further be realized that the majority of natives work on the mines for an average period of nine months and then proceed home. They only return when inclination or necessity decides. A big proportion of this enormous army is recruited from raw natives with no knowledge of underground working conditions, and not very intelligent. The training of these natives in methods of working provides one of the great problems of the mining industry. The fatal accident rate for both white and colored employees in 1931 was 3.81 per thousand; the rate for 1932 was 2.36 per thousand. This means that the improvement has resulted in an actual saving of over 365 lives in one year, as based on the 1913 figure. The chief causes of accidents on the Witwatersrand gold mines during 1932 were as follows: falls of ground, 25.63 per cent; truck and tramway accidents, 23.51 per cent; explosives accidents, 1.37 per cent; falling of material, 21.31 per cent. Falls of ground, therefore, as in other parts of the world, are the most prolific cause of accidents and account for nearly 40 per cent of the deaths due to all accidental causes.

The safety campaign of our accident prevention committee is conducted on well known lines. The committee is divided into a number of sub-committees and these carry out most of the work. There is a technical sub-committee which investigates safety devices and ideas; those approved are recommended to managers for adoption. Experiments and investigations are conducted periodically with specific types of accidents, such as falls of ground, truck and tramway accidents, those due to explosives, underground fires, etc., and the results of these are conveyed to the parties concerned.

A publications sub-committee takes charge of propaganda to reach the workmen, largely through the medium of "The Reef", a monthly magazine devoted to social news on the mines and to accident prevention. Over 8,000 copies of this magazine are distributed free each month, mostly to underground employees. The most important medium in use for carrying the message to the workers is the safety bulletin. Over

Executive Committee of the National Safety Council, welcomed the delegates and in a few gracious words introduced the general chairman, of the section, J. J. Plzak, Consolidated Water Power & Paper Company, Wisconsin Rapids, Wis., who presided. Chairman Plzak presented the first paper.

orig paper
6-10-33
Past, Present and Future of the Paper Industry

By J. J. PLZAK

Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis.

The speaker said in part: The past, the present, and the future are three separate worlds. You know the past, you yourselves wrote its history. The present is here—in this room—the future is in your hands, you are molding it right now. Build your patterns carefully.

Two years ago we set up certain objectives; some of these we have carried out most splendidly, others we failed in. Our ultimate success is measured by the net results of our accomplishments. In your hands is the yardstick—not individually, but collectively.

Unfortunately, we are scattered over a wide domain and personal contacts are quite impossible even as seldom as once a year in our national conference. But individualism can become a thing of the past and if our future is based on collective co-operation, we must start now; now in the present, and the future will take care of itself.

From now on let individualism be replaced by collective co-operation; indifference by eagerness; selfishness by beneficence, and then there will be no "buck passing."

First, let us set up a live, wide-awake section of committees—cull out the non-productive committees and concentrate on the active ones—the consolidation of several committees into one may help.

Next, we must set up an agency for the exchange of our ideas, expressions and problems, and by this experience exchange, we shall profit.

Last, but not least, we must reinstate the old spirit of good fellowship among our members.

Chairman
Data on the 1932-33 Safety Contest

By A. SCOTT DOWD

N 217
Plzak
 Chairman, Contest Committee, Paper and Pulp Section, National Safety Council;
 The Paper Industry Magazine of Chicago

The speaker said in part: We have concluded the second contest of a twelve-month period and are now in the third, which will be the ninth consecutive annual competition among the mill members of our section. Each of the past eight annual events has produced greater achievements. True, the number of mills participating in the last contest was less than in former years, yet it is clear that the reason for this has been the condition of the industry itself. In spite of reductions and curtailments that have taken place, some definite progress has been made in the prevention of accidents. Twelve and one-half per cent of the mills that finished the contest last

June made perfect scores of no accidents—a total of 11. In the previous contests, only 9¼ per cent of those that finished were perfect—a total of 9.

There were nearly 14,000,000 fewer man-hours worked in the past twelve months compared with the previous period, but on the other hand there were 2,255 more employees engaged, and only 87 mills finishing in the late one compared with 97 mills in the former contest. The decrease of mill participants was in Groups B, C, and Division II; Group C having the greatest decrease. Gains were made in Groups A and D, which were double the number in those groups in the previous year.

The number of disabling injuries was far less than in the year before but the lost time was greater. Some reason for the latter lies in the fact that in all contests prior to 1932-33, the standard scale of time charges was not used for deaths, permanent disabilities and permanent partial disabilities. Only one-sixth of the scale charge for specific injuries was used. On July 1, 1932, the standard scale was adopted.

The average frequency rate has been steadily decreasing during the past eight years. There were 53 mills with frequency below average in the last contest and 71 mills with severity below average. The ratio of employees to accidents was 42 to 1, and non-fatal to fatal was 83 to 1. Both of these ratios were a considerable improvement over the previous year.

The following mills have won trophies which are awarded to them by the National Safety Council:

Division 1—Paper and Pulp Mills, Group A.

Rank 1: Hollingsworth & Whitney Co. (Algonquin and Tocumnet Mills at Waterville, Maine.) Record of four injuries, 312 days of lost time.

Group B—

Rank 1—St. Croix Paper Company, (Woodland, Maine.) Record is a perfect score of no injuries during term of the contest.

Group C—

Rank 1—Cornell Wood Products Company, (Cornell, Wis.) Record is a perfect score of no injuries during term of the contest.

Group D—

Rank 1—International Paper Company, (Riley Mills, Riley, Maine.) Record is a perfect score of no injuries during term of the contest.

Division 2—Re-Manufacturing.

Rank 1—Kimberly-Clark Corporation, (Atlas Mills, Appleton, Wis.) Record is a perfect score of no injuries during term of the contest.

Presentation of Awards of National Safety Trophies

By J. I. BANASH

President, National Safety Council

Upon learning that Governor Brann, Governor of the State of Maine, was in the audience, President Banash invited him to participate in the ceremony by presenting the trophies which had been awarded to plants located in Maine.

Of the five bronze plaques awarded to group winners by the National Safety Council, therefore, three were presented by the Governor to Maine paper mill representatives; four certificates were also awarded by the Council to mills in that state for outstanding safety performance. Governor Brann remarked at the close of the ceremony that it was often said, "As goes Maine, so goes the nation," and he earnestly

intendent devised a piece of sheet iron running over the full length of the knife and completely enclosing the upper cutting edge, so that a man could not get his hands anywhere near the nip.

We have also had some trouble in guarding saws. There has been difficulty in trying to cover the sawing edge at all times. But one of the men on the safety committee devised a saw guard that works on a swivel arm which keeps the saw covered at all times.

I do not believe the time will ever come when nip hazards will not exist. After all guards are put on, there will still be nip hazards. But there is another kind of guard that in the past has been overlooked. This is not exactly a guard—it is a state of mind. When we think of nip hazards, we think of a guard or a knife, or a saw, or a point of contact. I believe a nip hazard may also be considered something the person has failed to do or something that was done incorrectly. The solution of the nip hazard problem is therefore not so much a question of guards as it is a building safety-mindedness into the organization from the boss down.

Back in 1925 the Cornell Mill had 125 accidents in which a doctor's services were needed. Out of those, 87 were lost-time accidents. We had a safety organization, safety committees, foremen's meetings, and all sorts of plans, but most of these pertained to guards.

The Cornell general manager who had charge of the safety work at that time conceived the idea that we were getting nowhere in eliminating accidents. He believed three steps should be taken in safety work: (1) Instruction, (2) Appeal, (3) Discipline. He turned things upside down. Instead of the usual foremen's meetings, they held mass meetings in the local theatre of all employees, and combined with this entertainment features to create interest in safety. In 1926 the first annual Safety First Picnic was held at which a thousand people were entertained. Back of all this was the name of safety.

During the year after starting this campaign, lost-time accidents dropped from 87 to 29, and the next year they fell to 13. The year after that there were only 8 lost-time accidents, and during the last three years there have been no lost-time accidents at all.

New Lessons Learned from Old Causes of Injury

By W. J. BRENNAN

Safety Engineer, Maine Department of Labor and Industry, Augusta, Maine

The speaker said in part: The following "Lessons" were not gleaned from the paper industry alone, but only those of interest to this group have been included.

A worker taught us a lesson when he shipped a belt onto a "loose pulley", and proceeded to shove an arm into the mechanism to make repairs. The belt worked over onto the adjoining tight pulley enough to produce a half-revolution. A fearful injury resulted, a duplicate of which no one I have contacted with ever heard about. Today a supplementary device prohibits such consequences.

Dynamite occasionally comes into wholesale use in the paper industry. Imagine the consternation of a group of workers who, after the firing of a string of shots, saw several sticks of explosive dangling in the maw of a steam shovel, ready to be dropped into the body of a truck. Now special staffs with flags mark each hole and the whole safety world should be appreciative.

A welder one day was sent into a large tank to make certain repairs and because of limited hose lengths, had his oxy-acetylene cylinders sent in as well. For some reason he had to leave after a few minutes of work and in his absence an explosive mixture leaked from faulty valves to collect in the bottom of the tank. Upon returning he struck a torch lighter and a terrific explosion resulted.

The lesson we learn from this is that our foremen must know the potentialities and peculiarities of the substances we use and must consider the safety phases along with the mechanical problems as orders are given. They and we must have a set up capable of getting all the information down through to the individual.

Suppose you asked your welders the following questions: What is oxygen and acetylene? Why is oil forbidden for use around the valves and fittings of cylinders? Why should torches be shut off at the tanks? What does the mechanism of a pressure regulator look like? How does it work and what precautions must be taken? Perhaps this gives you an idea; certainly no finer meeting will be had than that one attended by the factory expert on welding.

It seems in a paper or pulp mill that the floors are forever being torn up, usually by the use of jack-hammers. Buried in these floors are high tension cables and woe betide him who drives a drill point into such forked lightning. To my knowledge, it has happened, and now in each department of this mill hangs a blueprint showing the location, purpose and voltages of all such buried cables.

Your fire extinguishers are in fine shape, no doubt. But have you looked at the tip of the nozzles of those you recently used to be sure no residue of sodium sulphate has cemented the tiny orifice to deny the release of the tremendous pressures generated when the extinguisher is inverted? Somewhere in the country one of these plugged extinguishers went through the roof; forewarned is forearmed.

Those of you who have concerned yourselves with the slipping hazards on and around paper machines will have learned that there are dozens of places on the frames where operators stand to perform various functions. A safety engineer of whom we are very proud has done a great deal in this respect and from studies made during the various operations has practically eliminated slipping about his machines. Here, there and everywhere on his machine will be found non-slip metal welded to surfaces where once operators jeopardized their limbs. In a neighboring mill, a walkway across the face of the stack so surfaced would have prevented a man from shoving his hand into a nip during the closing days of the contest.

It seems to me that the best way in which to wring the last drop of benefit from the story of another's grief is to make the incident into a project, incorporating this into the records of our meetings. It requires no great vision on the part of anyone to appreciate the folly of reading of injuries in our News Letters in Safety Journals, or otherwise, only to have the person or persons fail to railroad the facts through to a logical conclusion.

One of the most effective methods of getting the information down the line supplementary to its presentation and discussion in our meetings, is by the use of memoranda sent to the desks of interested parties. In some plants special note books are provided in which such material is kept. In one plant a receipt slip accompanies the data, this to be signed and returned to assure the safety department that the subject matter has been given its proper attention.

Remembering always that there is nothing accomplished in accident prevention until such time as the basic lessons are firmly in the heads of the rank and file of the workers, we must supplement the teachings of supervisory forces with direct

educational material aimed at the man on the job. A favorite method is to use portable blackboards, these to be properly inscribed and embellished with illustrations if need be, then placed in such strategic locations as dressing rooms, main thoroughfares and areas where men gather for luncheon.

For many years I have also wondered why more of us have not taken advantage of the opportunities afforded by the worker's pay envelope. One plant with which I am well acquainted uses pay envelope enclosure with a very considerable success. At one time these enclosures carried a terse message, but of late years the subject matter has been changed to a recital of injuries sustained elsewhere, warnings pertaining to gasoline, icicles, ladder equipment and the like. To assure themselves that this material is retained sufficiently long for the subject matter to be absorbed, the enclosures bear numbers and several days after issuance, a miniature lottery is held. This little feature has been 100 per cent effective in alleviating the litter of enclosures which once were disgracing the main gate.

When the safety director goes into the locker room of a crew ten minutes before quitting time, he brings with him a single topic and develops it completely within that time, he may expect a very liberal dividend. Such an appearance not only supplements the educational activities of a crew supervisor, but affords a very intimate contact which is most advantageous. Show me the mill in which the safety director frequently meets with small groups of workers, and I will show you a mill where safety enthusiasm is at a high pitch among the rank and file.

THURSDAY MORNING SESSION

October 5, 1933

*Minutes of the
Meeting 11:21 P.M.*

Managed Safety in Maintenance and Repairs

By C. K. BOYER

Mill Manager, Consolidated Water Power and Paper Company, Appleton, Wis.

The speaker said in part: Safety in maintenance and repair work must be managed. Too often this has been dumped on the back of that universal scape-goat, the repair foreman, and the poor foreman is left, thereafter, to carry his constantly increasing load without well-defined guidance, with half-adequate tools, with a hodge-podge repair gang, and with iron-clad orders to keep a lot of junk running like real honest-to-goodness machinery.

The practical basis for safety in maintenance and repair work must start with management itself. Management must include safety in its program, not as some superimposed fancy trimming for publicity purposes, but as an honest, human and sound economic factor which will produce goods of the highest quality at a minimum cost in dollars and in human suffering.

Management can well be interested in the economic results of safer practices in production and repair work. Injuries cost money these days. They call for employers to pay medical bills, to pay for hospitalization, to pay for rehabilitation expenses and to pay for lost time compensation. Injuries make necessary untrained workers being placed on the injured man's job.

Most organizations have someone who is charged with the engineering work, perhaps an engineering department. If so, it is up to the engineer to see to it that

safety is incorporated into all new equipment and construction. New machinery should be designed so as to demand a minimum amount of maintenance. For all repairs eliminated means less repair hazards. No machine, however, can run perpetually without some repairs, and hence machines should be built so as to make repairs safely and economically.

Furthermore, new machinery should be put in space where repairs can be made safely. Many times new equipment is jammed into a reinforced concrete band-box in which the maintenance man must labor amid darkness, dirt and desperate language. Perhaps it is an electrician who must squeeze his shrinking form behind a crowded switchboard in order to examine a high tension oil breaker.

The engineers can watch out for unsafe equipment and badly placed machinery in old installations as well. Possibly a high pressure lubrication line will make it unnecessary for a repairman to crawl into a greasy cubby-hole to tighten up a bearing three times daily. Perhaps a modern enclosed feed reducer will eliminate a mess of open gears and greasy belts and at the same time cut power costs and repairs.

Here also a managed mill cost system will give facts and figures on repairs and maintenance which will economically justify such removal of repair and maintenance hazards.

Logically, the engineer's safety plan can be followed up by the purchasing department. For the purchasing agent can watch out for safety features on newly purchased equipment. He can ask for and obtain scientific and accurate data for the use of new materials which are dangerous if not handled safely. He may buy considerable corrosive resisting paints that are mixed with highly flammable solvents. Others which he buys may poison the lungs or else affect the eyesight. Some such materials cause serious skin irritations.

If chemists are available such new chemical materials can be referred to them for a safety analysis before being purchased, or else before being used promiscuously by painters and other repairmen.

Properly planned equipment and materials should be placed in the hands of repairmen who know their jobs. Such men are the choice of the employment or personnel manager. Production men must know their stuff but these men are confined to one spot in which they do their work. Repairmen, however, must be men capable of going anywhere in the mill with safety born of accurate knowledge of potential hazards. They must be men who intuitively foresee danger and take proper steps to safeguard themselves and others. They must be men of steady nerves, able to climb about on ladders or scaffolding without dizziness. They must be men of physical power sufficient to do the heavy work sometimes unavoidable. In short, a really safe repair crew needs to be hand-picked men.

Mention of the safety manager or of his department has been deferred until this point, for he naturally has to have methods and means with which to do his work. As that part of management which thinks first in terms of safety, it is his job to coordinate the work of the engineering, purchasing, cost accounting, and other personnel departments in their specific safety function. In short, he is the inspector general as well as the bureau of education in safety.

This survey of the foundation principles of an adequate managed safety program may appear too remote or out of place in a discussion of safety in repair work. However, such a program of safe practices must start with management and run all the way through to the repair foreman and his crew. Nor can we cover every safe practice item by item for your mill has its specific hazard which must be solved by your own organization.

ment department presents him with a card on which are listed questions and other information pertinent to the safety policies of the company. The man signs this card and presents it to the timekeeping department, which stamps the card and sends it to the foreman with instructions that he see the man and give him all information in answer to questions indicated on the card. These cards are then filed and may be referred to from time to time as evidence that the worker was informed upon safe practices.

Another method of handling the new employee was explained by Chairman Gilson. This consists of a safety examination card, outlining ten important safety questions, which the employee must answer in detail. The foreman's first duty, on having a new employee or a transferred employee report to him, is to talk over these ten safety questions with the man and get his signature on the card showing that the accident prevention practices outlined are completely understood.

Still another plan is used by the Crystal Tissue Co., Middletown, Ohio, and was explained by E. E. Grant. Here those famous safety laws, originally devised and promulgated by Dr. Harry Myers, have been summarized and printed in a small booklet. This booklet, adequately arranged and displayed, is given to each new employee, together with a short safety talk.

The testing, care and use of rubber protective equipment is another important subject. J. J. Plzak referred to his own experience. Some years ago he became apprehensive about certain rubber protective equipment used by electricians in his plant which had not been inspected recently. So he secured permission to have the gloves, blankets, and other equipment tested. During the process several gloves, which ordinarily should stand tests up to 10,000 volts, were found to be defective between 2,000 and 3,000 volts. Rubber blankets which should stand a test of 2,300 volts were punctured sometimes as low as 550 volts. As a result, an ironclad rule was established in the plant to test such equipment every thirty days.

Chairman Gilson suggested that in many plants proper equipment for testing rubber equipment, gloves, blankets, and so on, is not often available. But in his experience he had found that any neighboring public utility company would be very willing and ready to make such tests, if requested to do so. He recalled that one time a new shipment of gloves came into his plant and he had one of those peculiar "hunches" which sometimes come to a safety man. The gloves were brand new, nevertheless he took them to a friendly utility company for testing. Among them he found a considerable number of gloves that were unable to stand up under the standard tests for such articles. It is therefore important to test all new rubber equipment when it arrives in the plant and before being placed in service. Regardless of the fact that equipment may be bought from a thoroughly reliable manufacturer or dealer, it is often possible for the equipment to be damaged in shipment.

In discussing the News Letter of the section, it was agreed that the News Letter can be made successful only by each member of the section contributing something toward its pages. Mr. Augustus presented the suggestion that each member make a record of all accidents or near-accidents occurring in his plant and from time to time supply the News Letter with a description of those accidents which had unusual or especially instructive features. He further suggested a type of record and file card for such information about each accident which has been in use in his own plant. The information would, of course, be used anonymously in the section News Letter, emphasis being laid upon the methods for meeting accident problems.

ADJOURNMENT.

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Petroleum Section

Officers 1932-33

- General Chairman*—C. L. HIGHTOWER, Texas Pacific Coal and Oil Co., Fort Worth, Tex.
Vice-Chairman—E. R. ALDEN, Vacuum Oil Co., Inc., New York City.
Chairman Atlantic Division—R. W. BLACK, Standard Oil Co. (N. J.), Elizabeth, N. J.
Chairman Great Lakes Division—J. C. BERND, Sinclair Refining Co., East Chicago, Ind.
Chairman Mid-Continent Division—J. C. YOUNG, Tide Water Companies, Tulsa, Okla.
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 R. E. DONOVAN, Standard Oil Company of Calif., San Francisco.
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 E. J. SENNE, Socony-Vacuum Corp., New York City.
 C. W. SMITH, Standard Oil Co. (Ind.), Chicago.
 D. J. WALLACE, Mid-Continent Petroleum Safety Council, Tulsa, Okla.
Secretary—H. N. BLAKESLEE, American Petroleum Institute, Dallas, Tex.

ment department presents him with a card on which are listed questions and other information pertinent to the safety policies of the company. The man signs this card and presents it to the timekeeping department, which stamps the card and sends it to the foreman with instructions that he see the man and give him all information in answer to questions indicated on the card. These cards are then filed and may be referred to from time to time as evidence that the worker was informed upon safe practices.

Another method of handling the new employee was explained by Chairman Gilson. This consists of a safety examination card, outlining ten important safety questions, which the employee must answer in detail. The foreman's first duty, on having a new employee or a transferred employee report to him, is to talk over these ten safety questions with the man and get his signature on the card showing that the accident prevention practices outlined are completely understood.

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 E. J. SENNE, Socony-Vacuum Corp., New York City.
 C. W. SMITH, Standard Oil Co. (Ind.), Chicago.
 D. J. WALLACE, Mid Continent Petroleum Safety Council, Tulsa, Okla.
Secretary—H. N. BLAKESLEE, American Petroleum Institute, Dallas, Tex.

TUESDAY MORNING SESSION

October 3, 1933

Orig. paper
Na 17
Ref.

The first session of the Petroleum Section was called to order by J. I. Banash, President of the National Safety Council, who welcomed the delegates in the name of the Executive Committee of the Council. He then introduced General Chairman C. L. Hightower, Texas Pacific Coal and Oil Company, Fort Worth, Texas, who presided. Under the general topic "Looking Back As We Go Forward," the chairman briefly reviewed the activities of the various committees during the past year, closing with the following words:

Minutes
Na 17
Ref.

"In my opinion, there has never before been a time in the history of organized safety work when there was a greater need for an exchange of views and a frank discussion of our common problems than there is at the present time. The adoption of the petroleum code is certainly forcing to the front pertinent problems of personnel control which are not without the province of the safety engineer. We are daily being confronted with new problems on health. It is also true that constantly changing processes of producing, manufacturing and marketing have developed problems as yet unsolved. These must be safe individually, but their solution demands our co-operative effort. I therefore urge that each of you consider our sessions as not only an opportunity for a discussion of the prepared programs but also that they offer an opportunity for you to bring up for discussion those particular problems with which you are confronted. It is only in this way that we can get the greatest good from our meetings." He then introduced the first speaker.

The Accident Trend in the Petroleum Industry

By J. W. MYERS

Standard Oil Co. (N. J.), Chairman of the Statistics Committee

Orig. paper
Na 17
Ref.

The speaker said in part: Our statistics show that the petroleum industry continues to be the second largest group in point of exposure of all the industries co-operating in the statistical program of the National Safety Council. In 1932, our accident report covered 565,760,000 man-hours worked, this being exceeded only by the Public Utilities Section. It is a real pleasure to report that our frequency rate for disabling injuries for 1932 was lower than the average rate for all industries, the rate being 12.28 as compared with the all-industry rate of 13.20. It is significant that this has been the situation for three consecutive years. Moreover, the spread between these averages has been widening in favor of our industry. Nevertheless our position among the industries as a leader in accident prevention is somewhat less favorable than a year ago. Thus, in frequency we rank fifteenth lowest in 1932 as compared with fourteenth lowest in 1931, while our severity index dropped from 16th to 21st place. This does not mean that we have lost ground, but rather that some other industries have gained ground somewhat faster than the oil industry.

Although the accident prevention record of our industry is one of which we may well be proud, it is fairly certain that we have now reached a critical period in which the effectiveness of our safety work will be thoroughly tested. This belief is based on the following factors:

- (a) Increase industrial activity.

(b) The infiltration into our safety trained personnel of new employees as a result of the operation of the NRA Code.

(c) The tendency of executives and supervisors to temporarily lessen their emphasis on safety work, due to extremely pressing problems of great magnitude arising out of the reorganization of industry under the NRA.

It is entirely possible that we are even at this moment losing some of the ground which, after much effort, we have gained in recent years, but we must face the situation with the same optimism with which we are tackling our other problems. That the effort is worth while from a strictly business standpoint cannot be questioned, especially in these days when other operating costs are necessarily rising. Proof of this is found in the saving effected by the reduction in our industry's accident rates during the depression period from January, 1930 to July, 1933. If the 1929 rate of 26.78 had continued throughout this entire period the number of disabling injuries would have totalled 66,849 instead of 42,957.

Opportunities in Accident Prevention

By GERALD O. LOCKWOOD

The Empire Companies, Bartlesville, Okla.

Orig. paper
Na 17
Ref.

The speaker chose a novel way in which to present his subject. Instead of preparing a paper, which might have been made up from material secured by questionnaire from a large number of persons qualified throughout the petroleum industry to make interesting and valuable suggestions, he chose, rather, to hold a conference on the subject before the delegates in session.

There are three essentials in conference work, said the speaker. First, all members of the group must have some knowledge, for a vital interest in the problems to be discussed. Second, the conference group must be small, so that all men will have time to make their own contributions. Third, some method must be used to record the remarks as they are made so that all members of the group can see what has been said. If we are all able to see the recorded remarks, our thinking can be directed along logical channels.

Now, I am sure that all of us are interested in the subject to be discussed. However, the group in its entirety today is much too large to serve the purpose which I have in mind. I have asked 12 or 15 men to take the front seats this morning and serve as a conference group. These men will suggest methods that they are using, which are new to the rest of us, and the conference will analyze these methods for us all.

The following men, who had been suggested by Mr. Lockwood to form a part of a unit conference group, then took part in a lively discussion conducted along conference lines: J. C. Young, Tidewater Companies, Tulsa, Okla.; L. A. Hodell, The Carter Oil Co., Tulsa, Okla.; Carl Martin, The Phillips Petroleum Corp., Bartlesville, Okla.; H. W. Boggess, Sinclair Prairie Oil Co., Tulsa, Okla.; C. W. Smith, Standard Oil Co. (Ind.), Chicago; J. I. Manes, The Sun Oil Co., Dallas, Texas; H. N. Blakeslee, American Petroleum Institute, Dallas, Texas; R. E. Donovan, Standard Oil Co. (Calif.), San Francisco; C. L. Hightower, Texas-Pacific Coal and Oil Co., Thurber, Texas; J. C. Bernd, Sinclair Refineries, East Chicago, Ind.; R. W. Black, Standard Oil Co. (N. J.), Elizabeth, N. J.; H. C. Renz, Atlantic Oil Producing Co., Dallas, Texas; R. B. Rooper, The Humble Oil Company, Houston, Texas;

E. D. Murphy, The Mid-Continent Petroleum Corporation, Tulsa, Okla.; and R. R. Owens, Wirt-Franklin Petroleum Corp., Oklahoma City, Okla.

In closing the conference, the leader said, "some of you are interested in the conference idea. I cannot claim any originality for the method I have used today. This has been learned by association with the supervisors of trade and industrial education of the state of Oklahoma and Texas. I understand that practically every state has available a man trained in conference leadership and the further training of industrial men. I believe it would be well worth while for all of you, who have not already done so, to take advantage of the services of these men."

Report of the Nominating Committee

The chairman then called for the Report of the Nominating Committee and officers for the ensuing year were elected as follows:

- General Chairman*—R. W. Black, Standard Oil Co. of N. J., Elizabeth, N. J.
Vice-Chairman—A. W. Breeeland, Lone Star Gas Co., Dallas, Texas.
Chairman, Atlantic Division—J. H. Brown, Tide Water Oil Co., New York, N. Y.
Chairman, Great Lakes Division—J. H. Herbert, Standard Oil Co. of Ohio, Cleveland, Ohio.
Chairman, Mid-Continent Division—A. A. Odell, Barnsdall Refineries, Inc., Tulsa, Okla.
Chairman, Gulf Division—W. P. Raymond, Jr., Standard Oil Co. of La., Baton Rouge, La.
Chairman, Rocky Mountain Division—B. V. Osborn, Standard Oil Co. (Ind.), Casper, Wyo.
Chairman, Pacific Division—J. F. Roberts, The Texas Co., Los Angeles, Calif.
Chairman, Paster Committee—H. J. Wilson, Associated Oil Co., San Francisco, Calif.
Chairman, Engineering Committee—R. B. Rooper, Humble Oil & Refining Co., Houston, Texas.
Chairman, Publicity Committee—J. L. Risinger, Magnolia Petroleum Co., Dallas, Texas.
Chairman, Program Committee—C. L. Hightower, Texas Pacific Coal & Oil Co., Ft. Worth, Texas.
Chairman, Statistics Committee—J. W. Myers, Standard Oil Co. (N. J.), New York, N. Y.
Chairman, Health Committee—Dr. R. A. Jewett, General Petroleum Corp., Los Angeles, Calif.
News Letter Editor—G. O. Lockwood, Empire Companies, Bartlesville, Okla.
Members at Large—
 R. S. Bonsib, Standard Oil Co. (N. J.), New York, N. Y.
 V. R. Currie, The Texas Co., New York, N. Y.
 R. E. Donovan, Standard Oil Co. of Calif., San Francisco, Calif.
 C. L. Hightower, Texas Pacific Coal & Oil Co., Ft. Worth, Texas.
 Geo. F. Prussing, Union Oil Co. of Calif., Los Angeles, Calif.
 E. J. Sonne, Socony-Vacuum Corp., New York, N. Y.
 C. W. Smith, Standard Oil Co. (Ind.), Chicago, Ill.
 D. J. Wallace, Petroleum Safety Council, Tulsa, Okla.
Secretary—H. N. Blakeslee, American Petroleum Institute, Dallas, Texas.

WEDNESDAY MORNING SESSION

October 4, 1933

The newly elected general chairman of the section, R. W. Black, presided at this session, and immediately introduced the first speaker.

An Effective Accident Prevention Program for Refinery Operation

By W. P. REYMOND, JR.

Safety Engineer, Standard Oil Co. of Louisiana, Baton Rouge, La.

The speaker said in part: It is self evident that management must show its interest in and make accident prevention work a necessary part of production. It must stand behind safety work so firmly and actively that every foreman and workman will feel the management's support. Its purpose to retain no employees who fail to co-operate in the movement must be made known. With this full co-operation of the management, the following program of activities should be effected and supervised by the safety director:

1. General Safety Committee. 2. Workmen's Safety Committee. 3. Foremen's Inspections. 4. Investigation of accidents. 5. Formation, adoption, and enforcement of safety rules. 6. An educational program.

The General Safety Committee should be appointed by the management, be composed of foremen representatives from all of the principal refinery departments, with terms of service limited to about six months each, and these terms of service rotated so that all foremen will serve from time to time on this committee. At their meetings, where the safety director (or perhaps the superintendent) will serve as chairman, reports of all accidents, both serious and minor, should be discussed. Reports of foremen's inspections should also be read and discussed.

The workmen's safety committee should be composed of workmen representatives from the principal refinery departments, appointed by the respective foremen to serve for periods of two or three months each. Thus this committee will change its membership every two or three months and the majority of workmen will in time have an opportunity to serve on it. It has been our experience that when workmen feel they are given recognition and responsibility along safety lines, their interest in the work is increased. In plants using these committees, it has been found that a large percentage of the workers' suggestions are practical and worthy of adoption. Every effort should be made to demonstrate to these committee members that the management fully appreciates their work and interest in safety and that suggestions that will tend to improve conditions, not only are welcomed but desired.

Every week, two foremen from the general safety committee should be assigned to inspect one or more refinery zones. Such inspections should include close observation of all unsafe conditions and practices, unsanitary conditions, poor house-keeping, the need for safeguards, and the need of improvements in that zone. The reports of inspections should be sent promptly to the safety director. Afterward they should be read and discussed at the meetings of the general safety committee. Once the items mentioned have been assigned to the foreman most concerned for their attention, it is highly important that a follow-up be made.

Whenever an accident occurs an immediate investigation should be made to establish the cause of it and to find out where the blame should be placed. In each case an investigation should be made by the department in which the accident occurs and also by the safety director, who, as soon as the department foreman's report is received, should prepare a final report based on information gained from both investigations. Valuable lessons are always to be learned from an accident. Unless corrective measures are immediately put into effect, however, there follows the possibility of a similar happening, the result of which none can tell.

It is the duty of the safety director to definitely fix the cause of each accident and if possible render an unbiased opinion as to the result and responsibility for it. When this responsibility clearly shows that disciplinary measures are justified, this action should be initiated by the department head or the management, never by the safety director. The latter must secure and maintain the good will of all employees, for only by the cooperation which results from this feeling can he expect to attain success in the prevention of accidents.

Rules should be adopted which, in the judgment of the management, the safety director and the foreman, will best protect the refinery workmen from accidental injuries. Safety rules should include:

1. Instructions outlining the safe and efficient methods to be followed by the various crafts in performing their every-day duties.
2. Instructions outlining the safe procedure for conducting refinery operations.
3. Instructions outlining the procedure for adequately preparing refining equipment for inspection, maintenance, and repair work.
4. A system of written permits for issuance by authorized process foremen allowing hot work or work on and near equipment that has been in service.
5. Instructions regulating the personal conduct of employees and the use of necessary safeguards.

To have accident prevention successfully promoted, safety regulations must be enforced. An army cannot hope to reach its objective unless there is obedience in the ranks to the instructions of the officers; and by the same reasoning the prevention of accidents will not be accomplished unless safety instructions are carefully followed. It is the duty of all foremen and supervisors to see that safety instructions are fully complied with.

The attitude of the average workman toward safety depends largely upon the attitude of his foreman. If his foreman is "sold" on safety, and shows his men by careful instruction and supervision that he is trying to protect them, he will have little trouble in building up safety in his department. Minor infractions of safety rules should bring reprimands, and more serious violations should call for suspension from work.

A necessary part of any educational program must be the training of the foremen, who in turn must train their men. The conference method of improving foremanship, as conducted under the auspices of state departments of industrial education, provides an excellent medium for foreman education. This conference method of training brings out an exchange of ideas concerning the duties of foremen in such a manner that each one benefits by the ideas of others. This exchange of ideas, which is based on the experiences of the individuals throughout the plant organization, is one means of bringing about a better understanding and relationship between the company and its employees.

In the preparation of a safety educational program a variety of methods have been devised. Reports, showing comparative records of department and company acci-

dent experiences, serve a useful purpose by informing the refinery personnel of the progress of their plant and of each department in accident prevention. Safety posters, conspicuously placed about the refinery, and frequently renewed, are most effective in arousing and maintaining the employee interest. A refinery publication or news letter, issued at regular intervals, affords a good medium of publicizing safety information and makes a strong appeal to the workmen.

The petroleum industry is fortunate in having available the services of the United States Bureau of Mines in first aid training. This training is a wonderful help in leading men to prevent accidents. It has been seen that the workman who is trained in first aid better understands the effects of accidents, and this is probably because of his knowledge of the care necessary in rendering first aid relief to the injured. Every refinery employee, in my opinion, should receive this course of training. Immediate treatment for minor injuries is most important and every employee must be trained to seek the proper attention when hurt. Many infections, and later serious developments, may be prevented by the correct treatment of minor injuries.

Safety contests and other forms of competition afford means of encouraging refinery employees to practice greater safety. The Annual Safety Contest sponsored by the National Safety Council stimulates considerable employee interest. The competitive spirit, whether it be found in sport, business, or in safety, always finds response in American hearts, and the workmen appear to show more interest in safety as a result of competitions along that line. An interdepartmental safety contest, wherein every department competes for an annual trophy, provides a good incentive. In a large refinery, it may be desirable to divide the departments into contest groups, mechanical and process. In this way, each department will be competing against others whose activities are of a comparable nature.

Problems in the Handling of Ethyl Fluid and Ethyl Gasoline

By ROBERT A. KEHOE, M. D.

Ethyl Gasoline Corporation, Cincinnati, Ohio

In order to clear the way for a detailed consideration of the dangers potentially existent in the handling of ethyl fluid, I shall deal very briefly with the hazards speculatively associated with the distribution of ethyl gasoline as distinguished from other gasoline. Ten years of experience and of critical investigation have failed to reveal the existence of danger to any group of workmen, or to the general public, because of the presence of small amounts of tetraethyl lead in automobile fuel. Various aspects of the question are being further investigated at present, but only two matters deserve mention in a practical discussion of safety problems.

1. *Exposure to Lead Compounds in Cleaning Storage Tanks for Ethyl Gasoline.*
Tetraethyl lead alone or dissolved in gasoline slowly decomposes to yield crystalline triethyl lead compounds. Under the normal storage conditions this decomposition is almost inappreciable, but over a period of years variable amounts of such deposits can be found in the scale on the sides and bottom of storage tanks. If the sides or bottom of such a tank are cleaned in a dry state, finely divided dust containing triethyl lead salts may be suspended in the air, and may be inhaled by unprotected workmen who may enter the tank. The inhalation of these compounds causes irritation of the respiratory mucous membranes and the skin, accompanied

by violent sneezing, weeping, and burning of the skin. If this sharp warning be ignored further exposure may result in rapid lead absorption and acute intoxication.

It is a simple matter to prevent lead exposure of this type, either by cleaning the tanks in a wet state, or by the use of air line masks during the cleaning. Actually a combination of these two safety measures is employed in routine cleaning at refineries in general, in guarding against the inhalation of gasoline vapors. Nevertheless since the lead hazard would not be considered of itself, the attention of refinery personnel has been directed toward it through instructions which coincide with or supplement the current practices of tank cleaning. It should be pointed out further, that materials of this type removed from ethyl gasoline storage tanks should be buried or otherwise disposed of so that they may not be resuspended by air currents.

2. Lead Accumulation on the Surface of the Earth.

Through a variety of avenues lead compounds are being brought out of the bowels of the earth and distributed upon its surface. The deposition of finely divided lead bromide by way of the exhaust gases of automobiles and air-planes which burn ethyl gasoline is only one aspect of this process. I mention the problem in this connection not because the use of ethyl gasoline is the most important factor—for it is not—but rather because the whole question arose out of the investigation of the public health problems associated with the distribution of ethyl gasoline.

The Hazards of Handling Ethyl Fluid

The general character of the hazards in handling ethyl fluid is determined by the properties of the lead compound, which is its principal constituent. Therefore, if I appear to ignore the other ingredients, it is because safety measures must be directed specifically toward the prevention of exposure to tetraethyl lead. The latter is an oily liquid which shows a decided tendency to creep through the seams or joints of containers and pipe lines, thereby supplying abundant opportunities for the danger of leakage. Moreover, it is a heavy material, of almost twice the weight of water, so that packages of suitable size for the operation of mixing with gasoline are handled with some difficulty, and with the ever-present danger of physical injury to the worker, as well as the likelihood of bursting if dropped.

Tetraethyl lead has an appreciable vapor pressure at ordinary temperatures, and if exposed to heat the vaporization of the fluid develops a pressure within containers, which under extreme conditions (conflagration) may result in the bursting of the container with ignition of its contents, and which in the hot sun's rays causes a sudden escape of vapor when the container is opened. The oily (fat soluble) and somewhat volatile character of the material gives it a peculiarly hazardous quality among lead compounds in that absorption takes place into the human body both by way of the unbroken skin through contact, and by way of the lungs through inhalation. The saturated vapor of tetraethyl lead in air at ordinary temperatures contains approximately 5 mgs. of lead per liter of air—a concentration which is lethal for experimental animals after a few hours of exposure. It is apparent, therefore, that the rate of absorption of tetraethyl lead through the lungs is very much more rapid than in the case of particulate inorganic lead compounds, and that the dangers of inhalation are correspondingly great. The tendency of tetraethyl lead to decompose to yield peculiarly irritating and toxic solid compounds has been mentioned previously.

With these characteristics in mind, it is possible to visualize the chief difficulties

which attend the manufacture, transportation, storage, and handling of ethyl fluid. The necessity for the avoidance of leakage and spillage of fluid, and for prevention of skin contact or inhalation, is apparent. And not only must safety precautions be designed for the prevention of rapid absorption and acute illness, but also for the avoidance of repeated slight exposure with its resultant slow accumulation of lead which may result in chronic plumbism.

Hazards in the Manufacture of Ethyl Fluid

The preparation of ethyl fluid consists essentially of the blending of tetraethyl lead with a sufficient amount of an organic halogen carrier to convert the lead to the corresponding halide when combustion occurs, and with an oil soluble dye to give the fluid a deep color. The materials must be thoroughly mixed, and checked by chemical analysis for correctness of the quality and proportions of the ingredients. The finished fluid is stored in tanks, or introduced into drums or tank cars for shipment. The control of the dangers of manufacture is relatively simple, since all the operations are carried out by a single isolated group of men who are under constant supervision. The solution of the problem of safety is found in the use of carefully constructed closed systems of pipes, pumps and tanks, with the necessary vents carried well outside working areas. General and local ventilation is employed as a supplementary precaution. The filling of barrels for shipment necessitates a break in the closed system. This operation is carried out, therefore, in a specially constructed, highly ventilated hood, equipped with safety devices which care for either a few drops of fluid or a large accidental spill. The difficulty is increased by the necessity for accurate measurement of the fluid, this being accomplished by filling the container up to the desired net weight.

Skin contact with materials, and inhalation of vapor is obviated through detailed regimentation of the technique of all plant operations, including the carrying out of repairs, and the maintenance of meticulously careful housekeeping in the plant. The adequacy of precautionary measures is checked by regular medical supervision of the workmen and the plant.

An integral part of the manufacturing and shipping procedures is the cleaning, testing and repainting of metal drums before refilling, and the testing of refilled drums for leaks before shipment. The hazards of the cleaning operation are essentially negligible since it is done by equipment enclosed in highly ventilated hoods and operated from the outside. Cleaned drums are given an air pressure test, and filled drums are tested in a specially ventilated room, by setting them with the bung down for a period of twelve to forty-eight hours. The slightest leak becomes readily apparent because of the spread of the deeply colored fluid into the bright new aluminum finish on the surface of the drum. Suitable warnings are pasted tightly on each drum, together with instructions for caring for accidents or leaks. Mention is made of these details because they are of extreme importance in guarding against danger in transportation.

It is evident that the filling and handling of tank cars at the manufacturing plant is a simpler operation than the introduction of corresponding amounts of fluid into barrels. The construction of the tank is such that leaks are well nigh impossible except for the occurrence of most unusual transportation accidents. Tank cars are inspected, cleaned if necessary by equipment controlled at a safe distance, filled by weight from a storage tank, sealed, padlocked, and placarded with suitable instructions.

Hazards in the Transportation of Ethyl Fluid

The difficulties in transportation arise largely from the fact that the fluid may pass into the custody of persons who have not been instructed adequately as to the nature of the dangers with which they are dealing, and the proper means to employ in avoidance of such dangers. There is the greatest necessity, therefore, for anticipating and guarding against the type of handling which is given to ordinary commodities in transit. In fact, every effort must be made to see that no opportunity occurs for contact or exposure from the time of shipment until the material arrives at its destination, where it can be taken in charge by properly trained persons. For this reason shipping of drums, with rare exceptions, is carried out in full carload lots, or at full carload rates, so that the drums may be safely fastened in place in the car at the manufacturing plant and removed in safety by the trained personnel of the purchaser. Where shipment occurs by boat, the drum cargo is under the supervision of a representative of the shipping plant, until it is properly fastened in place on an open deck of the vessel, from which it is removed at its destination under the supervision of the shipper's or purchaser's trained agent.

The shipment of tank cars of fluid is not fraught with the same dangers as those associated with the transportation of drums, and for obvious reasons which require no further elucidation. It is true that major accidents might occur which would necessitate special handling of these cars and their contents. Carriers are instructed by placard to notify the shipper in such an event so that instructions may be given or the situation may be handled by an agent of the shipper. No serious difficulties of this type have occurred up to the present.

From time to time drum shipments of fluid have been made by truck. This has been done usually in order to avoid a transshipment of less than carload lots by rail. Thus a carload of fluid, shipped to some central point has been split among neighboring purchasers, each of whom has transported a number of drums by truck. This, again, merely represents the attempt to maintain the responsibility for the handling of drums in the hands of persons who are fully informed as to proper methods.

Hazards in Handling Fluid at Refineries and Bulk Mixing Points

The above paragraphs have dealt with the precautions which must be taken by the distributor. From this point on, it is necessary for the purchaser to see that the fluid is handled only by the proper persons, that it is mixed with gasoline in proper amounts and by acceptable procedures, and that the emptied containers are returned to the distributor with the same care against danger to the carrier that was observed by the distributor. The difficulties to be overcome may be separated into the hazards of storage and the hazards of the actual mixing procedures.

These hazards in the case of drum storage include the mechanical difficulty of handling heavy packages, the possibility of leaks and spillage, the development of pressure in the drum with high temperature, the partial solidification of the fluid at low winter temperatures, —i. e., freezing out of the halogen carrier, which must be melted before the fluid can be mixed into gasoline, and the occurrence of a fire, with the possibility of bursting of drums and ignition of the fluid. Theft of the fluid, and tampering with it must also be prevented. Obviously the fluid should be stored where the containers can be handled with ease, where vapors will not be confined, where spilled fluid can be readily washed away, where there is protection from direct sunlight (in warm or temperate climates), and from the spread of fire, and where there is security from chance or intentional handling by unauthorized persons.

When fluid is shipped in tank cars the chief storage problems have to do with the transfer of the large amount of heavy fluid from the tank cars to a fluid storage tank without allowing exposure to occur, the prevention of leakage of either liquid or vapor from the storage tank, and provision against excessive cooling or heating.

The hazards of mixing with drums of fluid arise in moving heavy drums to the mixing site, in removing the bungs, in emptying out accurately measured amounts of fluid, in mixing the fluid with gasoline, in rinsing out the drums when emptied of fluid, and in replacing the bungs. All this should be done without leaks or spills, and it must be done without exposure, on the part of the handler, to the liquid or vaporized fluid. Moreover any implements or equipment used in the process must be cleaned up so as to remove any opportunity for subsequent contact with liquid or vapor at the mixing site.

The most serious aspects of the problem of handling fluid out of a storage tank are concerned with accuracy of measurement, the prevention of leaks in the pipe lines, and the carrying out of repairs if and when leaks develop.

Methods Employed in the Elimination of Hazards

It is one thing to bring under control the occupational dangers of a single industrial plant, or that of a series of similar plants which operate under the same management. It is quite another to accomplish this end in the case of hundreds of widely distributed plants which have almost as many different owners and managers.

Especially at the beginning of this new industry, it was necessary to make a careful appraisal of the hazards. In order to do this, some type of centralized responsibility for the manner in which mixing was to be done, had to be established. This was achieved through the issuance of regulations and instructions to the purchasers of ethyl fluid, together with specifications for mixing equipment. Compliance with these regulations and specifications was made an obligation to which purchasers were bound by contract. Under this regime a high degree of uniformity both in equipment and in technique has been maintained.

Mixing plants are built so as to satisfy not less than minimal specifications supplied by the distributor of ethyl fluid. These specifications cover the storage facilities for ethyl fluid, the mixing equipment, locker rooms, bathing facilities, ordinary and special protective clothing and equipment, and gas masks. Regulations are provided covering all the procedures, including the requirements in the matter of cleanliness, clothing changes and similar details. Workmen are selected from those available by a medical representative of the distributor of ethyl fluid, on the basis of physical fitness, and each man is instructed as to the regulations, and the dangers associated with improper handling of ethyl fluid and exposure to it. A placard of instructions to workers is posted conspicuously at the mixing plant.

Storage space for drums of fluid consists of a concrete platform at box car or truck height, with at least three sides open to the air, and a roof overhead suitably connected with drains so that it can be thoroughly hosed. This platform is continuous with the mixing area, the entire structure being enclosed with heavy wire, locked against entrance, and being of fireproof construction. The storage tank for fluid delivered by tank car is located adjacent to the mixing equipment.

Mixing of fluid supplied in drums is carried out by means of two types of equipment, one for less than full drums of fluid, the other in which not less than a full drum is used. In the former case a special apparatus is fastened in the bung opening, and the desired amount of fluid as indicated by gross weight loss, is drawn off by means of an eductor, attached to the gasoline line.

In the other case, the full drum of fluid is used as the unit of measure, and one or more drums as required are emptied by means of an eductor attached to the gasoline line, and mixed with the proper amount of gasoline in a tank. The operation is completed when the eductor line has been well washed out, when all the fluid has been introduced into the gasoline, and when the fluid and gasoline have been recirculated so as to obtain complete admixture. The latter is an important item, for when the heavy fluid is merely poured into gasoline it drops to the bottom and remains as a separate layer for a long time. Not only would this introduce serious error into the composition of the gasoline, whereby excessively low and (more important in relation to safety) excessively high concentrations of fluid in gasoline might be distributed, but it may also result in the accumulation of concentrated fluid at the bottom of the tank, to be encountered, perchance, when the tank is to be cleaned.

The entire procedure of storing the fluid and mixing it with gasoline in mixing plants which handle tank cars is carried out in two steps: (1) emptying the tank car into a storage tank which is suspended on a scale; and (2) mixing weighed amounts of fluid into gasoline. Both steps are carried out through the use of an eductor on the gasoline line. Since all movements of the fluid are accomplished by suction, and since sufficient vacuum for the purpose can not be obtained in the presence of leaks in the system, it follows that if the apparatus moves the fluid at all, there is no opportunity for skin contact with leaking fluid or inhalation of escaping vapor.

The various factors which influence the magnitude of occupational hazards of the workmen may be listed in the order of their importance as follows: (1) The extent of the co-operation of refinery management in the avoidance of irregular practices such as unnecessary sampling of fluid, the removal of small amounts of fluid into intermediate containers for experimental mixes, and for the correction of errors in mixing—in short, the avoidance of any handling of fluid except by means of the standard mixing equipment; (2) the quality of the mixing equipment; (3) the frequency of mixing (this depends largely upon the adequacy of storage facilities for ethyl gasoline in relation to the volume of Ethyl gasoline distribution); and (4) the degree of caution exercised by the mixing personnel in following the instructions as prescribed.

The importance of the last item is stressed at all times in the promotion of safety, but much greater dependence is put in the automatic safety which is afforded by the installation of proper mixing equipment and adequate storage facilities. It is manifestly impossible to prevent departures from accepted and safe procedures excepting as the refinery management and personnel give their willing and intelligent co-operation toward the promotion of safety, and unless they accept in practice, the point of view that no commercial consideration can justify the violation of a regulation which is reasonably designed to promote safety. The importance of the development and maintenance of this point of view toward the handling of ethyl fluid cannot be overemphasized, for therein is the most significant problem of safety. The chief functions of the medical representatives of the distributor of ethyl fluid are to promote such a point of view, to maintain and improve the quality of mixing plants and to prevent the gradual decrease in caution which otherwise is almost inevitable after years of freedom from occupational injury. The periodical medical examination of every person engaged in this work, together with occasional study of the lead excretion of a representative group of such workers, serves largely to deter-

mine the degree of success which has been achieved in the performance of these functions.

Perhaps this statement describes a somewhat uncommon concept of the significance of medical examinations in the promotion of safety. If this is true, it should be understood that such a concept does not arise from any lack of appreciation of the necessity for the utmost care in the performance of examinations, and for the maintenance of proper professional relationships with the workmen. Rather, it springs from the certainty that no amount or excellence of medical care is sufficient, in itself, to prevent the occurrence of lead poisoning among men who are working under conditions of exposure which bring about the absorption of significant amounts of lead. In our opinion, the only successful way to prevent occupational lead poisoning is to so limit occupational lead exposure that poisoning cannot occur.

Safety in Marketing Petroleum Products

By A. J. MARTINSON

*Orig. paper
Oct 1932*
Safety Supervisor, Union Oil Co. of Calif., Los Angeles, Calif.

The speaker said in part: The ideas set forth here are of necessity limited, but the organization and methods outlined resulted in the following achievements:

The tangible money saving has been at least \$6 for each dollar expended, which should be of interest to any organization which carefully scrutinizes operating expense. The decreases in number of accidents and their frequency from the year 1929 to 1932, bearing in mind that our accident prevention efforts started in February, 1930, are as follows: 1929, 182 lost-time accidents, and a frequency rate of 23.4; 1930, 134 accidents, and a rate of 18.2; 1931, 62 accidents, and a rate of 9.4; 1932, 30 accidents, and a frequency rate of 5.1. This shows a reduction of 78 per cent in three years.

Our first step was a careful study of the accident experience of the department, which revealed that lost-time accidents had increased 105 per cent in four years, with a corresponding increase in injuries and in medical and compensation costs. This was also true of other direct losses such as loss of commodity and repairs to equipment. The indirect losses, such as delayed deliveries, time off with pay, cost of time lost by other employees due to curiosity, sympathy and other reasons, plus the cost of time lost by supervisors in assisting injured workmen, investigating causes of accidents, selecting and training new employees and preparing accident reports, had increased in a similar ratio.

Three routine operations, handling drums and barrels, falls of persons from various causes, and cranking trucks had caused 60 per cent of the disabling injuries.

It developed that 35 per cent of the lost-time injuries were minor in nature; that there was in the majority of these cases no good reason for loss of time beyond the day of injury, or disability that would prevent the injured from carrying on his regular work. It was evident that because the injured employee had been given salary or wage consideration for these short absences, we had many minor injuries which unnecessarily were classed as lost time. From the high ratio of accidents occurring to new employees it was evident that they had not received the necessary training in their new jobs from the foreman in charge. Obviously, this not only resulted in lost-time accidents, but in much inefficiency from a production standpoint. There was also evidence that experienced employees had more accidents than should

haustion, as handling and cutting cement is a rapid pace and very hard work. Also we have the danger of cement burns and eye infections. It has been difficult to influence men to use gloves while cutting cement, as they are unable to grip the sacks securely. We have been very successful in getting the men to wear goggles to prevent cement dust from lodging in the eyes. The goggles are so equipped with enclosed rims and thin mesh wire that very little if any cement can get through, but they do allow air to penetrate which eliminates the fogging of the lens.

After painting and necessary repairs are made, we rig up to drill the surface plug. This consists of changing drill collars, taking off cement joints, connecting up flow nipple and fill up lines. This is regular routine work, but here exists the hazard of material and tools piled and laying around on the derrick floor. To eliminate these hazards, we have placed a tool box and space $4\frac{1}{2}$ feet wide by 20 feet long on one side level with the derrick floor, where men are required to keep the tools, slips, small connections, bits, and so on. I want to say here that one of the easiest things to keep repaired is the most difficult on a drilling rig and that is small hand tools, such as hammers, files, wrenches, hatchets, saws, chisels and sledges.

When rigging up is completed and the service pipe is set, the drilling of hole for the oil string is started, with breaking down drill pipe and running of oil string; here we experience the hazard of making connections. Many injuries are received from making up posts, short handles on slips, rotary tables not properly supported, falling of elevator lokes when changing elevators, pulling in pipe, using pipe wagon, bad derrick floors, and many other duties that are performed at this time. I feel sure that some injuries can be credited to drillers making hole, and that of trying to make as much hole as the driller that made the first run after service plug was drilled. This is usually easy and fast drilling and he is credited for making a good run or a lot of hole. If you have ever watched men at work on a drilling rig, I believe your opinion is the same as mine, that the driller and his crew work at everything like they have only five minutes in which to do that job.

After the well is complete and flowing through separators into the tanks, the rig is torn down, which in the majority of cases is done without cutting off production from the well. Here much care and safety must be practiced in tying and letting down crown blocks. Should crown blocks fall there is always a danger of breaking the well connection and allowing the well to get out of control. Here is an excellent place to provide and install derrick slides. Heavy timbers are placed over Christmas tree connections for protection in case blocks should fall. Many times, if the Christmas tree connections are all under the derrick floor, the rotary table is placed over the connections.

Bringing in the Well and Disposal of Oil and Gas

By L. P. KNOX

Safety Inspector, General Petroleum Corp. of California, Los Angeles

The speaker said in part: One hesitates to think what would have happened to an operator with the limited knowledge of twenty years ago, if he should have attempted to deal with the deep wells, the large quantity of high gravity oil and the enormous volume of gas under tremendous pressures which are to be found in this field today. Considering how the most ordinary safety measures of today were disregarded or even unknown fifteen or twenty years ago, the modern operator cannot help but

wonder how many of his predecessors managed to survive. Few precautions were taken. If the proper material could not be obtained quickly, any that could be found at hand was used. Gas, when encountered, was allowed to go to the air under the most unfavorable conditions, and with little thought given to the danger of ignition. The operator's one idea was to get the oil out of the ground and on its way to the refinery.

Today all is different. Given adequate tools and equipment, a well trained crew and a complete understanding of the hazards to be encountered, few operators look forward with any great misgiving to the actual work of putting a well on production. Unhurried and well ordered procedure, varying somewhat with personal experience of the man in charge and the established practices of different operators, will in any given field result almost always in successful completion. In fact, it is so that their occupation is a dangerous one, the operators rarely overlook any known precaution which may result in a failure.

With the Christmas tree erected, the tubing in the hole, the flow lines to the sump and traps in place and all other service equipment in readiness, the actual work of bringing in the well is started. The usual practice in Kettleman Hills is to reduce the specific gravity of the mud by gradually thinning the water as it is circulated down through the tubing. In some cases the well will start flowing during this process. When this happens, the casing head flow lines are closed and the well flows through the tubing.

The usual practice is to direct the first flow to a sump. All obvious sources of ignition should be eliminated while the well is being blown. The oil and gas jet should be directed through the middle of the sump so that the energy of the jet will be dissipated before it strikes the ground. Jets should not be directed toward the walls of the sump which may contain hard material capable of producing sparks. Due to the jet reaction, which in some cases is tremendous, lead lines should be securely anchored so that they cannot tear loose and endanger life and property by whipping around. The practice of blowing the well into the derrick should be avoided wherever possible because the fire hazard is greatly increased on account of sand and pebbles causing sparks in striking portions of the steel derrick or by faulty wiring and static electricity.

Once a well has started flowing, few operators consider it advisable to shut it in or to circulate mud in the hole again under pressure. For this reason, a tubing machine has been developed which makes it possible to successfully raise or lower the tubing with the well producing through the flow line from the casing head. A plug is first pumped in the tubing to the desired depth, after which the fixtures above the upper control valve are removed, and the tubing machine installed above this valve. This valve, as well as the master valve below, is then opened and a joint of tubing lowered through the tree and screwed into the upper end of the special collar which was placed on the upper end of the tubing string when it was first landed in the hole. The tubing string is then raised and the special collar removed, after which it can be raised or lowered in the hole as required. The tubing machine is provided with a pair of gas-operated rams which can be used to handle the tubing string in case this cannot be done with a hoisting line from the crown block. This operation is carried out with safety without interrupting production from the casing head flow lines.

After separation, the crude oil is gauged and shipped by pipe line or other means, either north to the San Francisco Bay area, or to the Los Angeles Basin area for refining. There are no refineries at Kettleman Hills. The gas from the high pres-

*Orig. paper
Oct 5, 1911
(Weeks)*

sure traps is treated in absorption plants at 400 to 500 pounds pressure and delivered to the utilities. The gas from the low pressure traps and vapor tight tanks is treated also in absorption plants after which it is compressed to 400 pounds for delivery. Large pipe lines are maintained by the public utilities by means of which the dry gas is conveyed to both the northern and southern metropolitan areas.

*Long paper
Ch 5
Pipe lines*

Operation and Maintenance of Pipe Lines

By H. L. HERSHEY

Safety Director, The East Ohio Gas Co., Cleveland, Ohio

The speaker said in part: In discussing the operation and maintenance of pipe lines, let me assume that all necessary work has been completed in the laying of field or gathering lines, trunk or transmission lines, both intermediate high and low pressure distribution lines, the construction of compressor stations, and all phases of work from the source of supply to the place of consumption, taking into account all safety practices known in the construction of a gas distribution system. To understand this more thoroughly, it will be necessary to separate the operation and maintenance of pipe lines into four classes, as follows: (1) field or gathering lines; (2) compressor stations; (3) trunk pipe or transmission lines; (4) distribution lines; medium high pressure and low pressure.

Field or gathering lines: These lines are laid and connected to the side gate of the well after the well has been shut in. The size of pipe depends on the volume of gas at the well and the distance from the well to the transmission line, or to the compressor station. Well drips, meter or measuring stations, check valves and line gates are set at locations where they can be conveniently reached and operated.

The care and operation of the wells which are turned on and off under the direction of the pressure department, the blowing of drips, the walking or patrolling of field lines to locate possible leaks, the changing of charts on gauges, and the inspection of safe conditions at the wells and along the field lines are in care of men known as well tenders. Each well tender has a certain number of wells under his care. Small repair parts are kept at convenient locations for maintenance of these field lines. Where repairs cannot be made by the well tender, field or repair crews are notified to do the work.

The field division is under the supervision of a field superintendent, and is divided into various districts, each under the supervision of a district foreman. Where replacement or repairs are necessary, pressure is taken off the line by closing various control gates; the line is cut, and a section of pipe is removed (usually one joint) on both sides of the location where replacement is to be made. Care is taken that a great enough distance is used to insure against gas entering low places or drifting back into the ditch where the men are working. Vents are also placed on the end of pipe and extended up high enough to allow any dead gas to drift away in high atmosphere.

Inasmuch as the field is the source of supply, the perfect operation and maintenance of the field division is one of the most important phases of the industry. All other branches must depend on it.

Compressor stations: Compressor stations are necessary for the varying requirements of gas consumed. The distance that natural gas will flow under its rock or

natural pressure is limited. Compressors insure a proper control of field pressure, prompt and rapid delivery, and a satisfactory service to all companies.

Careful operation of compressor equipment is very necessary in order to keep the maintenance down to a minimum. A constant check-up on all safety devices and other equipment is necessary to eliminate any possible trouble.

Trunk pipe or transmission lines: Operation of the pipe or trunk lines is under the supervision of a superintendent of trunk lines and is further divided into districts, each under the supervision of a district foreman who is stationed at or near the pressure or control station on the trunk line. At these stations gates and pressure gauges are set for the control of gas as it passes through the lines on its way from the wells or compressor stations to the consumers. Various pressures are maintained at these stations, depending on the distances they are located from the wells or compressor stations, the place of consumption, and the amount of gas consumed. The demands of the industrial, commercial and domestic consumers and the weather conditions at various times of the year also are dominant factors in the pressure carried on these lines.

All trunk lines are walked or patrolled at regular intervals, the intervals depending on the importance of the line and the pressure maintained. The duty of the line walker is to cover regular distances, repair or report all leaks, inspect all regulators, all private telephone lines, note pressures at various points along the line, report any unusual condition such as washouts, landslides, road improvement, erection of buildings on or near the line, take complaints of property owners, and when necessary, he is called upon to assist regular emergency crews when repairs are made in his district.

Temporary repairs are made at any time of the year, but any construction work which compels the closing down of certain sections of the line is always done in the summer when the load demand is lighter. This work is under the supervision of the district foreman, who uses all of the valuable regular employees in his district. If more men are needed, they are selected from near locations, and are men who have done similar work at various times. It is very essential when replacement is made on a dresser line which is being relaid over a hill or high level that the pipe be connected by enough sleeves to eliminate any possible change of pulling apart by any settlement or contraction which might occur at some later time.

Distribution system: The distribution system is operated under two stages of pressure: intermediate or city high pressure, and a low pressure system. The city high pressure system begins at the border stations, or where the trunk lines end. These stations are located at the city's edge, and it is here that the regulators and measuring devices are used. High pressure gas is supplied to industrial consumers throughout the city, if the plants are located where it is possible to reach them; other high pressure lines reach into various sections of the city in order to keep a required pressure in the regulators which supply the low pressure system. Pressures vary at these regulators, depending on the population of various districts and the required consumption.

Low pressure, or district regulators, are placed at selected locations along the city high pressure lines, these in turn reducing the pressure from pounds to ounces into the low pressure mains, from which service lines are run and meters installed to measure the gas used by the consumers in various appliances.

The maintenance of the distribution system requires a continuous inspection to avoid leaks. Certain sections of the city mains are spudded and inspected every month. Other sections call for inspection once or twice each year. Replacement and

reconstruction of mains are necessary due to soil conditions, electrolysis, city improvements such as street grading, paving, sewers, water mains, bridges and public buildings. It is the pressure control department that is constantly on watch 24 hours a day over the entire transmission system which assures a continuous supply of gas to satisfy all users of this commodity.

THURSDAY LUNCHEON SESSION

October 5, 1933

This session was devoted chiefly to the presentation of National Safety Council trophies awarded in the 1933 Petroleum Section Contest. H. N. Blakeslee, American Petroleum Institute, secretary of the section, spoke briefly on the statistics of the contest. He said that only in two departments, manufacturing and marine, did the figures show an upward trend as compared with the annual summary of injuries for 1932. During the contest which lasted from January 1 to June 30, 1933, 158 contest units, employing 46,174 men, worked a total of 219,794,874 man-hours. During the contest a total of 2,414 disabling injuries were suffered, making the average frequency rate for the contest 10.983. Eighty-two of the contesting units finished the contest with a frequency rate below the average.

The handsome trophies awarded by the National Safety Council were presented to representatives of the winning companies by W. H. Cameron, managing director of the National Safety Council. He spoke briefly in commendation of the individual companies and also in praise of the fine work that was being done to reduce accidents throughout the Petroleum Section. He then presented the trophies to the following unit companies, each of which had won first place in the contest, and also certificates of merit to certain other companies:

Manufacturing Department, Group A—The Water Oil Co., Bayonne, N. J.—2,106,558 hours, 3 injuries.

Manufacturing Department, Group B—Indian Refining Co., Lawrenceville, Ill.—491,765 hours, no injuries.

Marketing Department, Group A—Standard Oil Co. (Indiana), Chicago, Ill.—34,884,896 hours, 76 injuries.

Marketing Department, Group B—Texas Pacific Coal and Oil Co., Thurber, Texas—1,065,868 hours, no injuries.

Producing Department, Group A—The Ohio Oil Co., Findlay, Ohio—2,335,517 hours, 12 injuries.

Producing Department, Group B—Hope Construction and Refining Co., Pittsburg, Pa.—330,232 hours, no injuries.

Natural Gasoline Department, Group A—Lone Star Gasoline Co., Dallas, Texas—237,566 hours, no injuries.

Natural Gasoline Department, Group B—General Petroleum Corp. of California, Los Angeles, Calif.—120,895 hours, no injuries.

Pipe Line Department, Group A—Union Oil Co. of California, Los Angeles, Calif.—495,043 hours, 1 injury.

Pipe Line Department, Group B—Ajax Pipe Line Co., Muskogee, Okla.—155,265 hours, no injuries.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



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TUESDAY MORNING SESSION

October 3, 1933

The first session of the Power Press Section was called to order by Harry Guilbert, The Pullman Company, Chicago, Ill., who welcomed the delegates in the name of the Executive Committee of the National Safety Council. He then introduced General Chairman Elmer J. Smith, who presided. Chairman Smith, speaking on "Our Progress During the Past Year", gave a brief resumé of the activities of various sectional committees and praised each for its devotion to duty during the year. He then introduced the first speaker.

Dis. paper
7217 Power Press.

Trend of Accidents in the Metal Trades Industries

Orig. paper -
7/15/36

By A. L. KAEMS

Safety Engineer, Simmons Co., Kenosha, Wis.

The speaker said in part: Our annual injury reports to headquarters of the National Safety Council are the basis for available information on the trend of injuries in the metal trades since 1926. These reports show that substantial improvement has been made in the last six years; the combined records for manufacturers of hardware, stoves, stampings, wire, and other metal products show a decrease of about 50 per cent in the frequency and severity of disabling injuries.

With operations at much lower levels today and many organizations disrupted, can we maintain the low rates of the last year or two as business improves, or will injury rates start upward? We want to hold the ground we have gained. Fatalities and injuries resulting in the loss of a few days time are now far down in frequency; but such injuries as crippled hands, lost fingers and toes, and other permanent disabling injuries, which occur oftener in metal trades than in most industries, have not declined very far in either frequency or severity. In other words, any significant increase in these injuries, which, I want to emphasize, impairs the efficiency of a man and invariably results in considerable medical and compensation costs, will quickly change the whole picture of our accident situation. Permanent partial disabilities in our industries accounted for over twice as much lost time as fatalities last year, although 6,000 days are charged for each fatal injury.

Our annual reports do not give the details about the circumstances involved in such injuries and so I cannot mention specific conditions which require attention. I hope that in the not distant future we will have such facts available, but in the meantime, I request each one of you to report the facts about your permanent partial disabilities to the News Letter editor and profit from a description of accidents by checking your own plants for similar causes or conditions that might cause the same accidents.

The small organizations can be a big help in maintaining our good record. Statistics covering the manufacture of light and heavy metal products show that large organizations have frequency and severity rates about 50 per cent lower than small plants. I firmly believe that any thinking manager of a small shop will agree that small organizations can reduce this differential. Many small organizations, like the Noera Manufacturing Company, a subsidiary of the Chase Company, the C. C. James Company, of Grand Rapids, Mich., the Horton Steel Works, a subsidiary of the Chicago Bridge and Iron Works, and the wire plant of the Aluminum Company of Canada, Ltd., have demonstrated that perfect records can be maintained over long periods.

There are, it is true, numerous large organizations that can also well afford to keep a watchful eye on their safety records. Plants producing metal stampings and metal ware averaged 12.15 for frequency and 0.85 for severity in 1932 but many had much higher rates. The records of some of these organizations show, also, little or no improvement in the last two years. A company whose rates are far below the average has shown the effectiveness of its safety program, but the high rate plant with no record of improvement over several years has good cause to investigate its situation. If each metal trade organization examines and analyzes its own record carefully and then acts in accordance with its conclusions, we need have no concern over the future trend of injuries in our industries.

Report of the Nominating Committee

Chairman Smith then called for the report of the Nominating Committee and officers were nominated and elected as follows:

General Chairman—A. L. Kaems, Simmons Company, Kenosha, Wis.

Vice-Chairman—H. L. Vits, Aluminum Goods Manufacturing Co., Manitowoc, Wis.

Secretary—G. A. Kuechenmeister, Dominion Forge and Stamping Co., Walkerville, Ont., Canada.

News Letter Editor—C. E. Libby, Scintilla Magneto Co., Sidney, N. Y.

Engineering Committee Chairman—Louis Boraks, Liberty Mutual Insurance Co., Boston, Mass.

Exhibit Committee Chairman—B. E. Rockhoff, Detroit Steel Products Co., Detroit, Mich.

Health Committee Chairman—Dr. George R. Nichols, American Can Co., Chicago.

Membership Committee Chairman—H. C. Howsam, Hubbard Spool Co., Chicago.

Poster Committee Chairman—G. S. Thompson, Gnu & Company, Detroit, Mich.

Program Committee Chairman—George H. Berry, Western Electric Co., Chicago.

Publicity Committee Chairman—R. M. Zelder, Edison General Electric Appliance Co., Chicago, Ill.

Statistics Committee Chairman—J. D. Lyle, Fisher Body Company of Cleveland, Cleveland, Ohio.

Slides and Safety Kinks Committee Chairman—E. J. Wallman, Great Lakes Forge Co., Chicago, Ill.

Members at Large—

T. O. Meisner, American Can Co., Chicago, Ill.

J. W. Hemling, Automatic Electric Co., Chicago, Ill.

John B. Gibson, Western Electric Co., Chicago, Ill.

S. H. Slaymaker, Fairbanks, Morse and Co., Beloit, Wis.

W. J. Graves, Michigan Mutual Liability Co., Detroit, Mich.

E. J. Smith, Western Electric Co., Chicago, Ill.

The Safe Operation of Portable Pneumatic Tools

By WILLIAM W. JANZER

Safety Engineer, Seaman Body Corp., Milwaukee, Wis.

The speaker said in part: Probably the types of portable pneumatic tools most commonly used are the hammers for riveting, caulking, chipping, cutting stone, and flanging, all in different sizes and speeds; the jack hammer for mining, drilling rock and concrete and tamping; the grinders, the drills, nut runners or setters, and many so-called home-made air-operated clamps; small presses, squeezers and riveters.

In brief, the items of safety that should be applied to all types of portable pneumatic tools are as follows:

1. Good air hose—metallic protection where subjected to rough usage or for dragging over sharp edges.
2. Good couplings or connections—such as cannot be disconnected accidentally and permit whipping of the air hose. If threaded connections are used, see that plenty of threads are turned in.

Orig. paper -
8/12/36

3. A valve, within easy reach, to shut off the air when changes of tools are required. When a valve is not handy, men will kink the air hose and if it slips out of hand, the operator or co-workers within range are apt to get a good wallop. With the usual metal fitting on the end of the hose, serious injury may be inflicted. All fittings on hose should be well clamped. Where more than one hose is attached to a line or manifold a valve should be installed for each unit.

4. In all grinding, chipping, drilling, and many of the other pneumatic tool operations, eye protection should be used. You have not only the particles you cut or chip away to contend with, but the discharged air will blow foreign bodies into eyes. While the latter cause mostly minor injuries, if the foreign bodies are not removed promptly, ulcerations are started which often cause permanent loss of vision. Constant irritation of the eyes causes inflammation, resulting in cost for treatment and irritation and also produces a growth over the eyeball which has to be removed physically. This condition develops very slowly and its seriousness for this reason may not be recognized. In connection with required eye protection on many pneumatic tool operations, it is not always the operator who is in gravest danger of eye injuries. Rather, it is the worker nearby. Portable shields or screens of various sizes can often be placed between men and permanent shields can be erected for bench work to prevent particles flying.

5. On some operations or tools it may be possible to direct the discharged air from the tool in a direction where it will do the least harm. This is an item I would like information on with particular reference to applying it on die grinding where you must work from many angles.

6. Tripping over air hose, especially where many units are punched, is also a hazard.

7. Exposed triggers and throttles that do not automatically shut off the air pressure when hand is removed, are also a source of danger. The hazard of accidentally setting a tool in motion can be eliminated, or contact prevented while it is in motion, if all tools are placed in a proper receptacle, such as a stand, pigeon hole on bench or jig or metal holster. I advise against hanging tools on hooks or nails, especially the open handle type. If placed in this manner they can be easily bumped off or pulled off by tripping on air hose or electric cord. In our shop metal holsters are fastened to the work bench or forming jig.

8. Heavier portable tools, if used within a fixed radius, should be counterbalanced for ease and safety in handling.

9. On air clamps or air presses used as jigs, and benches, the throttle should be guarded so it cannot be bumped and the tool accidentally set into motion.

10. On all so-called home-made air operated tools, such as squeezers and riveters, all working parts excepting, of course, the points, should be fully enclosed.

11. Workmen should be required to report defective tools as soon as units go wrong and the tool should be repaired immediately or removed from service. Too often investigation of an accident disclosed the fact that such defects were reported and not attended to.

12. Gloves should not be worn while using revolving air tools. Loose or ragged clothing is also a hazard. Recently we had a man get the leg of his trousers wound up on a portable air grinder.

In the case of air grinders special care should be required in the handling. Rough handling such as dragging or pulling the machine with the air hose, tripping an air hose and pulling the unit off the shelf or bench onto the floor will cause cracking of wheels and the subsequent breakage when in use. Rough handling also springs

spindles and wheel breakages follows. Air grinders operate at different speeds and care should be exercised that proper size and kind of wheels are used for its speed.

Flanges of proper dimension for size of wheels are as essential as on a fixed grinder. It is not uncommon to find men using ordinary washers in place of a flange or using a wheel up to three inches in diameter without a flange or washer. Blotters should be installed between flange and abrasive wheel. Metal flanges should not be tightened directly against an abrasive wheel. Guards should be used on the wheels whenever possible.

In the case of air drills and reamers, we have a hazard of injury from sudden turning of the machine should the drill or reamer stick. Blocking the throttle is an unsafe practice. Use a holster or proper receptacle for the smaller type, especially those with exposed trigger.

In the case of hammers, wherever possible have a device on the hammer to hold the tool in place. If this is not practical, require the men to remove the tool when the hammer is not in use. Here, too, the holsters or other suitable receptacles can be used for safe and convenient handling of the hammer.

Importance of Safety Inspection in the Press Room

Orig. paper - 5925 By J. LEONARD JUHL

General Superintendent of Planning, The Murray Corporation of America,
Detroit

The speaker said in part: The importance of safety inspection covers a multitude of significant aspects—especially when one singles out the press room where hazards are great and the common run of accidents exceedingly bad in character and the resulting costs higher than the average in the majority of other departments or divisions.

Floors to be safe must be properly maintained. Press room floors must be kept free of oils and greases. This requires scraping at regular intervals. Bad floor conditions are one of the principal causes of accidents in all kinds of trucking. We must insist on both inspection and maintenance of floors if we are going to do our part to keep a low accident record.

The handling of material in the press room is a very complex problem. We must deal not only with the piling and unpling, loading and unloading, lifting by hand and by power, but we must also have a comprehensive understanding of the operation of cranes, hoists, conveyors, electric trucks and gas driven trucks. Material handling accidents are numerous and this is not particularly to be wondered at when one tries to take into the scope of his mind what a very definitely large part of the industrial operations are directly associated with the handling of all kinds of material.

Outside of the important problem of the correct method of handling dies, our storing and handling problems in the press room are necessarily confined primarily to sheet steel and stampings in process and also the finished stamping.

Continuous inspection, not by the safety engineer alone, but by the foremen and workmen is necessary to insure against piles being too high or carelessly stored.

Despite the fact that the modern press room is equipped with cranes and hoists of all types and every workable and conceivable type of conveyor, there is still much trucking, both hand and electric, yet to be done. Likely, under any and all conditions, trucking will continue to be as much a part of the press room as some of the press operations.

First, let me say that no man operates an electric truck without being licensed by the safety department and then only after he has shown the mental and physical stamina sufficiently sound to warrant his handling a piece of equipment which represents an investment of from \$3,000 to \$5,000. An electric truck is a dangerous piece of equipment if the driver does not know his job.

Hand lift trucks are used to transport flat skid or box skid loads of material from operation to operation where the routing specifies work on the part away from the continuous operation line-up. This type of hand lift truck is also used for moving to the central small part storage, skids and other containers which the electric trucks take to the shipping room or assembly lines. Other types of hand trucks in our press room have been practically eliminated. The virtual passing of hand trucks of the obsolete types has definitely cut down material handling accidents to a degree at one time believed unattainable.

There are many rules relative to crane operation. To insure safety, cranes must be operated only after an authorized inspector has passed on them and then by crane operators who have successfully answered all necessary points of issue in the questionnaire submitted before giving operators' licenses.

The movement of any crane while handling material of any description must be governed by a definite and uniform code of signals. We employ the signal code as recommended by the National Safety Council. Signals can only be given by one individual and this man absolutely governs the movement of the operators except in a case where the operators can see a hazard that will result in an accident if signal instructions as given are carried through. Warning signals such as sirens, whistles, bells or gongs should be sounded before starting and during crane load movement.

The necessity for speed in this highly competitive industrial era has pushed the use of all types of conveyors into the foreground. Mechanical conveyors are occasionally put in for safety's sake but more often to improve methods of getting material to and from a given area. Mechanical conveyors soon determine after a few months of operation how safety minded were the plan engineer and the safety engineer. Too much care cannot be exercised in any type of conveyor installation.

Chain conveyors should be guarded with a wire trough-shaped screen where operators or assemblers are working directly beneath the conveyor proper. Flat conveyors are used by us in the transporting of loose scrap steel to the baling room. The conveyor is placed approximately five feet under the floor level; this operation being controlled from the baling room. Flat conveyors are used chiefly by us in loading sheet metal scrap which has been baled. The hazards here are approximately the same as with the ordinary chain conveyor. However, it is more essential that a substantial guard screen be placed under the flight conveyor, owing to the nature of the product being carried.

One of the greatest difficulties in getting men to wear goggles is the fact that sometimes safety engineers are inclined to want goggles worn by workmen in areas where they really are not required. However, if there is any question as to the advisability of goggles, they should be worn, by all means, regardless of what the operator may think. It is our practice to inspect every man's job, without consideration as to what production department he is in, to determine whether or not goggles are necessary.

In reviewing protective clothing in so far as the press room is concerned it seems that only a few practical rules need be laid down. First, it is advisable to have safety shoes. Second, the ordinary shirt sleeve is too loose and should be cut off

above the elbow or a pair of over sleeves or cuffs should be used. Third, neckties should not be worn by press room operators for fear of getting the tie in some of the moving machinery parts. Fourth, steel-lined gloves should be worn only in extreme emergency, where the materials are rough or sharp. Gloves constitute a real hazard and their use should be carefully studied.

THURSDAY MORNING SESSION.

October 5, 1933.

Selling Safety to Workers in the Metal Trades

By THOMAS P. KEARNS

Superintendent of Hygiene and Safety, Industrial Commission of Ohio,
Columbus, Ohio

The speaker said in part: At the outset I must say I am not sure whether I like the term "selling" safety to the worker. I like better the phrase "teaching safety to workers", since the whole problem is fundamentally grounded in education.

The first step, of course, is contact. You must reach the worker in order to sell safety. And here arises the first barrier which you must hurdle in order to get in touch with your prospect. The worker is in a plant. You cannot march uninvited into a shop and preach safety to the worker, individually or collectively. You must first have the consent of the management to even get in touch with your prospect. Furthermore, every argument you make will fall on sterile ground if you have nothing more from the management than consent to peddle your wares. A successful sales talk depends on management's interest and cooperation. And you cannot go into a shop to sell safety to the worker unless and until management has set the stage by taking all measures that are management's part in a safety program—approved mechanical guarding, proper assignment of men, alignment of machinery, well defined aisles, adequate lockers, toilets and lavatories, well lighted, sanitary and orderly work rooms, safety committees, a thorough system of reporting accidents, and numerous other features that might be enumerated but with which you, as safety engineer, are thoroughly acquainted.

Thus it is that in answering the question of how to sell safety to the employee, we are compelled to answer by giving you some idea of how to sell safety to the employer. He is the real salesman. Safety sentiment never grows from the bottom up. Hence the necessity of initiating a safety program with the arousal of managerial interest.

In selling safety to the employer, reliance must be placed on two main arguments—safety as a form of employee welfare and safety in the light of its economic value. A convincing presentation of either one of these arguments should be sufficient to effect a sale, but as a matter of fact it generally requires thorough conviction on both points before the average employer is ready to recognize the desirability of safety and adopt it as a principle of operation equal in importance with production.

If the safety movement is based upon humanitarianism, as we will all concede it should be, ordinary common sense should teach us that the ultimate success of that movement depends largely on mutual understanding and good will, and these are certainly not encouraged and cultivated by arbitrary regulations, the observance of which are mandatorily enforced. Furthermore, it seems the height of folly to expect

the fullest measure of interest and cooperation of workers in a program actuated largely by purely economic motives.

The point I am trying to make is this; no worker is really a safe worker who observes safety regulations because he has to. He must be made to reach that stage of conviction where he works with an eye to safety because he wants to. I have made this statement before and I repeat it for the reason that it is my firm conviction that therein rests the key to the problem of mental attitudes, which have such an important bearing upon the whole accident prevention question.

It is only a touch of human nature that a man should have a deeper interest in projects of his own creation than he has in matters thought out by others and imposed upon him as one of the requisites for holding his job. In the one instance he has a pride in demonstrating his own achievements. In the other he is performing a duty in which he has no real creative interest. Telling a worker he must do this or do that may prevent a lot of occupational injuries; but convincing a worker that, as a matter of self protection, he should do this or that will prevent even more. People do things more cheerfully and more effectively from their own volition than they do under compulsion. This is just as true of the employer as it is of the worker, yet many employers who are themselves convinced that safety pays are blind to the lesson involved.

Since the subject of our talk is the sale of safety to the worker, let us look at the proposition from the standpoint of the employee. Which thought is mostly likely to compel his interest in safety work, that which indicates a real human interest on the part of the employer in his physical well-being or that which attempts to enlist his co-operation on the basis of economic saving to the company?

Before this question can be properly answered, we must all have a clear realization of the fact that industrial conditions have changed with the times. A few years ago, before the age of mass production and consolidations, the employer was in close contact with his employees. He knew them personally, was acquainted with their family life and social affiliations and had a personal interest in their welfare, not only in those conditions which had a bearing upon their productive capacity, but in a physical and economic welfare, also. Today, the real employer in the average plant is often without personal contact with a single man in the plant. He may not even be a resident of the community in which it is located and his authority must be delegated to subordinates whose positions often depend upon greater production at less cost. These subordinates, no matter what personal views they may entertain on the subject of safety, are powerless to put their theories into practice without the sanction of the higher official who may be located a thousand miles away, who may never have been in the plant and who has no first hand knowledge of the conditions existing as related to accident hazards.

If I were to be asked what is the first and most difficult barrier to be surmounted in getting a group of workers solid on safety, I would say without hesitation—mental attitudes. Here the engineer is many times groping about in the unseen. He has no knowledge of the character of the relations between management and men, the extent of the confidence and respect each has for the other, the sincerity of the employer in his safety professions or the loyalty of the worker to his superiors. Yet these mental attitudes sell success or failure to any safety undertaking, regardless of the completeness of safety regulations or the rigidity of their enforcement. No substantial safety structure can be reared on the flimsy foundations of dislike and distrust. It must be firmly embedded in the rock of mutual respect and interest.

No matter what system of safety education you use, and they are many and varied, the seeds of safety thought you have sown will never come to fruition if you neglect to completely impress upon the mind of the employee that you have a real personal, human interest in his welfare and convince him that that interest is entirely free from exercise of dictatorial authority. Safety ground can be followed in no other way and success in any safety movement depends largely on ground preparation. Psycho-analysis of individuals and groups, as a preliminary to the carrying out of a safety program, has an importance that cannot be too strongly emphasized and the extent to which the results are favorable or unfavorable depends largely upon the perception of management in assuming attitudes that encourage loyalty and pride rather than antagonism.

The success of the safety movement depends almost entirely upon somebody selling safety to the employee. You cannot sell a man something in which he is not interested. You cannot interest a man in a movement in which he is denied the right of participation. Hence, it should be plain that no safety program can be fully successful that does not give the employee a voice in its plans and policies. And just as certainly, the full measure of no employee's interest in safety can be aroused by purely economic appeals. Safety regulations may secure his compliance but no real heart interest can be awakened until there comes to him the conviction that the employer has a human interest in his welfare that transcends all consideration of production and profits, that refuses to weigh physical pain and mental anguish in terms of dollars and cents and is actuated solely by the spirit of brotherly love.

Education and Discipline in the Accident Prevention Program

By J. A. VOSS

Director of Industrial Relations, Republic Steel Corporation, Youngstown, Ohio

The speaker said in part: Statistics of recent origin indicate that approximately 98 per cent of accidents in industry today are due to (1) indulgence in unsafe practices, (2) violation of safety rules, and (3) chance-taking and indifference toward the safety movement. These statistics also emphasize the necessity of education and discipline, and therefore our efforts must be concentrated on the education, training, and instruction of the employees.

This can be done only in three ways. (1) By a study of the safety requirements of the job itself. (2) By a plan whereby the man is taught how to fulfill the job with the greatest safety and efficiency. (3) By absolute discipline, so that in the course of his training the best and safest way of performing a job becomes a habit with him.

The effectiveness of safety devices, rules and regulations depends largely on how much the human beings working with them keep their minds constructively active. We will have safety largely in proportion to the number of workmen and executives who think safety and who use this thinking as a basis of safety action; therefore, any device, scheme, or plan which will stimulate or improve thinking by industrial workers in their relation to safety merits our careful and thoughtful consideration.

1. Keep all officials and all employees actively interested in the safety and well being of their co-workers by maintaining great interest at meetings of general safety

committees and departmental committees. We hold monthly meetings with our district managers and department superintendents. The department superintendents hold monthly meetings with their foremen, and the foremen hold meetings at least once each month with their employees. We feel that this method of carrying safety from management to workmen is a wonderful medium of keeping safety education alive.

2. Interchange of all information relative to lost-time accidents, showing briefly the causes of such accidents and recommendations to prevent recurrence so that when accidents happen the manager, superintendent, and in fact everyone in authority, will all preach the same gospel of safety to prevent recurrence.

Education on any subject can be accomplished when the student takes the keenest interest in the subject. To insure success in such a movement there must be instilled in the employees the feeling of self-interest and self-protection, possible only through their own efforts, explaining to them that it may be their own individual person that is injured or that it may be a very dear friend or relative. If they can be made to understand that it is their individual duty to report these dangerous practices, conditions, etc., the greatest incentive for the continuation of safety will be recognized. Employees should be educated not to put off making reports of unsafe practices or conditions until some periodical meeting, but the motive "do it now" should be instilled in the mind of every man who has anything to do with such matters.

The fact that some employees have no accidents or practically none in the performance of their duties, while others working under similar conditions have many accidents, is due to the human factor. They may be caused by insufficient training or education, by lack of proper discipline, by lack of interest in the job, by worry or other distractions, by poor health, by a wrong attitude toward the job, the employer, or the worker's associates, or life in general. Therefore, it becomes necessary to develop a study of the individual who tends toward having accidents, and follow this with an application of suitable corrective measures.

The foreman should be made to realize that it is his responsibility to prevent accidents and that it is an important part of his duties to catch all unsafe practices, violation of safety rules, etc., so that hazards may be met before an accident really occurs. If he sees one man doing something in an unsafe way he should use this as text for a talk to his men and an example to help others avoid the same thing. It does not do to talk only to the one man who has used the unsafe practice. Foremen should be instructed to select one source of accidents each week or month, and use this as a basis for department inspection to remove such sources of hazard by either equipment or method of work.

Discipline has an important place in the safety program so that in the course of the employee's training the best and safest way of performing a job becomes a habit with him. Foremen should never allow an unsafe practice, violation of safety rules, or other infraction of safety instructions to get by them. We all know that men as a whole are amenable to reason and in the accident prevention program, therefore, one only needs to combine patience with fair discipline to get results. It may be an unpleasant duty to discipline an employee after an accident has happened; if discipline becomes necessary, it is much easier to apply this before accidents happen. Penalties should be given for infringement of rules or indulgence in unsafe practices if the employee has been previously cautioned against them. If a warning is not effective, discharge should then follow. I would rather see an employee walk through the gate of a plant for discipline on account of an unsafe practice or infringement of a safety rule than to have him carried out on a stretcher.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Public Utilities Section

Officers 1932-33

General Chairman—C. B. BOULET, Wisconsin Public Service Corp., Milwaukee, Wis.
Vice-Chairman in Charge of Telephone and Telegraph Interests—F. M. PEPPER, Illinois Bell Telephone Co., Chicago.

Vice-Chairman in Charge of Gas Interests—E. J. KREH, Philadelphia Co., Pittsburgh.
Secretary—HOWARD M. SHAW, North American Light & Power Co., Chicago.

News Letter Editor—W. G. CLEVELAND, Northern Indiana Public Service Co., Hammond, Ind.

Chairman Membership Committee—S. C. DICKINSON, Pacific Gas and Electric Co., San Francisco.

Chairman Poster and Film Strip Committee—H. A. PROLMY, Public Service Co. of Northern Illinois, Chicago.

Chairman Program Committee—WILLIS MACLACHLAN, Consulting Engineer, Toronto, Ont., Canada.

Chairman Publicity Committee—H. E. SHEDD, Appalachian Electric Power Co., Bluefield, W. Va.

Chairman Statistics and Contest Committee—W. H. BROWN, Northern States Power Co., Minneapolis.

Chairman Engineering Committee—ROY M. GODWIN, Philadelphia Electric Co., Philadelphia.

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E. W. GORRY, The United Electric Light and Power Co., New York City.
A. A. KLINGE, Public Service Company of Colo., Denver.
W. H. MULLIGAN, Hydro-Electric Power Commission, Toronto, Ont., Canada.
JOHN M. ORTS, Public Service Corporation of N. J., Newark, N. J.
JOHN STILWELL, Consolidated Gas Company of N. Y., New York City.
D. W. WAIT, The Bell Telephone Company of Pa., Pittsburgh.

Councillors—

F. S. BEAUMONT, The Peoples Gas Light and Coke Co., Chicago.
B. B. McCULLOCH, Bureau of Safety, Chicago.
H. L. MEAD, Ohio Bell Telephone Co., Cleveland.
C. B. SCOTT, Bureau of Safety, Chicago.
J. L. VANDEGRIFT, The Chesapeake and Potomac Telephone Co., Washington, D. C.
H. F. WEBB, West Penn Electric Co., Pittsburgh.
H. M. WEBBER, Illinois Bell Telephone Co., Chicago.

TUESDAY MORNING SESSION

October 3, 1933

The first session of the Public Utilities Section was called to order by Ernest L. Simonds, Southern New England Telephone Company, New Haven, Conn., who extended a welcome to the delegates in the name of the Executive Committee of the National Safety Council. He then introduced General Chairman C. B. Boulet, who presided. Chairman Boulet made a brief report on the activities of the section during the past year, mentioning especially the work of various active committees, and emphasized the need and willingness of all members of the section to co-operate fully with the newly elected officers during the strenuous times ahead for industry under the "New Deal."

He then called for the Report of the Nominating Committee, which was presented by E. S. Beaumont, Chairman, and the following officers were duly elected for the ensuing year:

General Chairman—F. M. Pepper, Illinois Bell Telephone Co., Chicago, Ill.

Vice-Chairman for Telegraph and Telephone Interests—D. W. Wait, The Bell Telephone Co. of Pennsylvania, Pittsburgh, Pa.

Vice-Chairman for Gas Interests—E. J. Kreh, Philadelphia Company, Pittsburgh, Pa.

Vice-Chairman for Electric Interests and Program—Roy M. Godwin, Philadelphia Electric Co., Philadelphia, Pa.

Secretary—John J. Barada, Laclede Gas Light Company, St. Louis, Mo.

News Letter Editor—Ray A. Edwards, San Diego Cons. Gas and Electric Co., San Diego, Calif.

Engineering Committee Chairman—W. H. Mulligan, Hydro-Electric Power Commission, Toronto, Ontario, Canada.

Membership Committee Chairman—A. A. Klinge, Public Service Co. of Colorado, Denver, Colo.

Poster and Film Strip Committee Chairman—H. W. Lueck, Commonwealth Edison Co., Chicago, Ill.

Publicity Committee Chairman—H. E. Shedd, Appalachian Electric Power Co., Bluefield, W. Va.

Statistics and Contest Committee Chairman—W. H. Brown, Northern States Power Co., Minneapolis, Minn.

Health Committee Chairman—Dr. Hart E. Fisher, Chicago Rapid Transit Co., Chicago, Ill.

Special Representatives—

J. M. Buswell, San Joaquin Light & Power Corporation, Fresno, Calif.

S. C. Dickinson, Pacific Gas & Electric Company, San Francisco, Calif.

P. R. Kuhn, Penn Central Light & Power Company, Altoona, Pa.

W. R. Loyd, Alabama Power Company, Birmingham, Ala.

H. A. Ptolemy, Public Service Co. of Northern Illinois, Chicago, Ill.

John Stilwell, Consolidated Gas Co. of New York, New York, N. Y.

A. G. A. Representative (Not yet named).

Councilors—

E. S. Beaumont, The Peoples Gas Light & Coke Co., Chicago, Ill.

C. B. Boulet, Wisconsin Public Service Corp., Milwaukee, Wis.

B. B. McCulloch, Bureau of Safety, Chicago, Ill.

H. L. Meade, Ohio Bell Telephone Co., Cleveland, Ohio.

H. W. Moses, Edison Electric Illuminating Company, Boston, Mass.

C. B. Scott, Bureau of Safety, Chicago, Ill.

J. L. Vandegrift, The Chesapeake & Potomac Telephone Co., Washington, D. C.

H. F. Webb, West Penn Electric Co., Pittsburgh, Pa.

H. M. Webber, Illinois Bell Telephone Co., Chicago, Ill.

Chairman Boulet then called upon the first speaker of the program.

Training: From the Standpoint of The Psychologist

By MORRIS S. VITELES

Department of Psychology, University of Pennsylvania, and Director of Personnel Research, Philadelphia Electric Company, Philadelphia

The speaker said in part: Training is among the principal factors in increasing efficiency, in reducing accidents, and in otherwise improving individual adjustment in industry.

Although the value of training may be recognized and the attempt made to organize it, much of its beneficial value may be lost through a failure to apply psychological principles of learning in the development of skill through training. This is well illustrated in the methods ordinarily employed in training motormen in the electric railway industry. The safety with which a trolley car is operated depends upon the integration of habits of response during the training period.

The purpose of devoting a period of two or three weeks to training the motorman is to promote the integrated co-ordination of these responses. They must be so firmly established and co-ordinated that when the motorman goes out on the road alone, in full charge of a street car, he performs them without the intervention of consciousness, that is, without thinking.

The procedure adopted by many street railway companies in training motormen is somewhat as follows: The apprentice spends a half day or a day in a school-room—ordinarily an old car fitted up for this purpose. Here he is taught the simple operations of starting and stopping a car, the meanings of signals, the uses and locations of fuses, the use of the fender, and similar details of operation. He is then assigned to a "run" with a motorman chosen by reason of his record for the instruction of apprentices. He spends a day with the motorman, watching him run the car and running the car himself under the direction of the motorman. For a period of ten days to two weeks this procedure is continued, the apprentice being assigned each day to a different motorman on a different run. The purpose of placing the apprentice with the different motormen is to give him contact with a number of experienced, trusted men, from whose example he may profit, and at the same time to enable him to learn something about the different routes, the special difficulties of each, etc.

The effect of assigning the new man to different motormen each day in this way is, however, from the point of view of the psychologist, most harmful. Experimental studies of learning have shown that when opposing associations are alternately practiced, they have an interference effect upon each other, particularly during the early practice period. In other words, the formation of a habit is interfered with if other responses, antagonistic to the one being learned, are practiced along with it.

In the procedure for training motormen described above this law of habit interference is overlooked. It was found by the speaker, who learned to run a street car as a preliminary step to the preparation of a test for the selection of motormen, that

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practically each of the motormen under whom he took training had his special "tricks"—individual ways of handling the controller and the air-brake handle. Instead of receiving from day to day uniform training in a definite series of responses involving the same muscular combinations, there were variations in the patterns of response employed from day to day. The total effect was to create interference in habit formation—a condition which retards the development of skill, lengthens the training period, and promotes an uncertainty of response which continues after the close of the training period, to the danger of the public and of the operator.

There are a number of training methods that can be used in overcoming the disturbing element in the training program described above, but each of them, in order to bring results, must apply the knowledge of the learning process contributed by the psychologist to industry. In the development of all kinds of skill—in working a punch press, in handling steel plates, in electrical substation operation, in gas plant maintenance, the training program is of utmost importance in the development of proficiency and of safe habits of work. An important feature of the good training program is a consideration of the psychological factors involved in the acquisition of skill.

Allied to the problem of exposing the new worker to variations in practices such, for example, among experienced motormen, is the question of whether practice on one form of work is of advantage in enabling the worker to perform better other kinds of work. Until recently educational practices were formulated on the belief that an increase in efficiency in one activity is accompanied by an increase in the power to perform other similar activities. This belief in the *transfer of training* assumed the existence of "general faculties" or "unitary powers" of memory, observation, judgment, motor ability, etc., each of which was developed through exercise with any difficult task involving that faculty.

The study of transfer effect has indicated that under certain conditions the practice of similar tasks may induce a *negative transfer* or *interference* with the acquisition of skill. The character of such interference is well illustrated in the classic card sorting experiment, in which the subject is required to sort as quickly as possible a set of 100 cards divided into 10 suits. The cards are so shuffled that in no case do cards of the same design come together. After the cards have been distributed 10 times, another order of designs is substituted for the one to which the cards have been sorted and the cards are again sorted 10 times. During the first three trials with the changed arrangement of designs the time taken to sort the cards is generally longer than the time for the first three trials of sorting to the first arrangement.

An outstanding weakness of the program for training motormen described above is the opportunity which it allows for *negative transfer*. The possibility of such negative transfer, combined with the evidence that the practice of similar movements has little if any positive value, further confirms the desirability of insisting upon the repetition of only those movements which have been found most suitable for the task as a means of ensuring the achievement of the necessary level of skill and safety in its performance.

An analysis of laboratory findings suggests that, as a general rule, it would appear to be good practice, from the viewpoints of efficiency and safety, to emphasize first the correct performance of the task, but to supplement this as early as possible with an emphasis on speed. The new worker must be trained in such a way that he will never be tempted to develop what the consensus of expert opinion agrees to be bad habits or undesirable methods of work. However, if the training period is to

accomplish its aims the habits of *quick workmanship* must step on the heels of *correct habits of workmanship*. Very early in the training period an emphasis on quantity of production must be introduced in order to profit fully from a joint stabilization of the correct and fast pathway into a fixed "motor form" embodying the advantages of speed and accuracy—of high quantity and quality and safety of production.

As indicated earlier in this discussion, the most important single factor in the acquisition of skill is *practice or repetition*. However, in order to take full advantage of the influence of repetition in establishing skills it is important to employ during practice only the most effective movements. It is just as easy to establish an incorrect or inefficient response as to set up, one which will most effectively meet the needs of the situation. The repetition of a faulty swing in golf, for example, will serve to establish that swing more and more thoroughly and, because of the effect of negative transfer, may later interfere with the development of a swing capable of producing better results. In the same way the repetition of a faulty method of work may result in its settlement and in interference with the learning of better methods. If left to his own devices the workman may as readily adopt a relatively inefficient method of work as "hit upon" a method calling for the least expenditure of effort on his part. If given an opportunity and the incentive to think through the problem involved in learning, the worker may ultimately choose a better method, but the only certain way of insuring the choice of an efficient method is through instruction from the very beginning in the method or methods which an analysis has shown to be most effective for accomplishing the purpose of the task. Effectiveness, in this connection, must be measured not only by a production criterion, but by the cost in energy expenditure and safety. Energy cost becomes particularly significant because of the fatigue induced by extra effort, and because of unfavorable effect of such fatigue upon accident proneness.

Training: From the Standpoint of The Teacher

By PROF. S. N. STEVENS

Department of Psychology, Northwestern University, Evanston, Ill.

The speaker said in part: Teaching is an art which, because it centers so exclusively in the influencing and directing of human thought and action, implicitly or explicitly requires that the teacher, if he indeed is to be an artist at his task, must of necessity make use of certain very definite psychological principles. I think sometimes we make a rather fatal error of assuming that the knowledge of the laws of *general life* is essentially synonymous with the art of teaching.

If we consider the attributes of a good teacher, we find among other things, first, that *good teaching* involves the communication of ideas in such a manner that the individual being taught not merely understands the meaning of the ideas in a general way, but comes to appreciate the significance of the ideas in relation to other areas of *information* to which they are naturally related or to which they become associated as the interest of the student expands and widens under the stimulation of the teaching itself. The teacher does not begin his task with a group of mental vacuums. He starts with not a passive but a very active material. The students whom he seeks to teach bring to him diverse backgrounds of experience, a wide range of individual differences in basic capacity to learn and profit from experience, as well as a diversity of *natural interests* in the problem to be discussed. Consequently, these things must be taken into consideration and as nearly as possible adapted to, if the teaching is to

possess any art at all, or is to have any value and significance for the people being taught. It appears to me that one of the weaknesses of both training methods is that it does not take into consideration these facts which seem to me to be essential to the problem.

A good teacher adapts his instructions to the needs of the students. No two men are alike, either in their capacity to understand or perform. The teacher will consequently be faced with adapting his methods of teaching to the capacities and needs of his pupils. In some cases he will have to repeat information and instructions many times before the student will have the ideas clearly enough in mind to transform them into action. In other instances a single careful statement will be enough to furnish all the insight and orientation that is necessary. It is obvious then that the teacher must be patient, and be willing to state and re-state his instructions many times. It will be well for him to remember that if the students are of average intelligence and after several periods of instruction they are still unable either to reproduce his ideas or to interpret them in form of action, it is more than likely a failure on his part to have communicated the ideas clearly, concisely and definitely in the first instance.

A good teacher respects the attention limits of the student. In general, it is safe to say that he can attend to only one thing or situation at a time. Under normal conditions we will attend long enough to ascertain what the situation implies or means and what we are to do about it. It is better to see to it that the student gets three or four basic facts or principles clearly and definitely and in the form in which he can put them to work, than it is for him to get twenty ideas, not anyone of which is meaningful to him.

At its best, teaching involves a leading out process. It is not merely putting new ideas into the minds of the students, but also getting the man to reproduce for you in the light of his own experience and understanding the facts and principles which you as a teacher have expressed. Teaching is more than lecturing. It is more than just handing out ideas. It is process by means of which ideas so handed out are given back spontaneously and correctly by the student who has been exposed to them.

A good teacher illustrates the principles that he is enunciating, by means of pertinent examples and illustrations, taken directly from the situation in which they are to be applied. I am a great believer in good demonstration. The more care used in selecting visualized material and in developing well planned and carefully rehearsed demonstration, the more effective the teaching will be.

A good teacher recognizes the value of repetition. Some ideas are so new and so novel that they are not easily tied up by means of the process of association with earlier experiences. The habits of performance which they imply has to be built from the segments of habit formation employed in the performance of other tasks and acts. The teaching must be of such a character as to facilitate the process of reorganization and integration of these earlier habits into a new complex. Many phases of work are so novel that a great amount of thought and experience is necessary for the student to gain any feeling of reality from them. Repetition should never be dull in the sense that the same words are employed repeatedly, but the same ideas should be reiterated many times, through the use of simple, yet vivid illustrations.

A good teacher should be able to arouse interest in the student, not merely by means of the things he says but also by the manner in which he says it. A spontaneous, vital interest on his own part is an essential prerequisite for the stimulation of interest in the student. The vital spark of enthusiasm which flies off from his own convictions will strike fire in the minds of his listeners.

Training from the Executive's Viewpoint

By F. M. PEPPER

General Plant Employment Supervisor, Illinois Bell Telephone Co., Chicago

The speaker said in part: In the Illinois Bell Company in Chicago, we have approximately 700 foremen and supervisors in the plant trained as vocational instructors and about 95 per cent of all plant training is now being done on the job under actual production conditions and on productive work.

From a psychological as well as pedagogical viewpoint, training on the job under actual production conditions or, in other words, linking the learning process with activity, is sound. We have found that where the learner is being trained on the job and on productive work, the instruction is more effective and that the learner is more enthusiastic and interested due to his actually contributing something to the production job.

A survey or analysis of the management function indicates that it is in itself largely a training job and that it is never complete. In any progressive enterprise, training is always going on and it is not confined to the newer employee.

With the recognition that training is a responsibility of management, are executives and supervisors qualified to do the training job? Generally not. Keen knowledge of the job and ability to perform in itself does not insure ability to efficiently teach it either in whole or in part to others. Teaching in itself is a profession, just as much so as any other art, and the individual foreman must be taught to teach, just as he is taught and trained to do the rest of his job.

The Bell System recognized in our earlier foreman training conferences that there existed a real need for training foremen in how to teach, and that this had to be done before we could, with any degree of certainty, transfer the training job back to the foremen. I say back to the foreman because we had really taken that responsibility away from him and he had very little to say or do about it. We developed a vocational instructors' training course for supervisors and foremen which consists of a three to four weeks' course on a full time basis in the teaching process with sufficient supervised practice to insure capability. This training work is carried on by men specially trained for the purpose. It takes ten to twelve weeks full time to train them as teachers of teachers. Briefly, the course consists of:

- (1) An appreciation of the need for an organized vocational training program.
- (2) The teaching-learning process.
- (3) Teaching methods.
- (4) Method of making job analysis and lesson planning.
- (5) Method of preparing lessons.
- (6) The layout and use of courses.
- (7) The field application of the plan.

In the development of training course outlines, the question of standardization of work methods invariably comes up. In our work, and I think in all industries, there are many jobs where there are several ways in which the operation may be performed. A real analysis of the various ways of doing the job generally determines that there is one best way, one series of small operations which will result in the greatest efficiency, and this, invariably, is the safest way.

In one instance, for example, an analysis of the operations incident to splicing cable resulted in the elimination of approximately 20 per cent of the motions which were found to be superfluous. (In the case of an 1,800-pair cable this would ap-

proximate 18,000 unnecessary motions.) Of course, this gets down to a motion study, but such studies do have a place in training programs.

In the development of any program for training or improving the performance of industrial workers, the big job is not determining *what* you want them to do; it is devising the method that insures that they will do what should be done in the way it should be done.

The problem of preventing industrial accidents is not so much devising methods and tools which, if properly used, will avoid accidents, but rather one of getting workers generally to use, properly and consistently, the safe methods and tools which we now have. The prevention of accidents, like the prevention of waste of material and time, is largely a matter of forming habits of careful workmanship. The same slip of the screw driver which punctures the hand also mars the screw head, damages some other part of the equipment, wastes time, and indicates faulty or incomplete training. From the workman's point of view, it is easier to use a screw driver correctly. Then why are the careless methods still in vogue? Simply because workmen at the outset learned wrong habits and were permitted to use them for years and years. Now, when you attempt to teach correct methods, you encounter a baffling resistance to change. A poster proclaiming "Work Carefully" will have little effect upon the work habits which have been used continuously for years. The key to efficient and safe workmanship is the continuous repetition, over and over, true to form, of correctly planned methods of work. There are no short cuts.

This point of view is not new to management. They have known it for many years but they are perplexed to know how to get these correct habits ingrained in workmen. I venture the suggestion that one of the principal difficulties is that the supervisory organization, particularly the first line foremen, are not aware of the importance of proper habit formation; they do not see the necessity for breaking incorrect work habits, they do not know how to go about developing the proper habits in their men, and they are not aware of the significance of constant supervision to see to it that good habits remain fixed.

Our practice in the Illinois Bell Company here in Chicago is to refer every report of an accident, minor or major, to the Plant Training Supervisor for analysis as to whether the particular work operation involved was included in the training course, whether the one best method of performing the operation is being taught, whether the training records indicate the operation has been taught, and what, if anything, is wrong in the performance of it. On the basis of this analysis, proper remedial measures are instigated. This frequently results in change in method of doing work, improved tools in some instances, retraining of the man, or, perhaps, training or retraining of the foreman.

The separation or taking away of our training job from the foreman and making it a centralized, special school job resulted in increased costs and lowered quality of training. It took away from the foreman that interest which he is bound to have if he is allowed to assume what he knows to be his rightful responsibility.

If we separate the safety feature from the rest of the operating job or in any way take away from the foreman the responsibility for the safety features of the job, he will lose interest and just naturally will not concern himself with this important matter. Let's let him do the job and let's help him so he may do it easily and naturally. To do this we must give due consideration to those psychological and pedagogical aspects of training which link safety with the operating job, together with real constructive effort through the medium of an adequate training program.

WEDNESDAY MORNING SESSION

October 4, 1933

The first feature of this session was the formal presentation of National Safety Council trophies to winners in the Annual Safety Contest of the Public Utilities Section. Chairman Boulet called upon W. H. Brown, Director of Safety, Northern States Power Co., Minneapolis, Minn., and Chairman of the Contest Committee of the Section, who presented briefly the salient points about this contest.

The contest extended from July 1, 1932, to June 30, 1933. A total of 127 units were entered in the contest, representing 91,779 employees who worked a total of 221,124,566 man-hours. These employees suffered 1,507 disabling injuries, creating an average frequency rate for the contest of 0.815, and 55 of the units finished the contest with rates below the average. Six of these unit companies had perfect no accident scores.

Lieut. Col. Henry A. Reninger, special representative, Lehigh Portland Cement Company, Allentown, Pa., and past president of the National Safety Council, then presented the Council trophies to winners of first place in the contest. He also handed out, with appropriate remarks, certificates merited by other contestants. Trophies were presented to the following unit companies:

Combination Gas & Electric Division Group A—Central Illinois Light Co., Peoria, Ill.

Combination Gas & Electric Division Group B—Oklahoma Power & Water Co., Sand Springs, Okla.

Electric Division Group A—Indianapolis Power & Light Co., Indianapolis, Ind.

Electric Division Group B—Mississippi Valley Public Service Co., Winona, Minn.

Gas Division Groups A and B—Central Indiana Gas Co., Muncie, Ind.

The remainder of the session was devoted to a symposium of three talks presenting the "Physical Plant from the Safety Standpoint," and discussing (1) Responsibility of the Design Engineer, (2) Responsibility of the Construction Engineer, and (3) Responsibility of the Operating Engineer. Chairman Boulet called upon the first speaker.

The Design Engineer

By W. R. SMITH

Assistant Chief Engineer, United Engineers & Constructors, Inc., Newark, N. J.

The speaker said in part: The design engineer must, in the very beginning, be conscious of the fact that he is in the position of being responsible for conditions affecting the constructor and the operator, and which neither will be able to alter to any marked degree. He must, therefore, fulfill his obligations in three respects:

1. His own design features must be predicated on the sound technical knowledge and experience which will insure reliability, efficiency, and economy.
2. He must be able to visualize, either out of his own previous personal experience, which is the more dependable, or out of such knowledge as he can acquire from his associates on construction, the respects in which he can reduce hazards of erection, etc., and give to the constructor the greatest latitude in his own operations.
3. He must be able to picture in his mind the finished plant in operation, under both normal and emergency conditions, and be qualified to apply the viewpoint of the

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operator as he makes his decisions with regard to general arrangements, clearances, accessibility, hazard elimination, etc.

From the first, or technical, standpoint, we may well expect a proper solution of any given problem by a qualified engineer. Here he deals with more or less well established fundamentals and data. If his work is pioneering to some degree, because of the utilization by him of higher temperatures or pressures, of greater capacities, of new or relatively advanced features of design or arrangement, he will need to be conservative in such cases where he cannot support his own conclusions with data out of the experience of others. Here the question of the safety of plant operators and workers in general goes hand in hand with that of safeguarding the investment and of guaranteeing the service of whatever nature against interruption or shut-down because of the failure of apparatus or equipment.

As we consider the second phase of the engineer's responsibility, that concerned with his obligation to the constructor, we realize that, whereas the engineer is in the position of being the one who can, with the exercise of good judgment, make it less difficult for the installation to be made with safety, yet, in general, his negligence, if there be any, (except of course, because of wrong technical approach), can be regarded merely as contributory. The construction force is responsible for the doing of work, and in all respects is expected to approach any construction operation with due regard for the hazards involved, and the technique in this respect is of such different character from that with which the designer is concerned. Fundamentally, the technique of construction involves the use of tools and equipment in ways correct and best suited to the nature of the work. But if difficulties of erection or inherent in certain arrangements are foreseen by the designer, and either removed through change or adequately provided for, much of the burden of responsibility in these respects can be lifted from the shoulders of the constructor. Here, therefore, does the engineer's obligation to develop that which can be produced economically stand out: for he may well see to it that he does not pass on to those who can do little if anything to improve them, situations which increase costs of construction because of complications in layout or congestion of the working forces, both usually imposing hardships on those responsible for schedules and necessitating extensive safeguarding and protection.

To the operator, the engineer's responsibility is real. In the first place, efficient and economical operation is expected; but in the second and more important respects, from the standpoint of our present consideration, what the operator desires is safe operation, free from routine hazards and the dangerous situation so often found to exist at times of trouble and which jeopardize the lives of workers during emergency and rush maintenance work.

Specifically, then, the engineer's problem is to strike the proper balance between the expenditures that he can afford to make to improve what we will call the safety factor of his project and the costs which might otherwise have to be incurred because of possible accidents due to hazards that would not have been eliminated. Those hazards which experience had definitely shown to exist with certain arrangements or operations, we would expect to be eliminated in some effective way in new designs; but it is to the new developments that, I think, our greatest concern should be given in this analysis. No one can predict all of the conditions that will arise, nor the actual extent of the risk that will confront the constructor and the operator respectively, when they in turn are called upon to construct and operate in accordance with a certain layout or general arrangement. It is through a thorough analysis of all the

possibilities, however, that we direct the engineer's attention, and in making such analyses and determining what, if anything, he should do, he has a right to assume a reasonable knowledge, experience, and exercise of discretion on the part of those who, as members of field forces and plant crews, come after him and take up their work where he stopped.

Illustrations are likely to be too specific, and it has always seemed to me that this subject, in general, is more one of principles. Perhaps, however, a few typical examples may serve to direct our thinking and show where emphasis belongs in certain respects. In the realm of details which we expect the engineer to examine most thoroughly from the standpoint of safety, let us consider:

1. Establishment of clearances and working space where not otherwise dictated by operating considerations.
 2. Provision of suitable exits from all building or areas where there is danger of any sort, thus making possible escape of men in emergencies.
 3. Protection of equipment and apparatus from fire and selection of fireproof construction wherever necessary, as for compartment doors, etc.
 4. Consideration of danger from burning oil, steam, water, conducting and asphyxiating gases, etc., in connection with selection of grades, heights of floors, placing of pits; elimination of piping from any area where it would be a hazard; closing of all openings between areas, sections, floors, where prevention of spread of any of the above is desirable.
 5. Safety interlocking of operations to: (a) safeguard life and limb of operators who perform operations; (b) safeguard life and limb of any others—construction or maintenance men, testers—who might otherwise be endangered.
 6. Adequate grounding of electrical devices, and of mechanical equipment to eliminate static charges, particularly where there is any condition that may contribute to explosions from this cause, of dust, oil, or gas fumes, etc.
 7. Degree of isolation of circuits and operations.
 8. Selection of gang or multiple operation of switches, valves, or other devices whereby hazards are eliminated.
 9. Dual control of operations, requiring two men, in any case where there is likelihood of mistakes which would have serious consequences to workmen or equipment.
 10. Provision of insulated platforms or surfaces for areas at telephone or other communication facilities, and in front of switchboards, or where there is danger of operating handles becoming electrified or statically charged.
 11. Use of fire walls, barriers, dampers, etc., to protect equipment from fire, or assist in the prevention of its spreading and its extinguishment.
 12. Proper ventilation, normal and emergency.
 13. Adequate illumination, normal and emergency.
 14. Arrangement of all piping containing any flammable gases, oils, or other fluids, so that they will not be subject to undue vibration, but also removed from locations where the contents may, if any pipe is broken accidentally, come in contact with hot surfaces or flame.
 15. Provision of means and facilities for the successful and dependable working of such "hold-off" schemes as may be essential or desirable.
- Accident prevention work, however, cannot be predicated on the assumption that there are no limitations to the expenditures that can be made to improve conditions, but rather on the relations between such investments, the likelihood of accidents (related to frequency), and the severity of such accidents when they do occur. If the severity is great, death or very serious injury being the probable result, then we find

that we are prompted to conclude that any designed expense to prevent this would be justified. We are, however, faced with other considerations, and cannot always conclude that extreme precautions are necessary, just because we can't imagine ourselves as the possible victim of the lack of them. Obviously, of course, there is at some point a limitation of the amount of money that the engineer can with justification spend in safeguarding a given insulation. If experience and cost records on previously completed work of a similar nature establish with sufficient definiteness the facts concerning certain conditions that can be improved, then the engineer is dealing with known values and can proceed with assurance. Many cases will arise, however, wherein only his mature judgment can be depended upon to guide his decision.

The engineer charged with the responsibility for design, can prove his worthiness of the trust placed in him only if his work demonstrates his ability to use men, money, and materials efficiently, which means without waste. We are all familiar with the great works of man in Egypt and elsewhere which were accomplished at tremendous sacrifice of life and under working conditions which we would today regard as intolerable. The great pyramids, constructed in accordance with the designs of the engineers of that day to be the tombs of monarchs, are more truly memorials to the lives which were sacrificed and the hardship and suffering borne by those who had no choice but to do the will of their masters.

I think that no designer is ever justified in the assumption that certain types of accidents are not preventable. The very progress of his profession, be it in whatever branch of engineering he may operate, has been made possible by an undying belief in the watchword, "It can be done."

The Responsibility of The Construction Engineer

By C. R. BEARDSLEY

Assistant Superintendent of Distribution, Brooklyn Edison Co., Brooklyn, N. Y.

The speaker said in part: What are the essential means the construction engineer must adopt? The essentials of an accident prevention program are, undoubtedly, the following: (1) standardized job methods; (2) adequate tool equipment; (3) carefully planned schedule—no congestion; (4) trained foremen and force; (5) supervisory follow-up—no delegation.

Of these, it may be said that the first three are fairly easy of attainment. Experience and experiment will develop the best methods and indicate the best tool equipment.

I have recently made an analysis of 55,000 accidents which occurred in public utility works. This experience has been broken down by type of injury against cause, responsibility, and prevention. I have segregated for study the nature of the injury, agency, the immediate occurrence or incidence (which most people term the accident which really is but one element), the indirect causes, the inherent or existing hazard, the key to prevention, the preventive, the grades of authority, and ultimate responsibility in the sense of obligation. Let me discuss briefly how these items vary with the different types of accidents.

The infrequent (but severe) accident: This type can be controlled generally through designed features of plant which will often prove costly to buy and install. They are, however, justified because, while infrequent, they result in heavy costs—by which is meant both the human suffering and the dollars lost in repairs to costly equipment and loss of use. Their infrequency has led to the mistake of omitting the protective

features of design as costly and unnecessary gadgets. Of course, not all serious accidents can be so controlled, but much of the really fine improvement in records, at least in the electrical utility experience, has been due to the scrapping of the older stations and replacement by switching and other equipment embracing protective measures. We can, therefore, pass over this feature of the accident experience as it lies in the province of Mr. Smith's contribution.

The frequent accident (less severe in injury): Perhaps we have paid too little attention to this class of accidents in comparison to that which we give to the spectacular individual case in which someone is killed or permanently maimed. In the aggregate, the cost (again including both human suffering and dollars loss) probably runs much higher in this classification—and do not forget that a minor accident may develop into a serious case. Another reason for our neglect is because in most cases the perfunctory reading of a report leads us to dismiss it, hiding behind the words, "lack of concentration," "carelessness of fellow employees," "failure to obey orders," or some other huck-passing phrase.

Design features will not go far to guard against this class of accident. Prevention depends on the actions of individuals as influenced by their training, methods of work, personal habits, and especially by the intent and keenness of the supervision they receive. The success or failure of the construction engineer in his safety program lies right here.

Methods of Training: The foreman is the key and supervision of the force which turns it. Then we must look to the training of foremen. While this may be in part an encroachment on the program of another section of this Congress, I feel that it is important enough to warrant duplication here. I would like briefly to describe a program of training foremen in job methods which is getting results.

The method used is that of conferences of small groups of foremen led by men in their own groups. The conference as a method is not new but perhaps some of our features are novel. The objective is to break down each job of field work to its least details and, through discussion, agree on the correct method of procedure to secure both efficiency and safety. At first we did not emphasize safety or analysis of accidents, but started on job training. We were encouraged greatly when the men soon developed the point that to do the job well and efficiently it must be done safely. Through these discussions, field practice is developed or corrected. Rules may be suggested and adopted and thus the foremen have a certain amount of self government. Rules thus originated and endorsed are more likely to be observed and followed.

Supervisory control: Assuming then that the foremen have been well grounded in the details of their jobs, may we further assume that the safety job is completely whipped? By no means! The real job remains of getting the knowledge of correct methods to the field men and to see that they follow them. We expect a tremendous amount from a foreman. By and large, we get a fine performance. His responsibilities are great. He has a large part of the duties which we enumerated for the construction engineer delegated to him to provide for the unit of force in his charge. Added to this is a lot of paper work on payrolls, receipt of material, reports of various kinds, and the difficulty of it is that he cannot delegate any of it to others. How in the world can we expect him to line up his gang and do the school teacher stint? It just can't be done all at once. It's a slow, gradual educational process.

I am drawing a conclusion from my own groups' experience. Our force of several thousand men is engaged in station, overhead and underground line work, emergencies and repairs, service work, sub-station operations, work in consumers' vaults and

premises, etc. Any accident report, whether loss of time results or not, goes across my desk. Generally, in reviewing a single case, it appears that either the man directly concerned or someone close to him in authority is responsible. In the more serious cases, we frequently have to look higher up. In a whole series over a long period we can gauge a much clearer view of the point of chief responsibility. But I would much prefer to watch this and determine the probability of results before the accidents occur by tabulating the inspection reports of job conditions.

The inspection reports moreover show the construction engineer something beyond a performance of the foreman. They show whether the assistant general foreman, general foreman, and supervisors are on their toes and are watching the foremen who report to them. In fact, it is a tonic to performance all along the line. The laxity may exist much higher up the line if the supervising group becomes perfunctory in its attitude toward either efficiency or safety, or prefers haste at the expense of safety, forgetting that planning might remove the necessity for haste.

The danger of complaisance: Probably in most companies we are either in or may soon reach a period of re-employment. In any event, we have been transferring men from job to job in an endeavor to keep them employed and on the payroll. The great danger is that we assume that they are qualified to perform work in their new locations, are familiar with the special conditions and methods necessary if a hazard is to be avoided or, indeed, if we are to avoid actually creating hazards.

We must not become complaisant because we have had good records. We must place the responsibility for training foremen, for seeing that they follow and know the capabilities, limitations, and performance of the new or transferred employees assigned to them. The supervisors must set a standard of schooling, physique, training in technique, and knowledge of safety precautions for special work, and must see that no unqualified employee is given work beyond his capacity.

This program, then, is primarily one of advanced prevention by attention to job details. To succeed, it needs more than a force of skilled mechanics, more than trained foremen, more than safety inspectors—it needs a construction engineer who can imagine the difficulties his men have to meet, who will personally analyze the failures and give sympathetic aid and apply direction in correcting them. When once the rank and file gets a feeling that the boss is out to help and not to "get something on them," their confidence and co-operation are assured. There is no greater stimulant to a good alert accident prevention spirit than for the men to know that the boss is watching. There is no greater reassurance to the boss than to realize that his force is on its toes, knows its job, and backing him up.

Orig paper p87 The Responsibility of The Operating Engineer

By W. A. BUCHANAN

W. A. Buchanan
District Manager, Appalachian Electric Power Co., Welch, W. Va.

The speaker said in part: In my industry, the electric light and power, which now employs a quarter million men, marked strides have been made in the reduction of accidents. In 1913, this industry killed one man out of each 50 employed, and injured one for each man on its payroll, whereas 20 years later, in 1932, fatalities were only one man out of each 1,400, and injuries were only one man of each 40. This great improvement, however, is not accepted as a satisfactory goal by those who have carefully analyzed and studied the problem. By the application of a reasonable accident prevention program, our industry should reach the point where there

will be only one fatal accident per year for each 2,500 men, and only one man injured from each sixty employed.

What is a reasonable accident prevention program, and what is the responsibility of the operating engineer in arriving at the minimum of accidents? The first and most fundamental problem with which he is confronted is the development of the operating personnel into a compact, co-ordinating group, each employee understanding his function and trained to meet any situation which may arise. Many factors have to be considered in solving this problem. The selection of employees, their health and family connections, their character and personality, the individual training necessary that each one qualify for his position, the careful planning of line authority within the organization, are all matters to which the engineer must give earnest consideration. Whether it be a water, gas, transportation, telephone or electric utility, this question of employee selection and training in order to develop a unified whole must be answered.

Beginning with the production division and endeavoring to bring to your attention some of the responsibility of the operating engineer who supervises a power plant where energy stored in coal is transformed into electrical energy, we first meet with the problem of proper handling and storage of slack coal, which in many cases involves the operation of various forms of cranes, conveyors, and like equipment. Many plants of later design pulverize their fuel, a process which greatly increases the storage and handling hazard, pulverized coal being highly explosive unless properly cared for. Injuries to the eye in and about the boiler room should be avoided by use of goggles and smoked lenses. All rotating apparatus should be carefully safeguarded in order to protect against persons or objects coming in contact with moving machine parts. Periodic inspection of all equipment and apparatus is essential in order not only to secure continuity of service but also to prevent serious loss of life and property. Past records indicate numerous instances where workmen have lost their lives from electric shock caused by faulty extension cords. Cleanliness, order, and consideration of continuity of service are the concomitants of accident prevention in the well managed boiler room. In the turbine room whether the generators be driven by steam or by water, the responsibility of the operating engineer resolves itself largely into a daily inspection of the machines. The governor mechanism, which is the nerve center of the generating machine, should be checked at frequently recurring intervals in order to determine that it will function when called upon to do so. Steam and water conditions must be carefully analyzed to protect the turbine blading. Pumping equipment and auxiliary motors, each of which is but a cog in the gear of continuous service, must be scrupulously inspected and properly maintained. These functions of plant supervision automatically decrease accident hazards and, if systematically followed out, will improve the accident experience of any plant.

Engineering research and the development of high voltage transmission of electric energy have afforded us the opportunity of locating generating plants at the most economical point where coal and water are best available. Connecting these plants by means of transmission lines which reach out to load centers at quite distant points, a transmission system is built up which may cover great areas and include many hundreds of miles of lines. In order to supervise properly the functioning of these lines and attendant apparatus, including transformers, oil switches, and switch gear, it is common practice to locate a system operator, more commonly termed a dispatcher, at some vital point, to whom is entrusted the responsibility of handling all switching operations. This dispatcher must be in constant communication with every

point on the system. When it is desired to change the status of any equipment or circuit, the dispatcher must be consulted and orders received from him as to the procedure. The system operator must be prepared to protect life and property in case of emergency, and he should make analytical studies under assumed conditions of trouble in order that his mind will be trained to function when actual emergencies arise. As long as normal conditions exist and operating procedure follows established routine it is possible that certain faulty conditions of personnel and equipment are overlooked. It is when trouble occurs or an emergency arises that these conditions appear. The operating engineer should so closely follow up his organization and so carefully inspect the equipment under his supervision that chances for error and apparatus failure are minimized. The maintenance of transmission lines uncovers hazardous conditions which require the utmost ingenuity to overcome, particularly in mountainous country where employees are operating far from their main headquarters. High voltage switch gear used in connection with transmission systems should be carefully and frequently inspected for defects. Oil switches particularly require the most exact adjustment in order to avoid possibility of failure to open when required.

In the routine operations of distribution, where employees are operating sub-stations, where line crews change from job to job daily, with no headquarters other than the truck from which they are working, hazardous conditions are developed which require constant vigilance. Distribution voltages rarely exceed 13,000, the most common being 6,600 and 2,300 volts. In handling such voltages, workmen can be sufficiently protected from electric shock by the proper application of rubber blankets, mats, hose, and gloves. The operating engineer should make a study of the needs of each type of crew and see that every man is provided with sufficient rubber goods to meet the conditions he encounters. All protective rubber goods should be carefully inspected and tested at regular periods under competent supervision. All tools, ropes, ladders and other accessories, both those owned by the company and the personally owned tools of the employees, should undergo regular periodic inspections. Even the smallest screw driver which is found to be defective should be cast aside. Maintenance of oil-filled apparatus and proper adjustment of oil circuit breakers should be meticulously supervised in order to avoid equipment failure with consequent loss of property and possible injury to life. Particular care should be given to tree trimming procedure.

The principal points to be watched in order to avoid accidents in underground distribution work are: protection against street traffic, support of trenches to avoid cave-ins, determination of the presence of noxious gases, proper identification of cables, correct use of hot solder and compound materials, and proper checking and inspection of air compressor equipment. The operating engineer should very carefully follow up all inspection reports and see that any condition of hazard is immediately corrected.

Many utility companies have concentrated all work on consumers premises under one department. Such work includes service installation, meter installation, handling of complaints, handling of consumers trouble, meter testing, meter reading, and appliance installation and service. The possibility of accidents occurring to the utility employee and to the public is very great and requires the utmost care and caution. Special attention should be given to the selection and training of employees whose duties require them to enter consumers premises, inasmuch as not only safety of life and property but the public relations of the company largely depend upon the character, attitude and personality of the utility representative.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Quarry Section

Officers 1932-33

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Vice-Chairman—S. M. SHALLCROSS, American Lime and Stone Co., Bellefonte, Pa.
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A. L. WORTHEN, The Connecticut Quarries Co., Inc., New Haven, Conn.

TUESDAY MORNING SESSION

October 3, 1933

The first session of the Quarry Section was called to order by General Chairman Otto M. Graves, The General Crushed Stone Company, Easton, Pa., who presided. The chairman gave a brief resumé of the activities of the sectional committees, particularly the Executive Committee of the Section, during the past year, and then introduced the first speaker.

*Orig. paper -
F-519*

Emergency First Aid

By DR. H. W. GENTLES

Chairman, First Aid Life Saving, Chicago Chapter, American Red Cross

The speaker said in part: The first picture that comes to my mind is made up of a series of accidents, men crushed, bones broken, bad bleeding and all of evidently serious nature from the start. On the other hand, in this city a few weeks ago a tailor pricked himself with a needle and a few days later died from lockjaw. One of our largest employers of labor in this community had no fatalities in the running of his plant, but one of the girls in his office suffered a slight abrasion on her finger and died of blood poisoning.

It is quite evident that if an injury, no matter how trivial, causes death, it must be looked upon as an emergency. Therefore, practically all first aid is emergency.

What do we require in equipment to meet such dangers? Asphyxia, drowning, overcome by gas, electric shock, require no equipment. For serious cuts with bleeding and tourniquet provided or improvised, and antiseptic to apply to the surface of the wound and the surrounding skin, dressings, bandages, and splints. For serious contusions or fractures we require splints, padding, bandages or ties.

In the work done in this section of the country the problem of getting at the patient is sometimes a difficult and serious one; and the safe removal of the patient without further injury is also a grave problem. We must realize that all cases that are serious from the start suffer great shock and the extent of that shock may modify the method of treatment very decidedly. In the case of a man falling, striking on a ledge, with several ribs broken and a compound fracture of the thigh, if a rope is tied around his chest and he is lowered to the ground a considerable distance below, he is quite likely to succumb to added shock. If the weather is warm and the man can be reached, blankets, hot water bottles and splints used on the spot will be the thing to do, while a means of removing him flat will lessen the primary shock. The same case under the same conditions in cold weather, if allowed to lie, would mean that the shock would be continued and if the man did not die at the time, he would be very apt to develop pneumonia in a few days.

From what I have said, it is evident that the smallest company can provide the material that is required to handle these cases or can improvise much of it.

During the war the experience of the allies in splinting fractures up at the front with the Thomas splint saved large numbers of limbs and lives, and in the newly issued edition of the American Red Cross text book the directions for applying these splints are given in detail. Any company can get these splints at a comparatively small outlay from the instrument maker, the local hospital or their physician.

Who is to do the handling of these cases? This brings in the question of the status of the medical man. First aid was brought out by the medical man. The scope and the limitations and the text books were written by him. It does not seem good sense, if the company has a medical man to whom these cases go after having first aid, that he should be ignored in the primary handling of those cases.

The interests of the patient, of the safety man, of the employer, are all definitely tied up in this, and the Red Cross or the Bureau of Mines or the Safety Council text books on first aid and its organization make it evident that there ought to be the closest cooperation between the four.

Any man who has had to do with first aid, who has seen the work in a number of companies, realizes that first aid should be done by men who have been carefully trained. If he has any doubt about it let him decide at once whether he would rather have his own broken leg fixed up by somebody who knew nothing about it or by a man who had been trained.

The training should be given according to the standards of the Bureau of Mines or the American Red Cross. These set a definite minimum standard of teaching, which has already justified its existence by, first of all, cutting down accidents wherever it has been properly installed; second, by making men take care where before they were careless, when they understand what happens to their bodies and the risks involved; third, by changing their conception of bravery and of common sense.

I can think of nothing that would add to the success of installing a course of first aid more than that the supervisors and executives shall become students of the first course and go up for their examinations. A number of years ago the American Telephone and Telegraph Company felt that it was important that every employee should be trained. To make the employees realize how important the executives

felt it to be, the directors of this great organization took the course themselves. Wherever I have found the executives not enrolling to take the course, or who only drop in for a few minutes occasionally so that the men felt that they were being patronized, that is the best way to kill a course.

Many men whose jobs are more or less monotonous, whose lives have got to a point where the men can look clearly to the future and realize that they cannot get much further ahead, men who have got good sense and a good brain, welcome this course because it gives them something new. They like to feel that they are taking it so that they can be of service to others. Many of these men and many of the younger men also become very enthusiastic and work many hours. If you bring the competitive side into it, you immediately add another element which brings in a good feeling between the men of the company that is very fine.

After giving the competitions, many companies feel that a small number of trained men is all that is required. Fortunately there is not much in our average daily life to keep a man up to scratch in first aid, and therefore, it has constantly to be repeated; unless it is, the enthusiasm, the good feelings, die out. How can one keep that alive? First of all, it is not necessary to go to great expense in having competitions. Secondly, the men so trained should be encouraged to tie themselves up with the community projects and volunteer their services to the American Red Cross for groups like the Boy Scouts, Girls Scouts, Catholic Youth, etc.

A town in Missouri last year had one plant that had eleven of their men, now all accredited first aid instructors, coaching eleven teams for the Boy Scouts. The Chicago Chapter of the Red Cross has developed this idea through trophies being given to groups of towns so that the standards of the Chicago competitions are setting the standards for a population of between ten and twelve millions.

The men who have been doing this work are more active and alive than they were eight or ten years ago. Many of them, in spite of the depression, are distinctly better off than they were. All of them are more mentally alert, handle responsibility better. They have learned to handle youngsters with a gentle hand, because young people will not attend first aid classes if they are bored. They try to be interesting and alert and they are of more value to their employers.

It will be seen from these remarks that so far as emergency first aid is concerned the training of the teacher is the most important thing of all; secondly, that this teaching shall go as widely through the rank and file of the employees as possible. That wherever the medical department does not oversee this work, the safety department should not only grab it and make it its own, but should bring the medical man in so that all are tied up, and it is backed in every possible way.

Equipment is the least important thing.

Report of the Nominating Committee

The chairman then called for the Report of the Nominating Committee, and officers for the section during the coming year were elected as follows:

General Chairman—Otho M. Graves, The General Crushed Stone Co., Easton, Pa.

Vice-Chairman—William H. Baker, J. E. Baker Co., York, Pa.

Secretary and News Letter Editor—V. P. Ahearn, National Sand and Gravel Association, Washington, D. C.

Poster Committee Chairman—H. F. Yotter, The General Crushed Stone Co., Easton, Pa.

Publicity Committee Chairman—J. R. Boyd, National Crushed Stone Association, Washington, D. C.

Statistics Committee Chairman—W. W. Adams, United States Bureau of Mines, Washington, D. C.

Members at Large—

Norman G. Hough, The National Lime Association, Washington, D. C.

H. V. Owens, Eastern Rock Products, Inc., Utica, N. Y.

John Prince, Stewart Sand and Material Co., Kansas City, Mo.

A. L. Worthen, The Connecticut Quarries Co., Inc., New Haven, Conn.

*Orig. paper
pp 54
52d.*

Mental Hazards By CLAUDE L. BAYLOR

Safety Engineer, Louisville Cement Company, Speed, Indiana

The speaker said in part: You cannot help anyone in any better way than by helping him to help himself. This means that you must get hold of the dynamic qualities that are in him—that are natural to him, that belong to him, that are a part of his original-life—or that have been built up by his training.

Nearly all accidents happen when men are worried or when their minds are wondering. Accidents will happen when men are nervously tense. When a man is happy he is relaxed. A workman may be preoccupied, he may be thinking about his best girl; but he is fairly safe if he is relaxed. Few accidents happen when a man is thinking about his best girl, unless, of course, he is afraid she is going to throw him over. Then he is tense.

There are many aspects to the psychological causes of accidents. The ones that I consider most outstanding and interesting are: (1) stupidity; (2) lack of attention (or inattention); (3) irritation; (4) worry; (5) interest; and (6) physical condition.

What I mean by stupidity is the entire lack of forethought of accidents, a man starting out to do a job or perform a task without considering just how much danger there might be in this particular thing and the way he is going to do it. This might be called lack of foresight and a great many accidents would be eliminated if only we had the power of using more hindsight along with our foresight. Going about work blindly, blundering through a task.

I would like to offer a word of caution, however. Do not mistake bullheadedness for stupidity.

Inattention is another great failing of the human mind. Lack of attention causes many accidents. This has also been called wool-gathering. "Sloppy mental reactions result in sloppy habits." Men with slow mental reactions and physical reaction on jobs that require alertness and quick coordination are misfits and out of place and their accident records will tell you so. The same is true of the men of nervous, quick action or jumpy employees working where cool thought and regularity are required. This failing is both inherited and acquired.

The third mental hazard is irritation. In it are found many causes of accidents. Among the causes of irritation which I might suggest are poor light and poor eyesight. Noise is irritating to some people. For instance, there may be some men in your quarry who are unable to settle down to the regular routine work for some time after they have listened to a heavy blast or shot.

Next comes that grim specter, worry. Here is a mental cause that fairly eats out the heart of a man. A mental hazard which may cause almost anything to happen is this attitude of mind. It can cause a worker to become unobserving, careless, and

inattentive; unable to use even the ability which he has. He will put his feet or his hands where he shouldn't, in short, he hardly knows what he is doing. This may be due to his personal worries at home or from some other cause, perhaps created by an inefficient foreman or keyman. It may be his dislike for his job; he may be dissatisfied with his wages or his working hours; but usually I have found that it is some real domestic worry.

Let us come to grips with our own shortcomings and weaknesses. It is astonishing how few of us are willing to do this. We have heard so much about the destructiveness of unsound (or unhealthy) self examination. We have it so impressed upon us that a man must believe in himself if he hopes to make others believe in him, that we deliberately avoid self-analysis and cultivate an illusion of self perfection.

We sometimes find the characteristic habit in workmen of self-pity. How many of us are guilty of it? Is there another man anywhere who has to work so hard and for such a small sum or for such an inconsiderate firm? Is there anyone who has to put up with such exasperating fellow workmen? The effect of such a state of mind is to create an inner tension, a sense of maladjustment which makes happy and effective living impossible.

The greatest wisdom is to have learned to think; a clear unburdened mind free of mental strife will bring forth the results that make for a perfect organization. Study your men, understand them and remember that many who have contempt for the follies of others have only excuses for their own. There are but few men in this world who do not care to take someone into their confidence. Why not let this confident be you? It will serve the two-fold purpose of helping him and you at the same time.

Watch for particularly sullen men in your organization, keeping in mind that the most miserable people in the world are those who are too busy to be happy, and some people are so occupied in revenging past injuries that they are wholly unprepared for the new ones.

Lack of interest in a workman is reflected not only in our accident prevention work but in our production. One of the greatest problems the school teacher of today has is how to interest the pupil. How to make his work more attractive, how to make it more enjoyable. The same problem applies in industry, and to interest men simply means to engage their attention, to excite, to create any advantage for them, to first make them a skilled part of the job which they are doing, to make the job attractive to them. It is interesting to watch a workman and see just how thoroughly and efficiently he will produce a job after you have made him understand that you are depending on him, that you have confidence in his ability to handle this particular job. It is not fair to expect efficient high quality work from one in whom you have instilled an element of doubt. Take the keyman into your confidence and they in turn will carry this confidence on down the line into even the lowly pick-and-shovel man and if he is shown the thing you want done, how it is to be done and understands that you know that he is the man that can produce this job, he will do it.

Last, but not least, let us consider physical condition of the workman. In selecting our workmen we should look for certain necessary qualifications. We should have certain specifications to which he must measure up, in order that he may fit into our organization properly. He should be physically fit and qualified to handle the particular job on which we wish to use him and not to be just another semi-satisfactory element in our organization. The physical examination in industry can be looked upon in two ways: (1) as a necessary qualification for employment; and

(2) as an interest shown in the workman, to make his physical handicaps known to him in order that he may take steps to correct them and qualify as a mentally and physically fit workman and, therefore, prolong his own life.

I would also suggest the following, along with a rigorous physical examination covering the usual field:

1. A test of general intelligence—not "book learning" but such characteristics as memory, attention, adaptability to unusual situations, reason (common sense) and perseverance.
2. A test of emotional stability, meaning the ability of the person to perform certain simple tasks as previously directed, despite the distraction of other things.
3. Minor tests for muscular fatigue, reaction time, judgment of space and motion.

*Orig. paper
p. 2*

Safety in Quarry Operations

By THOMAS J. QUIGLEY

Chief, Mines and Quarries, Bureau of Inspection, Department of Labor and Industry, Harrisburg, Pa.

The speaker said in part: In order to put safety across and get 100 per cent results it is necessary to sell safety to every employee on the payroll. Every man is a salesman, but some fellows have better success in selling than others. Salesmanship is simply finding a fellow who does not agree with you and sticking to him until you change his mind. Do not try to change his mind by using language that he does not understand, talk plain shop talk, point out to him different things he or someone in his gang has done in a unsafe way or in violation of safety rules or state law, which resulted in an accident or loss of property. Do not try to do all the talking, give the man you are trying to sell safety to a chance to do some of the talking. Give him a chance to answer your questions and ask others.

In the years I have followed accident prevention work, I have always enjoyed hearing the other fellow's side. Many times he has said things that irritated me, but I have always tried to avoid offending him. When selling safety I have always tried to convince the person to whom I was selling it, first, that I was absolutely honest in what I was telling him; second, that I was sincere in the cause of safety; third, that if he would try the plans I suggested, I would guarantee him increased production, reduced cost of production and greater efficiency from his men.

Once you have established confidence, your battle is won. One good sale will bring on many others. Find a real tough job, and by that I mean, find a company with a large payroll and a bad accident record, find the man who digs down into his bank roll to pay the accident costs. If you sell him, you have a real safety booster and he will get you some real prospects. Make an impression that lasts for years.

I would like to call your attention here to several remarkable safety records broken by what is known as "man failure."

No. 1. This plant had operated 1,104 days without one lost-time accident. The plant electrician, also a member of the Safety Committee, in violation of the safety rules, attempted to make repairs while the conveyor was in operation. His leg was crushed, necessitating amputation at the knee. Three days later he passed away. In his possession at the time of the accident was a safety lock and key furnished by the company, and he had been fully instructed to stop the machinery and lock it before making repairs, which orders he had always previously obeyed.

No. 3. This company had a wonderful safety record. They had won the safety trophy in their home state, also had been awarded the Joseph A. Holmes safety trophy by the United States Bureau of Mines. A fatal accident ruined this safety record. The investigation showed the deceased was working in violation of the safety rules and the superintendent admitted that he personally did not require the use of safety belts and safety lines because, in his opinion, it was not necessary. Here is a case where the superintendent personally decided that he knew more about safety than all the officials of the state and his own company, and it was necessary to take a human life to prove to him that he knew nothing about safety.

WEDNESDAY MORNING SESSION

October 4, 1933

*Orig. paper
p. 3*

The Individual's Responsibility for Safety

By R. C. SALISBURY

Safety Engineer, Hardware Mutual Casualty Company, Stevens Point, Wis.

The speaker said in part: Apparently, it is difficult for workers to believe that a minor accident is a potentially serious injury—a "miss is as good as a mile" to many of them.

In surveying many types of risks throughout Wisconsin, Minnesota, and Illinois, and coming into contact with numerous types of foremen, it is surprising to discover their utter lack of understanding of the real principles of effective accident prevention work. They neither anticipate nor look for unsafe practices. True, they do advise employees after an accident has happened, but in many cases investigation has shown they do not, at least systematically and frequently enough, warn the employees before the accident has happened. And who, gentlemen, is responsible for this?

My thought is that if supervisors do not know the actual and probable causes of accidents, or are not familiar with printed and published safety codes governing the industry in which they work, then the individual responsibility for safety may justifiably be shifted to that of the employer, or upon the shoulders of the safety engineer, for the failure to properly instruct the supervisory force. With such knowledge, a foreman cannot intelligently merge safety with production; disciplinary action is haphazard and subject to personal prejudices, and workers are blamed for "carelessness."

Until the foremen are trained and have passed on all of the knowledge acquired from such training to the workers, we cannot, with fairness, hold the individual worker responsible. I am fully aware that there are many instances of "failure on the part of the employees to obey instructions", but I repeat that there are just as many instances where the instructions were never given or that they were faulty and frequently misunderstood.

The general orders on quarries and pits for the State of Wisconsin, revised and published effective January 4, 1930, and your own Safe Practice Pamphlets of the National Safety Council, contain information that every foreman should have. A study of these pamphlets will do much for your industry. The responsibility of teaching right methods is yours. Until this is done, the individual's—either foremen or operators—responsibility ought not to be taken too seriously.

orig paper
Sa 5

Safe Practices in the Silica Industry

By WAYNE B. GYGER

Superintendent, Ottawa Silica Company, Ottawa, Ill.

The speaker said in part: The silica industry is singular in many of its characteristics as compared to other mining or quarrying operations, but is not unlike its sister industry in relation to potential accidents. The mining and refining of silica require an exacting yet fairly rough class of work. Removal of the overburden is usually accomplished by means of power shovels and trucks, or dump cars. The overburden contains rocks and boulders which often fall from a well loaded shovel, and for this reason the truck drivers are required to leave their trucks and stand at a safe distance until the loading is completed. On account of this measure no employee has ever suffered an injury from this source.

The writer has no knowledge of a dynamite accident having ever occurred amongst the washed and dried sand operators in this district. There are several reasons for this, but chiefly because none except well trained workmen are allowed to handle any explosives. These men are all paid a good wage, and as a consequence there is practically no turnover in this class of help, assuring the management of highly experienced men. Strict cooperation is given the blasters by other mining departments, erasing the possibility of persons, other than blasters, being injured by explosives. No tools are used around explosives which have any metal about them. Wooden mallets and wooden wedges are used for opening dynamite boxes. Punches made of wood are supplied for cap insertion into the dynamite sticks.

The shooting of dories is accomplished by placing a single stick of dynamite on any chunk too large to handle in the usual manner. These chunks, if handled by hand, would cause many injuries to the hands and also result in injurious lifting. The number of dories shot at one time is limited to twelve. This number requires a theoretically safe time for lighting. There is no nervousness on the part of the lighter, and therefore, less danger of late or lost shots. Blasters are instructed to use more than sufficient fuse to guarantee ample time to walk clear of the blasts. When electric detonators are used, the lead wires are of a liberal length. There is no stinting of supplies given the man to assure safe practice.

The housekeeping inside and around the yards of most silica plants is especially good. This maintains a safe condition in many respects.

Rigid compliance with the State Factory Inspectors' recommendations is observed without question. In some of the plants a safety organization among the men has proved to be beneficial toward finding possible dangers through discussion of the subject.

A first aid outfit is maintained at all plants, but few cases are treated in this way. It has proved a better practice to have a physician treat even small cuts and scratches. One plant boasts of a 100 per cent record against infection over a period of more than 25 years, and gives the above reason for this enviable record.

Posters issued by the National Safety Council are displayed at strategic points in the plant. The comments of employees relative to these posters prove them to be psychologically reactive.

A periodical physical examination is made of each man and a record of this examination is kept on file. This record is used by the plant superintendent for the purpose of selecting the class of work for which each man is physically best suited. There is no limit to the value of these examinations.

ADJOURNMENT.

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Refrigeration Section

Officers 1932-33

General Chairman—L. W. DAWLEY, Southern United Ice Co., Jackson, Miss.
Vice-Chairman—T. A. ADAMS, Union Terminal Cold Storage Co., New York City.
Vice-Chairman—CARL C. CLEMENTS, National Dairy Products Corp., New York City.

Secretary and News Letter Editor—EDWARD H. FOX, National Association of Practical Refrigerating Engineers, Chicago.

Chairman Membership Committee—A. J. AUTHENRIETH, Middle West Utilities Co., Chicago.

Chairman Statistics Committee—HERMAN HILLENBACH, American Ice Co., care of Knickerbocker Ice Co., New York City.

Chairman Engineering Committee—EMERSON A. BRADY, National Association of Ice Industries, Chicago.

Members at Large—

A. H. BAER, Carbondale Machine Co., Carbondale, Pa.

GEORGE B. BRIGHT, George B. Bright Co., Detroit.

C. H. GENGAR, The City Ice and Fuel Co., Cleveland.

H. F. HIRSCHFELD, Wisconsin Ice & Coal Co., Milwaukee, Wis.

E. G. HITT, American Associated Mutual Insurance Cos., Atlanta.

H. L. LINCOLN, The Union Ice Co., San Francisco.

B. B. McCULLOCH, Bureau of Safety, Chicago.

JOHN W. NEFF, Suburban Ice & Fuel Co., LaGrange, Ill.

W. M. O'KEEFE, American Warehousemen's Assn., Chicago.

GARDNER POOLE, American Institute of Refrigeration, Boston.

H. L. TRASK, United States Cold Storage Co., Kansas City, Mo.

VINCENT WAKEFIELD, Bar Rusto Corp., Kansas City, Mo.

COL. P. A. WEATHERED, Southwestern Ice Manufacturers' Assn., Houston, Tex.

orig paper - WEDNESDAY MORNING SESSION NAT - Safety October 4, 1933

The first session of the Refrigeration Section was called to order by R. L. Forney, representing the National Safety Council, who welcomed the delegates and introduced General Chairman L. W. Dawley, Southern United Ice Company, Jackson, Miss., who presided. Chairman Dawley presented a brief resume of the sectional

activities during the past year, outlining the work of the standing committees and commending the work of each committee chairman. He then introduced the first speaker.

Safe Operation and Maintenance of Pressure Lines and Vessels

By A. L. BLATTI

Railways Ice Company, Chicago

*Orig. paper
R 2592 also
Pg 27*

The speaker said in part: What are some of the known hazards that stalk every refrigerating plant and how can they be coped with and prevented from taking their usual annual toll?

Normally, a pipe line is a harmless, inactive piece of apparatus and if properly selected, installed, tested, operated and maintained, will go on doing its work for years and nothing unusual happens. However, should any of the foregoing be neglected, several things can happen, such as rupturing of pipe due to pressure in excess of that for which it was designed; troublesome leaks at flanges or fittings; small leaks resulting in loss of refrigerant and costly shutdowns, liquid trapping in low points, coming over to compressor in quantities greater than capacity of compressor; pipe failures due to strain; lack of proper supports; crystallization; expansion; lack of safety valves, and that arch enemy of all metals, corrosion.

Selection of material: Careful consideration should be given to the liquid or chemical to be used. In the selection of pipe fittings, be sure that they are of sufficient size and strength to withstand the pressure to be imposed. They should be of the proper alloy and of sufficient size to obtain low velocities.

Installation: Pipe lines of considerable length and subject to extreme temperature changes should be provided with expansion joints or loops. All gaskets should be of material that will not be attacked by contents of the pipe or container; lead gaskets are not recommended. Horizontal pipe lines should always be constructed to properly drain at all times. See that they are properly braced, free from undue strain and in proper alignment. Piping should be so arranged that the refrigerant from any pipe lines, vessels or section of containers can be withdrawn and stored in other parts of the piping system, or discharged to the sewer in the event of a severe fire.

Testing: The testing of refrigerating systems is an important procedure and careful supervision is warranted whether the equipment is new or old. In the City of Chicago the pressure tests adopted for certain refrigerants are as follows (giving first the high pressure side and second the low pressure side):

Carbon Dioxide, 1,500 pounds, high pressure side, and 750 pounds, low pressure side; Ethane, 1,100 pounds and 550 pounds; Ammonia, 300 pounds and 150 pounds; Propane, 250 pounds and 125 pounds; Methyl Chloride, 175 pounds and 125 pounds; Sulphur Dioxide, 135 pounds and 100 pounds; Isobutane, 135 pounds and 100 pounds; Butane, 100 pounds and 50 pounds; Ethyl Chloride, 100 pounds and 50 pounds; Dichloromethane, 15 pounds and 15 pounds; Trichloroethylene, 15 pounds and 15 pounds; Dichloroethylene, 15 pounds and 15 pounds.

If air is used as the pressure element, care should be exercised to maintain a moderate temperature, since high air temperatures and pressures, when exposed to other gases such as is present in some oils, may result in internal explosions en-

dangering life and property. A refrigerating system free from leaks under above pressures is not likely to cause trouble.

Shell containers and pressure vessels: Pressure vessels represent a potential hazard that justifies careful consideration. There have been a number of disasters in the past resulting from vessel failures that can be traced to carelessness or neglect in one form or another. Such failures can be prevented, for obviously failure is due to greater internal pressure being exerted than the ability of the shell to withstand.

There are many causes that can influence excess pressure. Let us consider, for example, a shell and tube brine cooler using anhydrous ammonia. Let us assume that the cooler has been properly fabricated and is in every way suitable for the service required of it. It is put into operation and performs satisfactorily. It is later decided to discontinue its use, the ammonia is pumped out and the valves closed; the expansion valve leaks and ammonia is accumulated in the shell. The maintenance engineer decides to give the cooler a thorough cleaning; he removes the brine, takes off the heads and proceeds to wash it out with warm water, or the temperature of the brine may be raised for the purpose of defrosting coils. Heat applied in any manner might easily result in sufficient pressure to rupture the shell; therefore, it is recommended that each pressure vessel containing expansive liquid or gases, be provided with an approved type of relief valve tested and set to open at not to exceed 90 per cent of the tested pressure of the vessel; it should be close to the vessel with no shut-off valves between, and the discharge from the relief valve should be piped to the outside of the building or to a low pressure point in the refrigerating system.

There are other conditions that are conducive to vessel failures, such as erosion, corrosion, chemical action and electrolytic action. Because a piece of equipment has performed safely and satisfactorily for a period of years is not an indication that it will continue to do so. All equipment should be inspected periodically. Wall structures may be so weakened as to cause failure under normal pressure. There are a number of companies who will insure pressure vessels and piping systems at a very nominal rate. Such insurance also entitled the insured to a thorough inspection twice each year and in the opinion of the writer it is an excellent investment.

A general inspection of all equipment should be made periodically and a permanent record kept. Any condition constituting hazard or material weakness should at once be corrected. Yet in the final analysis, safety rests with the personnel. A plant or system may be equipped with all manner of safety devices but if common sense and good judgment are not exercised by responsible parties, serious trouble may result. I have found on inspection that safety valves were plugged, fuses bridged over, relays blocked, pressure gauges not functioning, etc. It should be remembered that safety, good housekeeping, and economy are very closely allied and where one is in vogue the other two are given consideration. Too often, however, we find plants where all three are neglected.

Report of the Nominating Committee

The report of the Nominating Committee was then presented by B. B. McCulloch, Bureau of Safety, Chicago, and new officers for the section were elected as follows:

General Chairman—L. W. Dawley, Southern United Ice Co., Jackson, Miss.
Vice-Chairmen—T. A. Adams, Union Terminal Cold Storage Co., New York, N. Y.; Carl C. Clements, National Dairy Products Corp., New York, N. Y.; W. S. Wilcox, E. B. Higley & Co., Mason City, Iowa.

Secretary—Edward H. Fox, National Association of Practical Refrigerating Engineers, Chicago, Ill.

News Letter Editor—W. O. Ham, Southern Ice & Utilities Co., Dallas, Texas.

Engineering Committee Chairman—Emerson A. Brandt, National Association of Ice Industries, Chicago, Ill.

Membership Committee Chairman—Col. P. A. Weatherred, Southwestern Ice Manufacturers' Association, Houston, Texas.

Poster Committee Chairman—B. C. Skeen, City Ice Company of Kansas City, Kansas City, Mo.

Publicity Committee Chairman—O. J. Willoughby, Refrigeration Publishing Co., Atlanta, Ga.

Statistics Committee Chairman—Herman Hillenbach, American Ice Company, c/o Knickerbocker Ice Company, New York, N. Y.

Members at Large—

A. J. Authenrieth, Middle West Utilities Co., Chicago, Ill.

A. H. Baer, Carbondale Machine Co., Carbondale, Pa.

George B. Bright, George B. Bright Co., Detroit, Mich.

G. H. Genger, The City Ice & Fuel Co., Cleveland, Ohio.

J. Albert Greene, Geyser Ice Co., Waco, Texas.

H. F. Hirschfeld, Wisconsin Ice & Coal Co., Milwaukee, Wis.

E. G. Hitt, American Associated Mutual Insurance Co., Atlanta, Ga.

H. L. Lincoln, The Union Ice Co., San Francisco, Calif.

L. T. McArthur, Peoria Service Co., Peoria, Ill.

B. B. McCulloch, Bureau of Safety, Chicago, Ill.

J. F. Nickerson, American Institute of Refrigeration, Chicago, Ill.

W. M. O'Keefe, American Warehousemen's Association, Chicago, Ill.

Gardner Poole, American Institute of Refrigeration, Boston, Mass.

H. J. Trask, United States Cold Storage Co., Kansas City, Mo.

Safety in the Wholesale Delivery of Ice

By J. MOUDRY

Orig. Paper
R 257

Superintendent, California Ice & Coal Co., Chicago

The speaker said in part: In the olden days we carried a plank 14 to 18 feet long, with two "T" rails in the center to guide the ice into shops across the sidewalk. This, of course, obstructed the free use of the sidewalk to the public and the public, impatient as usual, rather than wait until the plank was lifted out of the way, would attempt to step over it, the result being that women, handicapped by their long skirts in those days, sometimes fell and were injured, resulting in a law suit. The ice was also a magnet to children, who would stand around the plank and sometimes be injured when the ice cake fell off. Then there was the old fashioned hook in the ceiling to which would be attached a block and tackle with hoisting tongs, and this was quite a factor in the accident record. When a cake of ice fell from a height, whether the accident was caused by the tongs slipping or by the cake splitting, this usually spelled disaster and death sometimes resulted.

We have now substituted for these methods the carrying of all ice on the shoulders of the men from a wagon up a pair of stairs especially built which are strong enough to stand a good-sized man and a cake of ice weighing 200 pounds. In our store-

rooms we insist on the men wearing a special shoe with a safety toe, able to withstand a pressure of 400 pounds without injury to the foot, but we do not demand it in our wholesale delivery.

There is also quite an element of danger when ice is edged in trucks and a sharp jerk of the truck may cause it to fall, sometimes several tiers being precipitated into the street. We instruct our men to wedge ice at the side with a 2 x 4 cut on a slant. This not only keeps it in place, but also keeps it from breaking.

There is another practice which has caused severe injury, especially to the public, and many costly law suits. This is the leaving of pieces of ice on the sidewalk just big enough for anyone to step on and fall. I cannot impress too strongly upon our fellow icemen the necessity of correcting this evil.

The motorizing of all delivery equipment and also equipping the trucks with pneumatic tires in our city, leaves us with the same problem that confronts those in other lines. That is the speed at which they travel and the ever increasing accident record, which in spite of what we have done to promote safety, still forges ahead in increasing number of accidents.

Safety in the Retail Delivery of Ice

By L. T. McARTHUR

Orig. Paper
R 257

Peoria Service Company, Peoria, Ill.

The speaker said in part: The first factor of safety is met at the garage in the morning in the examination of all tools and equipment. Tongs must be examined for sharpness. Do not allow a man to use tongs with broken or blunt points. Next, see that every man has a pick scabbard, and insist on his using it. This should be a very stringent rule as the carrying of a bare pick in the pocket is one of the most dangerous practices in our industry.

Caution all men about driving through alleys with car under control, as children and adults often walk or run out from between garages, or other buildings or gates, directly into the path of the truck. In driving on driveways or parkways where there is shrubbery, caution of the same kind is imperative. Teach your men to watch the rear end of street cars and busses so that if anyone may be passing behind them, it will be possible to see their moving feet before they come into full view, and thus there will be time to apply the brakes.

In the actual delivery of ice in the homes, care must be taken in placing the ice in the refrigerator so that when the door is opened none will fall out. Also do not leave pieces, no matter how small, on the floor. In one case of this kind the lady, stepping on a small particle of ice, fell to the floor and broke her leg. In another case where the delivery man cut ice on the porch a child slipped on a small piece and fell down a flight of stairs, breaking an arm. In another accident, the driver had a bare pick in his pocket, and while putting ice in a refrigerator, a child passed behind him and had its face cut on the pick point.

Another bad habit is practiced by some drivers, that of loading the truck or wagon when not properly backed up to the platform. Insist on every rig being backed up to the platform squarely so that if a foot slips you will have no broken legs or skinned shins because of this space for them to slip into. This may seem to be a trivial hazard but serious accidents have happened here. The same applied to pieces of ice on the platform. Did you ever compare the price of a broom with the cost

and pain suffered through a fall on or off of a platform? I am convinced that it pays to be very strict in all of these cases. When I say strict, I do not mean the discharge of a man, but a quiet, serious explanation of the hazards will almost always bring proper results.

One of the most important things to remember is that children love ice and will hitch on ice rigs. Caution your men about leaving long fifties or seventy-fives standing upright so they may fall over on the arms or hands of any child while hitching. Of course, they should not hitch, but children are not responsible. You are the one who will be held to blame, if not by law, then by your own conscience. I hope you have never had to suffer the memory of killing a child and that you never will, but you can never do too much safety work or spread the gospel of safety too wide. The avoidance of one serious accident, that may be traced to the accident prevention work you have done, will be a dividend payment equalled by nothing else you can receive for the same amount of effort.

THURSDAY MORNING SESSION

October 5, 1933

Safe Handling and Storing of Ice

By F. W. BRAUN

Manager, Safety Engineering Department, Employers Mutual Liability Insurance Company, Wausau, Wis.

The speaker said in part: Accidents cannot be prevented until we know where and how they occur. Accidents do not happen. They are caused. Someone or something is usually responsible for an accident. A hammer or hand tool falling from a stepladder and injuring a person below, does not cause an accident. It causes an injury. The person who carelessly left such equipment on the stepladder is the real cause of such an accident. Management should take more interest in actual causes so that a more intelligent program of accident prevention can be followed.

A study of five years of accidents under ice harvesting showed that 19 per cent were due to falls; 20 per cent were due to hand tools; and 30 per cent were due to handling. Statistics prepared by the National Safety Council show that the small operator had one death to each 38 disabling injuries, while the large operator had one death to each 100 disabling injuries. Small operators frequently neglect their equipment and because of the size of their operations pay no attention to their equipment and personnel. This is a serious mistake. Regardless of the size of the operations, men and equipment should be in the best of condition.

Slipping seems to be the chief cause of men being injured in falls. Floors should be free from small ice and be kept as dry as possible. Frequent sweeping costs little, yet aids materially in keeping the floor in the right condition. Slippery floors have been prevented by nailing half oval wood strips to the floor about one and one-half inches apart. The men can brace themselves firmly on this type of construction. It also keeps the floor free from water as this runs in between the strips.

Feet should be protected by safety shoes so that foot injuries can be prevented. In the matter of hand tools, particular attention should be given to the maintenance,

Poor, dull tools are a hazard. The points should be kept sharp. There should be a definite place or a definite rack for all tools. At the end of the day the workman should see to it that these tools are in that rack and kept in their place until it becomes necessary to use them again. When tools are kept in such a location it is easy for the maintenance man to inspect them and keep them in proper shape and condition. Men should not use tools to open chute doors or use them as chisels. It requires an educational program, of course, to regulate this but it can be done. The workmanship of tools is very important. Employers should get the best and see that they are properly kept in condition, as previously stated. Ice tongs should never be carried over the shoulder, but closed in the hand. Ice picks should be sheathed.

The handling of ice, of course, in storage and delivery is quite a problem. Pushing large chunks of ice with your foot is a bad practice and should not be tolerated. The lifting and pulling of ice is a problem and should receive careful consideration from the management. It seems to me that pulling ice from the side is much better than a direct pull as accidents frequently occur when tongs slip. All gears, frictions, sprockets on ice saws and machinery should, of course, be completely enclosed.

Men should be instructed in the lifting of ice. Stiff knees cause strained backs. Men should be taught to lift with their legs and shoulders so that these injuries can be prevented.

Ice is a food. Employers dealing in this product should look upon it as such and keep the plant clean and tidy.

Accident prevention does not require unusual genius, but the application of a little common sense at the right time will solve most of the difficulties in any industry.

Orig. paper Safety in Cold Storage Operations

By A. R. SHEPHARD

Superintendent, Fulton Market Cold Storage Co., Chicago

The speaker said in part: In the operation of a cold storage warehouse, only 5 to 10 per cent of the employees work on mechanically operated equipment, namely, elevators and engine room equipment. Thus 90 to 95 per cent working within a warehouse are using hand-operated and hand-controlled equipment. It is found that minor accidents occur most frequently in this large proportion of the employees, and in coping with the safety problem it is most necessary to instruct the individual employee and to provide all safety devices necessary for the mechanical equipment.

Some of the more common accidents will be outlined here.

Plates leading from the car to the unloading platform slipping, and truckload of merchandise going down between the car and platform, endangering the employee, is not an unusual accident. This can be eliminated by proper instruction of the employee in securely placing the plates before starting to load or unload the car.

Smashing toes under front wheels of a truck is also common with new employees. This is caused by placing the foot too close to the front wheels when turning a loaded truck. Forewarning the employee seems to be the only cure, although an injured toe seems to be remembered longer.

Sprained backs are often caused by lifting heavy objects. There is a proper way of lifting and handling any heavy object without putting undue strain on the back. Our practice is to place an experienced employee with each new one to teach him the proper method.

Wounding the hands on nails, splinters, etc., in the handling of wooden boxes and barrels can be greatly overcome by having the employees wear gloves while working. Dropping objects on the feet, hitting the fingers with hammers, stumbling over objects, slipping on stairs, etc., seem to be time-worn accidents that only individual effort will eradicate.

In the power plant there are many possibilities of accidents because of high pressures and moving machinery. The precautions that are necessary in an ordinary plant are doubly necessary in the plant using gases under high pressure. In taking care to prevent such accidents in our ammonia equipment, we have provided all receivers, coolers, traps, tanks, machines, or any vessel containing ammonia at any time, with suitable safety valves on both high and low side of compressors having the relieved pressure piped to outside air. In case an accident should occur and the operator could not get near the machine, we have a safety trip valve operated by a long cable placed at the entrance to the engine room so the machine and pressure can be shut off on the suction line. We have relief valves on the low and high compressors and check valves in the discharge lines.

In case of an emergency, ammonia helmets have been placed in different places with extra canisters—one in the center of the engine room, one by each exit, and one outside the engine room within reach of any one coming from outside.

Our electric motors are equipped with under voltage and overload relays. In front of switch-boards are wooden platforms covered with rubber matting. All high tension wires and buss-bars are screened in. All fly wheels and other movable parts are protected by screens and guards. Emery wheels are provided with safeguards and also goggles for the operators, complying with insurance and factory inspection rules.

Good ventilators capable of rapid air change are necessary in the compressor room. More than one exit is necessary for quick getting away in case of emergency. Fire extinguishers of tetrachloride and carbon dioxide type should be installed in compressor rooms in an accessible place. These are non-electric conductor types and are most suitable. Suitable tools should be accessible at all times for emergency repairs.

Well-equipped first aid kits are very essential and employees should be taught the use of resuscitation methods used by the Red Cross or similar organizations.

The Proper Use and Care of Respiratory Equipment in the Refrigeration Industry

By GEORGE KNOLL

Chicago Manager, Mine Safety Appliances Company

The speaker said in part: The past ten years have witnessed a considerable change in the refrigeration industry. The development of mechanical refrigeration, air conditioning of houses, theatres, office and other buildings has greatly enlarged the field of refrigeration service. This is undoubtedly the beginning of an extension and development program which will in the not far distant future open up larger and more extensive fields for the industry.

Naturally, with the advent of these developments, refrigerating gases other than

ammonia and those commonly used have been developed and utilized. Generally, they are not poisonous in low concentrations, but are irritating to the eyes, membranes of the throat and respiratory organs, so that one has ample warning of their presence. Such refrigerants as are not in themselves easily detectable, either by odor or by other means, have warning agents added, which are eye, nose and throat irritants and in very low concentrations, three to five parts per million, are intolerable to breathe. When released in confined areas, the gases become concentrated and as a result present respiratory hazards against which protection must be provided.

Carbon dioxide is used quite extensively as a cooling agent. However, a person can breathe up to three or four per cent in air with no effects other than a marked increase in the depth of breathing. At five per cent breathing is further increased, and ten per cent cannot be endured for more than a few minutes. It is not dangerous excepting in concentrations producing a deficiency of oxygen, which condition is rarely if ever encountered.

As some of the gases within certain limits are explosive, if it is necessary or desirable to determine whether or not an oxygen deficient atmosphere is present, it is generally recommended that tests be made with the miner's flame safety lamp, which will give positive indication of this condition by the flame becoming extinguished.

Various types of respiratory equipment have been used in the refrigeration industry, but the type which has proved the most practical and universally satisfactory is the mask consisting of a facepiece, connecting tube, canister and canister harness. The canister is filled with chemicals for removing the gases and is the most vital part of the mask. It is obvious that some chemicals have a greater capacity for absorbing specific gases than others. For this reason canisters are manufactured for individual gases, such as ammonia or sulphur dioxide, and also for various combinations where more than one is likely to be encountered. A standard of colors for canisters has been adopted, which in addition to their markings makes them easily distinguishable and assures the selection of the proper canister for the gas or gases against protection is desired. For example: for protection against acid gases such as sulphur dioxide, the canister is painted white; for ammonia a green canister is used; a canister for protection against all gases is furnished in red.

Research is being continually conducted to develop new chemicals and improve those in use in order to give industry the maximum in safety and protection. Very rigid specifications have been set up for the manufacture of canisters and the chemicals used must equal or exceed these specifications. They are kept under very strict laboratory control.

The life of the canister depends on the concentration of the gases to which it is subjected, the duration of exposure, and the manner in which it is stored when not in use. The concentration of gas is usually an unknown quantity and as the chemicals used are absorbents, they finally become saturated with the gas, at which time the canister must be replaced by a new one. This condition is readily detected by some of the fumes coming through. It usually requires about ten minutes from the time the first trace of gas is detected before the chemicals break down completely, which provides ample time for the wearer to leave the gaseous area to replace the canister.

The selection of masks should receive very careful consideration. Only such masks as have proved their efficiency and meet the approval of recognized authorities should be considered. In the United States we look to the U. S. Bureau of Mines as being our highest authority on matters relating to respiratory equipment. The Bureau has the proper research and testing facilities to pass upon the safety, effi-

Orig. paper -
125721

ciency and practicability of apparatus, and masks submitted for approval must meet very rigid schedules. The Bureau's approval seal on gas masks is assurance that the equipment has met their requirements and offers the safeguard to the purchaser that he is getting the best and safest equipment available.

All plants, apartment buildings, hotels or wherever refrigeration equipment is used should be equipped with an adequate number of masks to meet any emergency. The number is dependent upon the number of men to be exposed in the repair of the equipment. The masks should be located in some readily accessible place outside of the room in which there is a possibility of the escape of gas. In service work all men who are exposed to gases should be provided with masks.

The occasion requiring the use of masks is usually one of emergency, and unless handled promptly and efficiently, may mean considerable loss in refrigerant and possible damage to life and property. The equipment is of no value whatsoever unless it is maintained in first class condition, and the men are thoroughly familiar with its use. The masks should be inspected periodically, at least once a month, to see that rubber parts have not deteriorated, and that all connections are tight. The canister should be replaced once a year whether or not the mask has been used. Quite often masks are used at such infrequent intervals that the men do not get sufficient experience in their use to make them proficient. The masks are so simple that intensive training is not necessary; however too much emphasis cannot be placed on the importance of adequate training to thoroughly familiarize the men with the proper adjustment of the mask, testing for tightness, inspection and care. It would be time well spent if the engineer or employee who might be called upon to use a mask would, about once a month, put it on and wear it while performing some work, in order to become accustomed to the feel of the mask. This would build up his knowledge of the equipment and confidence, so that when called upon in case of emergency he would perform his work without hesitancy and with absolute safety.

Refrigeration gases and equipment are involved in a great many fires, in which gases, fumes and smoke produced from combustion are present also. An all-service gas mask which provides protection against all gases, smoke and fumes, including carbon monoxide, is used in a great many plants where masks are desired for this range of protection.

In connection with respiratory protection it is appropriate to mention the subject of resuscitation, as occasionally an accident occurs where it is necessary to employ resuscitative measures. Employees should be trained in the administration of artificial respiration and first aid measures so that in case of necessity, proper treatment can be given.

ADJOURNMENT.

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Rubber Section

Officers 1932-33

General Chairman—CHARLES F. SMITH, U. S. Rubber Reclaiming Co. Inc., Buffalo, N. Y.

Vice-Chairman in Charge of Program—H. W. LOW, Miller Rubber Products Co., Inc., Akron, O.

Secretary—R. A. BULLOCK, Corduroy Rubber Co., Grand Rapids, Mich.

News Letter Editor—B. F. GERPINK, The Goodyear Tire & Rubber Co., Akron, O.
Chairman Membership Committee—E. W. BECK, United States Rubber Co., New York City.

Chairman Publicity Committee—W. L. SCHNEIDER, The B. F. Goodrich Co., Akron, Ohio.

Chairman Statistics Committee—R. W. MORSE, The Firestone Tire and Rubber Co., Akron, O.

Chairman Engineering Committee—JAMES Q. LEE, India Tire and Rubber Co., Akron, O.

Chairman Health Committee—DR. J. NEWTON SHIRLEY, Hood Rubber Co., Watertown, Mass.

Chairman Slides and Safety Kinks Committee—A. M. DIETZ, Pennsylvania Rubber Co., Jeanette, Pa.

Chairman Poster Committee—ROLAND KASTELL, United States Rubber Co., Passaic, N. J.

Members at Large—

J. T. KIDNEY, The Goodyear Tire and Rubber Co., Akron, O.

M. A. QUIRK, United States Rubber Co., Detroit.

TUESDAY MORNING SESSION

October 3, 1933

The first meeting of the Rubber Section was called to order by Franklin M. Kreml, Evanston Safety Council, Evanston, Illinois, who, as a representative of the Executive Committee of the National Safety Council, welcomed the delegates and introduced General Chairman Charles F. Smith, U. S. Rubber Reclaiming Company, Inc., Buffalo, New York, who presided.

In "reviewing the year's activities," the general chairman sketched the two meetings of the Executive Committee of the section, held respectively at Akron, Ohio, and

New York City, and then complimented various sectional chairmen of committees on their work. He said that the depressed state of business conditions in general affected the activities of the Section. Fortunately, however, the News-Letter editor, B. F. Gerphelde, Goodyear Tire & Rubber Company, Akron, Ohio, was not so affected, and he gave the section an excellent News-Letter throughout the year. The excellent work of the Program Committee was also notable. Likewise, the work of the Slides and Safety Kinks Committee, and of the Statistics Committee. Dr. J. Newton Shirley, Hood Rubber Company, Watertown, Massachusetts, Chairman of the Health Committee, has warned the Section members to be on the lookout for accidents resulting from malnutrition of workers. The Membership Committee has not obtained any new members, but has dissuaded several members from dropping out.

"We are disappointed," said the General Chairman, "in not being able to present the Section with a Safe Practices Pamphlet, but hope that the data which has been selected toward a pamphlet on the subject 'Vulcanizers' will permit the new chairman of the Engineering Committee to complete the work early in his term of office."

Is the Rubber Industry Making Progress in Accident Prevention.

By R. W. MORSE

Director of the Workman's Compensation Department, Firestone Rubber Co., Akron, Ohio

The speaker said in part: The figures compiled through the co-operation of various rubber manufacturers indicate that frequency rates have been reduced substantially since 1926. They reflect the effort and sincerity with which the industry has worked for the physical welfare of its workers.

Taking 1926 as a base year, we obtain the following index numbers, which show the degree to which accidents have been reduced: the index numbers in 1927 was 89.7; 1928, 75.1; 1929, 60.5; 1930, 40.8; 1931, 36.7; and 1932, 34.2. So in the short span of six years, the decline has been 65.8 per cent.

Viewing the frequency picture alone, however, does not disclose the truth about severity rates. Again taking 1926 for a base year, the severity rate index numbers are as follows: In 1927, the index was 61.2; in 1928, it increased to 69.9; in 1929, it rose to 79.6; in 1930, it dropped to 60.7; and in 1931, it increased to 64.7; then in 1932 it dropped back to 48. These violent fluctuations indicate the need of more effort to find a solution for improvement.

As yet, control of severity appears to be very difficult. It is hard to explain why it is that a certain type of injury which necessitates only one dressing for a certain person may require many dressings for another; or why the same type of injury in one case produces a strained back, and in another results in a hernia. It may be due to the difference in physical condition of the injured employee.

However, I believe that all of us, realizing that we have very dangerous spots in our plants, can put forth greater efforts to educate the men doing a specific type of dangerous work to be more cautious. At present there seems to be no tool with which we can work so well as that of education. In order to be successful with education, of course, we must remember that it will be necessary to make a study of the causes of accidents in order to prepare the most suitable plan of education.

Our machinery designers must carry their share of responsibility in designing and locating machinery to see that the human factor is more adequately protected, and it is the function of the safety departments to contribute their share in making the machine designers more conscious and sympathetic with the protection of the men that operate dangerous machinery.

Comparison of the rubber industry rates with those of all industry shows that the rubber industry occupies a foremost position among those industries reporting to the National Safety Council. Noting the comparison of frequency, we find that during the past six years all industries dropped from the 1926 base 61.5 per cent, while the rubber industry dropped 65.8 per cent. Severity in the rubber industry has decreased 52 per cent as against only 35.3 per cent for industry as a whole.

The Effect of Outside Conditions on Accidents

By J. J. LOGIE

Supervisor of Employment and Safety, General Tire & Rubber Co., Akron, Ohio

The speaker said in part: Man is a creature of the heart and not of the mind. His conduct is influenced more by his feelings and emotions than by his reason. Psychologists assert that our efficiency is below normal on an average of 30 per cent of the time due to the influence of some crisis in our emotional state. The sources or causes of crises are in many cases only trivial things.

In other words, crises that aggravate our feelings reduce our efficiency, and hence we become "accident-prone."

Take the case of Mr. A. This man for years had been a steady and dependable employee. He was a sort of gang boss, and his personal accident record was perfect until a certain day when he received a badly contused finger and it was necessary to amputate the finger at the first joint.

After about one week, we allowed him to return to work, as he could act as a leader for his gang, and at the same time favor the injured finger. On the second day after his return to work, I happened to drop into the hospital for a casual visit, and there sat my friend A soaking an injured foot.

I asked him a few simple questions to determine the cause of the accident and injury and noticed that he was considerably embarrassed at having received a second injury so soon after the first. I invited him to come to my office, after he had received treatment, and there A and I had a complete understanding.

At first he was reluctant to talk, but gradually he opened up and told me his story. Some weeks previously he had been out with the boys and came home late, with too many drinks under his belt. His wife made the mistake of scolding him while he was in this condition. They quarreled, and he slapped her. In the morning, he found that his wife had left for her home in the south and had taken their only child with her.

She wrote him after a few days and asked him to come and bring her back, explaining also that she had not revealed their troubles to her people. The letter had been written about two weeks earlier, but A, although remorseful, was too proud or stubborn to reply. Naturally, I advised him to do the manly thing and go and bring his wife back. I pointed out to him how considerate his wife had been in not telling her relatives about their quarrel.

You can readily see how this crisis in A's life reduced his efficiency and was the direct cause of two personal injuries in less than two weeks.

Another case was that of B, also recognized by his boss as an excellent worker. He was a widower of middle age and "stepped out" occasionally. On a certain Monday morning he reported for work, and, about one hour after starting, his hand was caught between two solid tire bases, causing a fracture of several bones. This man made a slow recovery, and eventually suffered a permanent, partial loss of function of the hand, costing the company a large sum of money.

Within ten minutes after the accident, we got the story indicating the cause of this man's troubles. He had spent the week-end celebrating in the usual manner. He had lost all sense of time and location and awoke, that morning, to find himself in one of the low dives common to all large cities. He came directly from this joint to the plant, changed his clothes and started to work. The accident he suffered soon after is another proof that outside conditions do make us accident prone.

I could go on for a long time quoting cases of this kind. For instance, one man received a broken leg, and when we called to notify his wife, she informed us that he had left home a week earlier and that she had not seen him since. Another one received injuries that resulted in his death. We found he had deserted his wife and family and was living with another woman.

Each of these cases could have been prevented. Men usually relieve the pressure by telling their troubles to someone else. Fellow workers knew these stories before the injuries occurred, so the whole responsibility reverts to the foreman. Just as it is his duty to know machines and materials, so he must also know the persons who are in his charge. He must gain their confidence by his sympathetic attitude. It is not necessary for him to coddle or baby the help; just an earnest effort to understand their problems is sufficient. A friendly inquiry, or a word of advice or encouragement now and then will accomplish this. It is a wise foreman who treats his help in this manner, as he will know in advance when there are outside conditions liable to cause accidents in his department.

Minutes copied filed. 6/17/16.

The Safe Use of Carbon Tetrachloride in the Rubber Industry

By LEON J. D. HEALY

Consulting Chemist and Engineer, Milwaukee, Wisconsin

The speaker said in part: The subject of this paper implies that there is a hazard involved in the use of carbon tetrachloride. There seems to be a considerable difference of opinion amongst various investigators as to whether the use of carbon tetrachloride involves any hazard.

Published data on the subject is quite confusing and often contradictory. The situation was quite well summed up by Dr. F. R. Brunot of the United States Public Health Service, Bureau of Standards, Washington, D. C., at the last annual congress of the National Safety Council, who said that his rather superficial study of the matter has led him to believe that a number of people interested in carbon tetrachloride adhere to one or the other of two diametrically opposed beliefs: First, that the chemical is a non-toxic agent under any and all conditions; and the other group believing, secondly, that it is so highly poisonous as to be dangerous for any use. "Of course," said he, "the truth lies in the mid-ground between these two opposing ideas." It was his impression, based upon work carried on with animals, that carbon tetrachloride properly used cannot be considered a product dangerous to health.

"The sensible way to look at the whole situation is to recognize that carbon tetrachloride is toxic in high concentrations, quite possibly dangerous in the middle range, and in all probability so slightly harmful in small concentration as to make the damage done negligible. It then becomes simply a matter of using the chemical in such a way as to avoid the danger zones."

The writer has had experience in handling many thousands of gallons of carbon tetrachloride during the past dozen years and on several occasions has personally experienced the toxic effects of this chemical. He can readily understand why there are contradictory opinions on the subject because the physiological effects are not very marked where concentrations of the vapors are low or exposure is of short duration, and any ill effects could easily be laid to some other disorder of the system. But it is the writer's sound belief that any person who has had extended experience in the handling of carbon tetrachloride under varied conditions, will readily admit that there is a hazard involved in the promiscuous or un-intelligent use of this material. Please note that I have qualified the hazard as conditional upon how it is used.

Although there is a lack of published data covering all phases of the physiological effects of carbon tetrachloride, nevertheless, the chemical and physical characteristics of this chemical compound are well understood and sufficient knowledge is at hand which, if used intelligently, can overcome any serious hazard involved by the use of this chemical in the Rubber Industry.

C. T. has milder physiological effects than many of the other solvents used in the rubber industry, notably for instance, carbon-di-sulphide, benzol, chloroform, and coal tar solvents. Furthermore the odor is not so disagreeable, its vapors are non-irritating and it does not promote coughing in low concentrations. However, prolonged exposure to C. T. vapors of high concentrations may bring about serious physical disturbances marked by drowsiness, headache, nausea and possibly irritation of eyes, nose, and throat. Moderate exposure seldom shows serious symptoms although some persons appear to be more susceptible than others. Effects resulting from less serious exposure usually are rapidly overcome by fresh air.

Quoting from Hamilton ("Industrial Poisons in the United States"), Dr. Hamilton says: "Chronic poisoning occurs sometimes in rubber works . . . I have never found a case of very serious poisoning from this source, although in three rubber factories I found men complained that their health had begun to suffer from exposure to fumes. Nausea, loss of appetite, loss of weight, irritation of eyes, nose and throat and inflammation of the skin of hands and forearms were symptoms they described." In this connection, there is no information as to the nature of the exposure nor the time required for the symptoms described to show up. From the writer's observations in the use of C. T. in the rubber industry, the symptoms just described were no doubt produced by daily exposure to relatively high concentrations or to poorly ventilated rooms. Such symptoms often show up in cold weather when windows are kept closed.

The writer recalls a case not long ago where eight girls were set to work repairing some defective goods, during which operation carbon tetrachloride cement was used. These girls were seated at several small tables in one corner of a large high ceilinged room and each was given a small can of cement and brush. Late in the afternoon the forelady reported to me that most of the girls complained of headache and that two were somewhat nauseated. We found that while the room had all the appearance of being well lighted and ventilated, the heavy C. T. vapors had settled in the corner where the girls were working. The windows were closed on account of cold weather and the vapors had not escaped. The windows were opened

and the room ventilated and the next day none of the girls complained of any further bad effects. This is an illustration where the job was not a regular one and no thought had been given to the matter. It goes to show, however, that the peculiar heavy suffocating vapors of C. T. can cause trouble even when used in small quantities if they are allowed to accumulate, and this they assuredly will do if not sufficient air is stirring to dissipate them.

At the last National Safety Congress, Dr. J. Newton Shirley, in a paper entitled "Is Carbon Tetrachloride a Health Hazard as Used in the Rubber Industry?" described both the effect of C. T. upon the flesh and when taken internally through the mouth or inhaled. In the first instance Dr. Shirley states: "We first note that when used externally, it causes a sensation of warmth and smarting to the skin as noted with chloroform. I have never seen this go on to blister formation when prolonged exposure occurs. Since this is an excellent fat solvent, it will quickly remove the normal oily and greasy secretion of the glands of the skin, leaving the surface exposed to chapping and drying out. Such a condition may allow secondary infection to take place. . . . I have never seen what I could call an infection from its use in this way. There is evidence to believe that C. T. can be absorbed through the skin because of its high affinity for fat. I can find no record of a toxic condition resulting from such absorption alone."

Again quoting Dr. Shirley: "Now, you may say that consideration of the toxic action of C. T. when taken by mouth is not important, but I will call your attention to this as I consider that the most dangerous toxic effect of exposure to lower concentrations of C. T. vapors may be due almost entirely to that amount of C. T. which is absorbed by the saliva and swallowed. This enters the system as though it were injected." . . . "Turning to the inhalation of C. T. vapors, we enter the main source of danger in so far as the rubber industry is concerned. Fairly concentrated fumes cause smarting and burning of the eyes, nose and throat. Then we note running of the eyes and nose and the increased amount of saliva in the throat with swallowing. The employee soon feels sick at his stomach and vomits. If the worker is able to continue his work, he becomes sluggish and confused, mental dullness. He loses his finer sense of touch. If such exposure does not use him up, he complains for the next day or two of loss of appetite. It seems that his symptoms, if he gives up work, continue to grow worse for several hours and will require three to six days to clear up."

According to U. S. Public Health Service Report, Bulletin No. 185, the toxic effects of C. T. vapor at various concentrations is as follows:

CONCENTRATION

P.P.M. IN AIR

48000-63000	Kills most animals in a very short time.
24000-32000	Dangerous in 30 to 60 minutes.
4000- 6000	Maximum amount for 60 minutes without serious disturbances.
1600	Maximum amount for prolonged exposure.

I have cited these references to emphasize the fact that there is a definite hazard to be contended with in the use of C. T. in the rubber industry.

Carbon tetrachloride is used in the rubber industry as a solvent for rubber, in the manufacture of cements, in certain dipping and spreading operations and as a cleaning solution.

Its solvent properties are made use of in the manufacture of rubber cements and many of the rubber cements put out to the trade are made with this solvent. C. T.

has replaced carbon-di-sulphide, benzole, and coal tar naphthas to a great extent within recent years where it greatly reduces the poisonous properties of these more highly solvents as well as making the cements non-inflammable and non-explosive. These cements are made by dissolving the rubber in the C. T. and are put out to the trade in drums, tin cans and collapsible metal tubes. They are used for a multitude of purposes including library, office, and household uses. For the latter purposes they are usually put up in collapsible tubes or small cans or jars.

C. T. cements are also used in rubber factories for cementing rubber articles during the process of manufacture.

The usual method for making these cements is to put the required amount of C. T. into a churn, start the rotor and add the masticated rubber in small pieces until all of the rubber has been added. A rubber cement churn might be anything from a small open ice cream freezer to a 500 gallon enclosed and sealed tank with agitator. The most popular type of small churn used in many factories consists of a 50 to 75 gallon capacity vertical cylindrical iron tank with a cover and revolving paddle extending down within the tank. One half of the cover opens to permit the charging with solvent and rubber while the other half of the cover supports the bearing for the shaft driving the agitator. These covers are not very tight and considerable solvent is lost through the lid and around the opening through which the shaft passes.

When cements are prepared for the trade in large quantities, either a 250 or 500 gallon tightly sealed type of churn is usually used. These types of churn are of heavy construction, with bolted-on top in which is a manhole for charging which in turn is fitted with a tight gasket so as to keep the churn sealed during the actual churning process. The shaft for turning the agitator also passes through a stuffing box so the leakage from such a churn is very small indeed.

Some years ago the writer checked the loss of solvent during churning operations of these several types of churns. It was found that the old pony type of mixer with loose fitting cover had a loss of solvent of from 20 to 25 per cent. The usual 50 to 75 gallon type had a loss of from 10 to 15 per cent whereas the large sealed type showed a loss of only 2 to 3 per cent. So you can readily see that the type of churn used is a controlling factor in amount of ventilation necessary to remove C. T. vapors from the cement churning room.

During the charging of the churn is where the greatest danger lies. But this operation is over in a few minutes, so duration of exposure is short. There is, however, some precaution necessary to prevent the solvent splashing onto the hands or clothing. The solvent will not harm clothing, but will soak through rapidly and irritate the skin. Often the solvent is added at various stages of the churning. In the case of the small churns it is poured in with a bucket or through a hose. The large churns are fed by hose or automatic pipe system and pump. One of the best equipped cement departments which I have been in had full automatic system whereby all churns could be filled and emptied by compressed air through a system of pipes and valves. In this room the only contact with C. T. vapors was while rubber was being charged in through the manhole. Needless to say, there was very small chance of fumes escaping here. This room also had vents near the floor for the heavy vapors to escape. Although there was no forced ventilation of this cement room, there was scarcely a trace of solvent odor at any time.

All hazard in the cement department can be removed by installing tight churns and having a good circulation of air, especially near the floor so that any escaping fumes which settle can be readily removed. A poorly ventilated room can be made

safe by installing a suction system which withdraws the air from the lower part of the room and especially directly under the churns.

Large 500 gallon churns are sometimes set in a well below the floor level to make charging easier and to economize on head room. In such installations, no operative should attempt to descend into the pit for the purpose of making repairs or otherwise without first ventilating the pit with a fan, vacuum hose or other suitable means.

The filling of cans and collapsible tubes with the finished cement, unless done by machinery, should be done under a hood or over a table with down draft of air to draw any volatile fumes away from the operator. Even where machine filled, some ventilating device is advisable to prevent the fumes from spreading throughout the room.

In the manufacture of certain rubber articles, considerable cementing is done. Sometimes this is done mechanically and in other places it may be done by hand. As an illustration of satisfactory system of the former method, I will describe a system with which I have had some experience. The articles to be coated with cement were immersed in the rubber cement solution, withdrawn and placed in wire trays setting within a rectangular metal box with a suction applied at one end near the bottom. The surplus cement drained into a removable pan at the bottom where it was returned to the cement churn and reworked. The articles were dried by a rapid down draft of air passing out through the opening at the bottom and then carried by the exhaust system without the building.

When cementing small articles by hand, the operatives can be seated at a table fitted with small grid plates directly in front of each worker. A suction pipe runs along under the table and connects all of these openings. The small cement tin should be placed in close proximity to the opening in the table top and the actual cementing carried out directly over the screened opening. I have in mind one installation where the cemented articles were placed on a traveling belt and carried to a drying chamber supplied with heat for drying and suction to exhaust the vapors.

There are numerous places throughout a rubber plant where various solvents including C. T. are used for cleaning surfaces of rubber to make better adhesion during the manufacturing operations. Some of the worst hazards are involved here. There is both the hazard of getting the hands continuously wet with the solvent as well as the danger of inhaling the vapors arising from evaporation. It is quite common to use mixtures of C. T. and naphtha for such purposes in the proportion of about $\frac{2}{3}$ of C. T. and $\frac{1}{3}$ naphtha or gasoline. This is done to render the cheaper naphtha non-inflammable and to increase the cleansing effect of the latter.

In these washing operations a felt swab saturated in the solvent is frequently used and often handled with the bare hands. It is here where serious effects might develop and there are instances where very bad cases of poisoning have developed through such methods. Practically all such operations can be carried out by using a swab with a handle, thereby preventing the solution from coming into contact with the skin. Adequate ventilation should also be provided as noted above. If it is impossible to keep the solution from getting on the hands occasionally, it is well to have the workers rub a little glycerine or a mixture of glycerine water and a small amount of gelatine on their hands. The glycerine solution repels the solvent and prevents removal of fats.

C. T. is also used in a few special spreading operations where it is a vehicle for applying a thin coating of rubber over paper and delicate cellulose fabrications. The rubber is dissolved in the solvent as previously described and the solution fed onto

a traveling sheet of the material to be coated. It is spread evenly by a system of rolls and scrapers and then passes through a drying chamber where the C. T. is driven off thereby leaving a dry coat of rubber on the surface of the material. The coated material emerges directly from the coating apparatus and enters the drying chamber. In the drying chamber the solvent is removed by the so-called unbalanced pressure system. Hot air is passed over the surface of the material through jets in a counter direction to travel of the material. The solvent laden air passes downward over the edges of the material and is withdrawn downward through the well by a suction system which maintains a very slight vacuum, thereby preventing escape of solvent vapors into the room.

In summing up, practically all hazard can be eliminated in the use of C. T. in the rubber industry by carefully studying the particular operation involved and carrying out the latter in such manner that the workers are protected from either inhaling the vapors or getting the solvent on their hands or clothing. A simple ventilating installation such as suggested for the operations mentioned will in most cases give ample protection.

The principal points to be considered are:

1. C. T. is toxic and dangerously so if concentration of vapors is high or exposure of considerable duration.
2. Evaporation of C. T. is rapid.
3. C. T. vapors are very heavy, toxic and suffocating. They sink to the floor and suction ducts should be placed low.
4. C. T. is absorbed through the skin and by inhalation. Therefore protect the skin from direct contact and remove vapors by adequate ventilation.

Presentation of N. S. C. Safety Trophies and Certificates

The data on the 1933 Safety Contest in the Rubber Section was presented by General Chairman Charles F. Smith. Twenty-five units were registered in this Contest, which ran from March 1 to August 31, 1933. A total of 32,569 persons worked 31,653,195 man-hours or an average of 972 hours per person. The average frequency rate for the contest was 9.636, which is a 67 per cent increase over the 1932 contest rate of 5.760.

Thirteen units completed the contest with a frequency rate below the average. The ratio of persons employed to disabling injuries during the period was 107 to 1, compared to 176 to 1 for the 1932 contest.

One unit completed the contest with a perfect record. Three units completed the contest last year with perfect records. During the period of the contest for 1933, there were 305 disabling injuries, one of which was fatal, and ten permanent partial disabilities.

The trophies and certificates to winners in the contest were presented by W. H. Cameron, managing director of the National Safety Council. Trophies were presented to winners of first place in each of the two general groups of contestants, and certificates to those ranking in second and third places. Awards were made as follows:

GROUPS A, B AND C.

1. National India Rubber Company, Providence, Rhode Island.
2. New York Belting & Packing Company, Passaic, New Jersey.
3. Glove and Shoe Companies, Naugatuck, Connecticut.

GROUPS D AND E.

1. Fabric Fire Hose Company, Sandy Hook, Connecticut.
2. Canadian Goodrich Company, Ltd., Kitchener, Ontario, Canada.
3. Pacific Goodrich Rubber Co., Los Angeles, California.

WEDNESDAY MORNING SESSION

October 4, 1933

The session was opened by a presentation of "Safety Kinks in the Rubber Industry." This feature, illustrated by many lantern slides, was presented by A. M. Dietz, secretary, Safety Division, Pennsylvania Rubber Company, Jeannette, Pennsylvania. The safety kinks consisted of newly developed guards, novel display boards, and other devices originated by members of the Rubber Section for the greater protection of employees from accidental injury.

The material for these lantern slides was contributed chiefly by the Goodyear Tire & Rubber Company, the Corduroy Rubber Company, and the United States Rubber Reclaiming Company.

Nomination and Election of New Officers

The report of the Nominating Committee was presented by Ernest W. Beck, Chairman, Nominating Committee, and officers were elected as follows:

General Chairman—H. W. Low, Miller Rubber Products Co., Akron, Ohio.

Vice-Chairman in Charge of Program—B. F. Gerpheide, Goodyear Tire & Rubber Co., Akron, Ohio.

Secretary—A. M. Dietz, Pennsylvania Rubber Co., Jeannette, Pa.

News Letter Editor—R. A. Bullock, Corduroy Rubber Co., Grand Rapids, Mich.

Health Committee Chairman—Dr. Ash, United States Tire Co., Detroit, Mich.; Dr. J. Newton Shirley, Hood Rubber Co., Watertown, Mass.

Poster Committee Chairman—Oliver Hopkins, National India Rubber Co., Providence, R. I.

Statistics Committee Chairman—J. J. Loge, General Tire & Rubber Co., Akron, Ohio.

Publicity Committee Chairman—R. W. Morse, Firestone Tire & Rubber Co., Akron, Ohio.

Engineering Committee Chairman—W. L. Schneider, B. F. Goodrich Co., Akron, Ohio.

Slides and Safety Kinks Committee Chairman—H. A. Walker, Goodyear Tire & Rubber Co., Akron, Ohio.

Membership Committee Chairman—E. W. Beck, United States Rubber Co., New York, N. Y.

Members at Large—

C. F. Smith, U. S. Rubber Reclaiming Co., Buffalo, N. Y.

J. T. Kidney, Goodyear Tire & Rubber Co., Akron, Ohio.

C. F. Horan, Hood Rubber Co., Watertown, Mass.

M. A. Quirk, Samson Tire & Rubber Co., Los Angeles, Calif.

Time Study and Safety

By C. L. HUNGERFORD

The Firestone Tire and Rubber Co., Akron, Ohio

The speaker said in part: What is time study? It is a certain scientific analysis of methods and equipment used or planned in doing a piece of work, development in minute detail of the best manner of doing it, and accurate determination of the time required.

What are the functions of a time study department? In short, the function of the time study department is to determine the one best way of doing work. The best way is the right way, and the right way is always the safe way.

The time study department at Firestone comes under the labor department, the head of which controls safety, compensation, employment, hospital, fire, and police departments. This type of organization naturally effects a co-operation between time study and safety, not apt to be found in other organizations.

There is no change in planning, scheduling, new equipment, or layout made without the time study department being first consulted, in any of our plants at Akron or subsidiaries. Primarily the reason for this is to determine whether the contemplated change is good business from the dollars-and-cents standpoint. The investment to be made and the required time to pay out is a very important determining factor in the decision of the management.

It is during these conferences that defects in equipment and layouts are checked from the labor angle, and we are quite free to propose improvements, mechanical perfections which not only affect labor costs, but are also instrumental in removing hazards which might otherwise be overlooked until installations are made and ready for productions. The safety man also sits in on these conferences today; in the early years, he was unaware of such changes until someone was injured, or unless he just happened to sight the new equipment operating in the department.

We will now place our equipment or make the change in layout or scheduling. The time study engineer is called to make a study. He acquaints himself with the character of the work and all conditions which may affect it. With the aid of the foreman, he familiarizes himself with the quality of the work demanded. He observes the conditions under which the material is furnished the worker and the facilities which are provided for disposition of the finished product. If, during this preliminary study, it appears that certain conditions are abnormal, they are rectified before the time study is started. It is essential that a time study be taken only on standard conditions which can be repeated in the ordinary conduct of the work. If the study is a machine operation, he must determine speed at which the machine can be operated for best results.

In the rubber industry, for example, there are various limiting factors to machine speed: on all mills and calenders or similar equipment which masticates rubber, heat is generated by friction and the limiting factor is the amount of heat the compound being studied will stand. On other equipment, the rate of speed at which calender material can be separated from the liners or aprons in which it is calendered, is a limiting factor. A worker has only so much endurance, and this can not be overtaxed; so in some cases, the machine speed is limited by the human element.

The next step in taking a time study is an analysis of the task as a whole into elements. These elements are listed in the order they occur so that each one can be studied and analyzed individually, and it is the time study man's duty to point out

to the management possible improvements either through elimination of operations, further change in method or layout or substitution of machines for hand work.

It is at this point that the time study engineer can be most effective from a safety standpoint. A scientific time study will result in an operation that is done in a skilled manner at a high speed but not in a hurry. A distinction should be sharply drawn between work done at a high speed and work done in a hurry. The first will give perfect work because speed is obtained by elimination of all the unnecessary motions; the latter gives bad work because it is speeding up of all operations necessary and unnecessary. The greater number of motions we eliminate, the greater chance we have of eliminating potential hazards. Elimination of handling, trucking and moving from one operation to another works in like manner.

Reducing the number of motions also reduces fatigue. We are familiar with fatigue and its effect on accidents from that standpoint, because a tired worker is an accident prone employee.

Establishing of standard work specifications and correct time elements make for specific job habits, which should be habits of skill, which are built around the worker so each capitalizes on the strong human motives to form habits. This is skill, which is present in the skillful manipulation of the hands. Such factors as pointed out by Mogensen in his book entitled "Common Sense Applied to Motion and Time Study" are as follows: (1) Consistency; (2) Rhythm of movement; (3) Precision; (4) Speed; (5) Ambidexterity; and (6) Co-ordinated use of both hands simultaneously.

You can appreciate the results to be obtained by placing supplies, tools, and materials in six positions at correct heights and at such locations as to effect a minimum of effort, a minimum of distance traveled, a better distribution of motions of right and left hands, and the use of both hands simultaneously. The repetition of motions during the learning period becomes fixed with the individual whether good or bad. This explains the wide range of skill found in a group of workers on the same job.

All hand motions may be divided into five classes: (1) Finger motions; (2) Motions involving fingers and wrists; (3) Motions involving fingers, wrists, and forearms; (4) Motions involving fingers, wrists, forearm, and upper arm; and (5) Motions involving fingers, wrists, forearm, upper arm, and shoulder. It is important that motion should be confined to the least classification necessary to perform the work correctly. Pre-positioned tools not only make the work much easier but have also eliminated a lot of accidents.

Frequently when called to make a time study, the engineer will observe that equipment, material or tools are in such condition and not only to be defective from a work standpoint but unsafe. These are always reported and corrected before studies are completed. Although a number of the above treatments have been with piece work rates, we at Firestone through our unit cost system, time study every day workers to establish unit hours. As a result of these studies, many changes have been made affecting not only efficiency but also the safety of these workers such as: oilers, janitors, and service men.

A study of oilers reveals that their work took them in places of great hazard, such as exposed shafting which did not need protection as per the state law but which should have been protected to avoid personal injuries. Oilers were found to be climbing on equipment which was very inaccessible and ladders were installed to provide safe access.

Important items which must be taken into consideration during the course of a time study are such factors as illumination, ventilation, access by workers to drinking fountains, toilet facilities, etc.

Respiratory Protection for Dust and Fumes in the Rubber Industry

By JOHN M. LEWIS

Mine Safety Appliances Co., Cleveland, Ohio

The speaker said in part: The progressive, ever changing panorama in the rubber industry, with its consequent replacement of old accelerators with those of more recent origin, makes it rather difficult to definitely enumerate the respiratory hazards encountered during the manufacture and fabrication of rubber. Some of the early accelerators used in curing rubber were very toxic, and during the milling and calendaring of rubber, they gave off fumes that were quite dangerous to breathe, as well as being objectionable skin irritants.

You have made great forward strides in protecting the large groups of your workmen by the installation of efficient general ventilating systems. You have insisted that these very toxic accelerators be superseded by less and less toxic ones, even though somewhat less efficient in hastening the cure of rubber, until today there is little or no danger from the use of accelerators.

In the use of solvents, however, in the industry, there still exists a hazard of considerable proportion from a standpoint of their effect upon the respiratory organs. Gasoline, benzene, carbon tetrachloride, acetone, and methyl alcohol are definitely toxic, while amyl acetate, and ethyl acetate may be classified as irritating and mildly anesthetic. High alkali chromic acid, and cyanide solutions, of course, present a respiratory hazard when vaporized and inhaled. If hydrogen cyanide is formed, due consideration must be given the fact that it is readily absorbed through the skin and thus presents an additional hazard.

When we consider the various pigments used in the rubber industry, we must think of both the chemical and physical or mechanical action of dusts on the respiratory system. We must consider the nature of the pigments and the manner in which they are handled in the practical operations of the individual plants. We have known for a long time that various compounds of lead, zinc, antimony and mercury are poisonous when taken into the human system in sufficient quantity. The manner in which these pigments are used and handled in closed vessels and mixing vats, so that the workman is not exposed to the dust, shows excellent direction of engineering efforts in preventing the existence of what might readily be a serious respiratory hazard.

Let me describe briefly the construction and application of various types of respiratory protective appliances. We will assume that a respirator is a filtering device with a half-mask which covers only the mouth and nose and not the eyes of the wearer. Respirators, when equipped with a felt filter, are quite useful in preventing bland dusts from entering the respiratory system. When equipped with proper chemical filters, they afford the wearer relief from nausea and irritation which is frequently encountered in the use of volatile compounds. The M. S. A. paint respirator is an example of this latter type.

In order to give adequate protection to prevent virulent dust from entering the respirator system, the Burrell gas mask was developed. The dust is removed from the inspired air as it is drawn through a large wool felt filter pad which offers but slight breathing resistance.

When canister type gas masks are used, there must be an adequate supply of oxygen in the atmosphere, that is, 16 per cent or more. The concentration of poisonous gases must not exceed 2 per cent, with the exception of ammonia, which may be

3 per cent in air. These masks are not suitable for use inside of tanks or closely confined places.

The Burrell Industrial Gas Masks represent one type of canister mask where certain canisters are used for protection against specific gases or gas mixtures with dust. We are frequently questioned regarding the active life of a canister. We could give definite answers to these questions if we knew several variable factors such as concentration of a specific gas, breathing rate of wearer, etc. In general, the life of these canisters used on the industrial mask without a timer, is determined by the faint odor of the gas coming through the canister. When this occurs, it is time to change to a new canister. This type mask will not give protection against carbon monoxide.

The Burrell All-service Gas Mask gives protection against carbon monoxide and all other noxious gases and dusts which are known to be encountered in industry. In the all-service canister are chemicals and mechanical filters which embody in one unit, protection afforded by the entire group of canisters used on the industrial masks; further, it provides protection against carbon monoxide. The all-service mask is equipped with a mechanical timer which automatically counts the respirations of the wearer and tells him when his canister must be changed for a new one. Never under any consideration permit an all-service canister or mask to be used without the timer. The all-service mask is particularly designed for use by fire departments and for emergency use in the laboratory.

When it becomes necessary to do work inside of tanks, pits, vats, or bins, where the atmosphere may be deficient in oxygen and perhaps polluted with toxic fumes, the combination hose mask will give adequate protection to the workman. This device gets its name because it is made of a combination of gas mask face piece safety harness, oil-proof, non-collapsible hose, fresh air rotary blower, and trunk. The blower which is operated in fresh air is capable of furnishing an adequate supply of fresh air through 150 feet of hose to several workmen at the same time.

The one-half hour McCaa apparatus is an example of a self-contained oxygen breathing apparatus which permits the wearer to go into any irrespirable atmosphere with absolute protection for his own respiratory system. It is used most generally for rescue purposes. It consists of a small cylinder of oxygen under high pressure, a reducing valve, a lung governed admission valve, breathing bag, inhalation and exhalation tubes, mouth piece and nose clip, regenerator and cooler.

The thought of rescue brings up the consideration of suitable equipment for the proper treatment of a victim of gas poisoning. The H-H inhalator, designed by Doctors Henderson and Haggard of Yale University, is used as an adjunct to Shaefer Prone Pressure method of artificial respiration. The inhalator supplies a mixture of 7 per cent carbon dioxide for stimulation and 93 per cent oxygen for ventilation of the respiratory system.

In order that you may get the most practical benefit from respiratory protective appliances, you must use good judgment in the selection of proper equipment for the particular job. In this connection may I suggest that you read very carefully the article "What Permissible Means in Respiratory Protection" by William P. Yant, in the *National Safety News*, August, 1933. To the conscientious manufacturer of respiratory protection appliances, the approval of the United States Bureau of Mines is a cherished possession. As a user of respiratory protection appliances, it should be your standard of protection.

After you have selected your equipment, do not just hand it to your foreman or workmen and say "Here it is, it's up to you now." See that thorough instructions

are given in the method of use and maintenance of equipment. See that the men who will have to use the equipment are actually trained by wearing the outfit before they may have to encounter the cold facts of a hazardous situation. Train your men to put their masks on in fresh air. Test them for tightness and insist that they keep the masks on until they return to fresh air.

Paying Dividends on the Accident Prevention Dollar

By ERNEST W. BECK

Supervisor of Safety, United States Rubber Company, New York City

The speaker said in part: I think that one of the greatest satisfactions in safety work lies in the fact that well organized and efficient efforts pay big dividends—not only from a humanitarian point of view, but also from a cold dollar-and-cents point of view.

In order to show that safety work pays, it is the duty of every safety engineer to keep simple and accurate accident statistics and to use them. It is not sufficient only to keep such records, but in order to cash in on their values, they should be properly used. The statistical work of a safety department is similar to the work of an accounting department in any well organized company. It is the accounting department that figures out the profit or loss—the same is true with the accident figures.

Accident cost records should be compiled each month, and accumulative figures distributed periodically. Accident cost figures should be studied not only by the safety engineer, but also by the plant management, who should bring them to the attention of other members of the supervisory group, including foremen. Even more emphasis should be placed on the poor accident experience, which shows high cost, than on the most excellent record.

The company that I represent operates about twenty manufacturing units, employing approximately 30,000 men manufacturing all lines of rubber products. We also operate two textile mills, a chemical plant, and a factory making shoe hardware, including metal lasts. It is true that we have fewer factories and fewer employees than we had ten years ago. But I want you to note that in 1923 we had over 1,100 lost-time accidents, while last year, at the end of a ten year period, we had only 158. Our frequency rate has been reduced approximately 66½ per cent, and our severity rate has been reduced approximately 50 per cent. The number of deaths shows a decided downward trend.

You will be interested to know that the United States Rubber Company operated its factories for 34 consecutive months, covering the period from February 1, 1930, to December, 1932, without an industrial fatality—a total of 115,668,802 man-hours without a loss of life. I think you will agree with me that when a company the size of ours, with its many factories scattered all over the country, can operate 34 consecutive months without a loss of life, it is a record to be proud of.

The second set of figures which I wish to bring to your attention shows our compensation cost for all plants. The cost figures are not ex-medical, but include 50 per cent of all salaries paid to our plant doctors and nurses, and one-half the cost of all medical supplies. They include all money paid to outside doctors and hospitals, and also legal expense. You will note that our cost has been reduced during the last ten years from approximately 60c per \$100 of payroll to 36c per \$100 of payroll. With an annual payroll of from twenty to thirty million dollars, one can very easily figure

the annual savings. This tabulation alone, I believe, proves conclusively that the accident prevention dollar, properly invested, pays big dividends.

About ten years ago the executives of our company believed that it would stimulate further interest in accident prevention to organize an annual safety contest. I will not burden you with the many details that have been carried on each year in conducting our annual contest. Suffice it to say that each year during the past nine years, with the single exception of 1929, our company has shown an improvement in accident prevention work. During 1929 there was a decrease caused by five deaths, two of which, however, were disputed claims and were settled on a percentage basis, but have been considered as fatalities in our tabulation.

I believe that every industry should know how its accident experience compares with other industries. Likewise, every factory should compare its accident experience with the experience of other factories in the same industry. Years ago the rubber industry was considered a hazardous business, and perhaps that was true; but during the last few years, due to the splendid efforts on the part of the National Safety Council in accumulating industrial accident statistics, we are able to prove conclusively that the rubber industry is not now a hazardous industry.

In 1931 the rubber industry stood tenth best in frequency and ninth best in severity among 28 of the leading industries. In 1932, the rubber industry was ninth best in frequency and sixth best in severity among 31 leading industries of the country. The only industries having a better combined severity and frequency rate than the rubber industry were the tobacco, laundry, printing and publishing, and textile industries.

Doubtless you will be interested to know how we use our accident and cost figures at a particular factory. For example, take the accident and cost experience of a factory employing from 1,500 to 2,000 men, manufacturing mechanical rubber goods, including fire hose, packing, belting, rubber tiring, etc. You will note that during the four years, 1927 through 1930, the accident experience of this plant did not improve. In October, 1930, a decided change was made in the entire safety program at the plant. An experienced full time safety man was engaged, safety committees were organized, safety foremen meetings were held, and the safety advisory committee, composed of executives, met monthly to discuss safety policies and pending safety matters. The results were outstanding. Within one year the cost was reduced \$17,000, and within two years the cost was further reduced \$27,000. And this was a factory which had trailed along for several years well down in the list of factories in our annual safety contest.

I can not help but mention, also, the excellent work of one of our textile mills. During 1928 they had 77 lost-time accidents; in 1929, 50; in 1930, 13; in 1931, 2; and in 1932, only 2.

Don't think that it is necessary to spend large sums of money in order to get dividends. I know small factories where there is no safety organization, but the management is constantly taking the time (and I believe that time is worth more than money) to impress all of his associates with the importance of accident prevention work. As an illustration, I know of a large plant where an employee coming down the stairs one night slipped on an apple core, falling in such a manner that he broke his back. The poor man has not worked a day since. In the small factory that I have just referred to, no one in the plant could imagine anyone throwing or leaving an apple core on the stairs.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Safety Section, A.R.A.—Steam Railroad Section N.S.C.

Officers 1932-33

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ROBERT SCOTT, Atlantic Coast Lines Railroad Co., Wilmington, N. C.

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E. G. EVANS, Louisville & Nashville Railway, Louisville, Ky.

C. F. LARSON, Missouri Pacific Railroad, St. Louis.

F. M. METCALFE, Northern Pacific Railway Co., St. Paul, Minn.

J. T. PRATT, Reading Co., Reading, Pa.

The complete report of these sessions is published in a booklet entitled "Proceedings of the 13th Annual Meeting of the Safety Section", available from the American Railway Association.

TUESDAY MORNING SESSION

October 3, 1933

The sessions of the Safety Section, American Railway Association—Steam Railroad Section, National Safety Council, were held as a part of and in conjunction with the Annual Congress of the National Safety Council in the Stevens Hotel.

The opening session was called to order by Chairman Charles E. Hill, General Safety Agent, New York Central Lines, New York City. The invocation was given by the Very Reverend Gerald Gratton Moore, Dean of St. Luke's Pro-Cathedral, of Evanston, Ill. The report of J. C. Caviston, Secretary of the Association, was presented; and the chairman then called upon the first speaker.

Report of the Committee on Education

By L. G. BENTLEY

General Safety Agent, Chesapeake & Ohio Railway, Richmond, Va.

After presenting figures on the distribution of educational literature under the supervision of his committee, the speaker said in part: The committee on education believes that in producing educational matter for the consumption of the men back home there are three kinds of ideas that can be presented. There is the inspirational, which puts the minds of men to work on their moral responsibilities for the safety of their fellow men; there is the informative, which tells the men over the country how the work is progressing; and there is the educational, which gets right down into the heart of accident causes and remedies and seeks to plant in the minds of those who direct and those who work a knowledge of the manner in which they can prevent men from getting hurt.

It has been said that the day of the inspirational appeal is past, that safety today is altogether a matter of supervision and obedience to rules. Is this true? Is the day of sentimental appeal gone? Have we forgotten that man is his brother's keeper?

The answer to these questions seems to be conclusive, when we find that during the last year our distribution of inspirational posters greatly exceeded in volume the distribution of any other type of educational material. Although both our informative posters and our strictly educational posters were well received, the inspirational posters led all the rest.

But are we doing all that we can with these products? Do you know that there are 430,000 miles of track on our railroads and that we sold but 2,000 copies of our educational poster entitled "A Bum Stroke," or one poster for 215 miles of rails? On the very best distribution that we were able to effect, we sold only one for 43 miles of track. A man would have to travel a long way to see such a poster.

If I were the executive of a railroad, what would be my attitude toward the safety of my men? Would it be active or passive? Are you, Mr. President, satisfied to delegate the authority of carrying on the safety work to your subordinates, and then withdraw your active evidences of interest? Nothing is more discouraging to the man who is out in the field striving to accomplish, than to know that the big boss has a passive attitude toward his work.

I think the safety work on any railroad is an operating feature. Safety is operation. If there is an accident it is a criticism of the operation of that organization. Therefore, the safety department of a railroad, in my opinion, should be actively and closely associated with the operating head of the railroad; and by the same token, it seems to me that the reporting of accidents to the Interstate Commerce Commission should be done by the operating head of the railroad. They are his accidents, and if he is required to report them to the Interstate Commerce Commission, he must know all that is to be known about those accidents, how they occurred, what might have been done to prevent them, and whether or not they are proper to be reported to the Commission.

Report of Committee on Prevention of Highway Crossing Accidents

By H. A. ROWE

Manager, Claims Department, Delaware, Lackawanna & Western Railroad, New York City

The speaker said in part: Your committee has the satisfaction of once more reporting a definite decrease in the number of railroad highway crossing accidents, fatalities and injuries throughout the nation for the calendar year 1932, this being the fourth consecutive year of recessions from the peak year of 1928. The record is as follows: 1932, 3,499 accidents, 1,526 fatalities, and 3,989 injuries; as compared with the year 1928, 5,800 accidents, 2,568 fatalities, and 6,667 injuries. The reduction therefore, in accidents was 22 per cent, in fatalities 40 per cent, and in injuries, 40 per cent.

The problem of the prevention of railroad highway crossing accidents where double or multiple tracks are concerned seems to be growing in importance. In the month from the first week in March to the first week in April, 1933, three crossing accidents occurred in widely divergent sections of our country. In each of these cases, seven persons were killed. All three tragedies happened on double tracks.

These tragedies are indicative that the present signal system at highway crossings does not convey to the public mind a proper understanding of the situation. There appears to be necessity that signal systems should speak the language of motorists rather than be regarded strictly as a railroad engineering project.

The consensus of opinion of members of this and preceding committees of your section, studying the same subject, is that approximately 95 per cent of all railroad crossing accidents are preventable by the driver of the motor vehicle. This indicates definitely the necessity of education of the individual driver.

Your committee unanimously presents the following recommendations:

That particular stress be laid upon the necessity of giving adequate and timely warning to the public of the approach of trains to a highway crossing by sounding of the crossing whistle and the ringing of engine bell;

That the warning from engine should be continued until the crossing is definitely reached;

That suitable standardized methods of protection be employed where necessary at crossings to facilitate uniformity and public understanding thereof;

That crossings be periodically inspected and continuously maintained in sound travelable condition.

Address by the Chairman

By CHARLES E. HILL

General Safety Agent, New York Central Lines, New York City

The speaker said in part: During the five-year period ending with 1913 and immediately prior to the general adoption of organized safety on American railroads, the employee casualty ratio increased at an alarming rate. In 1914 the casualty rate began to drop and there has never been a year since this downward trend in accident frequency started when the casualty rate was as high or even approached that of 1913.

Based upon the official record of the Interstate Commerce Commission, covering all railroads of the United States, 1932 as compared with 1913 shows a decrease in the number of employee deaths from 3,715 to 557, and a decrease in injuries from 171,417 to 17,416. On a man-hour basis, this represents a reduction of 72.5 per cent in deaths and 81.6 per cent in injuries.

This means that in 1913 there was one death for every 498 employees, whereas in 1932 there was one death per 1,829 employees. The injury rate was reduced from one injury per 11 employees to one injury for 60 employees.

Had organized safety not been inaugurated upon the railroads of this country and the record of 1913 continued, there would have been during the succeeding 19 years up to and including 1932, 29,277 more employees killed and 868,162 more employees injured than actually occurred during this period.

Although railway accidents have been substantially reduced, we must not be unmindful of the fact that this record is in the past and future achievements must be measured against the record of today. We are still having accidental deaths and injuries to employees in such volume and through such inexcusable causes that they stand as a further challenge to railway management. They not only warrant our increased efforts, but a greater concentration of such efforts in the application of the well known specific remedies that will serve to ultimately result in the complete abolition of preventable accidents.

The Safety Section of the American Railway Association was organized in 1921 for the purpose of coordinating the efforts of the individual railroads in the prosecution of various activities in connection with the prevention of accidents of all kinds resulting from railroad operations.

It is imperative that we carry on this work and it must be pursued with greater zeal than ever before. As an aid to this plan, we must have a goal pledging this section and the individual carriers to use every legitimate effort to continue the descending ratio. It is necessary that we have a goal, it matters not what our vocation in life may be. A man, to be successful, must have a definite objective. When that is reached, he must change his objective, making his goal increasingly difficult to attain. Our perspective in life changes as our ideals change and our ideals are controlled largely through a process of comparison. Therefore, our plans for the future must contemplate a new goal—one that will reflect the spirit of the Safety Section, the spirit of the individual character and the spirit of the American Railway Association—a spirit of indomitable courage and the will to do.

We must visualize the more than 18,000 railway employees who were the victims of 1932 and resolve unto ourselves that in so far as it is within our control such needless sacrifice shall not continue.

How to Establish and Maintain Safety in the Shops

By T. W. DEMAREST

General Superintendent of Motor Power, Pennsylvania Railroad, Chicago

The speaker said in part: The development of safety in a shop is wrapped around three major factors which have already produced lack of safety: (1) conditions; (2) practices; and (3) the human equation.

It is certain that if the conditions in a shop are such as to produce lack of safety, no rational correction of practices can be consistently made. The workman is always

in a position to point out that the management is not consistent in endeavoring to correct practices when they themselves do not establish safe working conditions. I would first then clean up the shop, maintain a clean shop, not only from the viewpoint of appearance but from the viewpoint also of the distribution of materials. I would endeavor to create a desire for cleanliness in the minds of the workmen. A dirty shop makes a dirty man, a dirty man cannot respect himself, and the combination will produce very poor results in any safety movement.

I would correct as far as practicable all unsafe conditions in the shop in order that the management shall be in a position to approach the men and obtain safe practices from them.

I would then begin the correction of unsafe practices, selecting the most glaring ones for correction first, and in such correction would most thoroughly explain not only to the man involved but all of the employees in such departments, the reason why the practice is unsafe and the possible effect of producing an accident, the results to the man involved and also perhaps to his family. If you are acquainted with the more personal conditions of a man's life, you can use this knowledge very effectively in getting his attention when talking about safety work. Refer to his family, to his children, and in this friendly way you will be able to interest him in what you have to say about safety.

Talks of this nature can be given by the department foreman or his gang foreman to his men at regular intervals. In the meanwhile, the education of the master mechanic, the general foreman, department foremen and gang foremen should also be progressing. The question of education is never completed. Talks are much more effective than papers or letters of instruction.

Too little attention has been paid to the mental process of new men being employed for service. We are very careful as to their physical condition, their education, and their skill and ability to perform the service for which they were being hired. We have in the past, however, paid no attention to their mental trends, to develop whether or not from a safety viewpoint they would make a good employee. Such tests should be established as a requirement and in addition to the physical examination.

Safety to be effective must be automatic and subconscious in the individual. If it is necessary for him to stop and think before performing any operation, whether he is doing it safely or not, he is more apt to make an unsafe employee than a safe one. Its initial establishment must begin as a youngster at home, and this has caused me to believe that where there are ladies' societies of any kind on a railroad, that a part of their work at regular meetings or calls should be the safety education of the mothers from the home viewpoint. It is certain also that safety studies in our schools would be more useful than some of the work now being taken.

Then safety rules; their development and application are apparently necessary in the inauguration and advancement of a safety movement. They are the texts from which instruction is given. They are effective, however, only in so far as their practice becomes subconscious on the part of the man.

I am of the opinion that the explanation of a safety rule should be reinforced by practical illustrations. Men transferred from one department to another, with little knowledge of such department's work, have difficulty in grasping the rules as the terms used are not familiar. We find the same situation in our laborers, many of whom are of foreign extraction and who do not have a good knowledge of the English language.

TUESDAY AFTERNOON SESSION

October 3, 1933

Address

By FREDERICK E. WILLIAMSON

President, New York Central Lines, New York City

The speaker said in part: I got my first lesson in safety in a very trying way. I was working in Utica, and the yard was badly congested. I was working with a switch engine in the lower part of the yard, and it was snowing hard. I was on top of a string of cars, and I was trying to figure out how to get them out. I swung down on a side ladder, with my mind wholly intent on what I was trying to accomplish, and stepped back on track No. 2—there was a screech of a whistle, and here suddenly was No. 3's engine about 50 feet away, or so it seemed to me. Instinctively, I made a dive between this string of cars that was pulling out, and I could just feel that pilot beam whistle by me, and the engineer thought he had hit me. He stopped and came back to find that I was all right, but certainly I got a safety lesson from him in no uncertain words.

So I learned my first safety lesson by a shock and a scare. Today, however, we have adopted another principle. Now we are trying to teach the young men safety by rules, by education, rather than by letting them learn through experience and narrow escapes that safety is essential.

You and the affiliated safety bureaus of the several railroads have taught us to understand that while you can't undo accidents that have happened, you can see to it that no accident that does happen will be considered a closed book until there is a thorough analysis of its cause, with a view to the avoidance, wherever possible, of that same cause of succeeding accidents.

As we review the official records of the Interstate Commerce Commission, we note with pride the progress of the American railroad in the reduction of accidents, and all who are familiar with the subject recognize the large contribution of the Safety Section of the Association in that noteworthy achievement.

One of my distinguished predecessors in the presidency of the New York Central Lines was fond of saying that a railroad is composed of plant and personnel, and that personnel represents 90 per cent of its value. Much of the success of your work is dependent upon a recognition of the large importance in safe railroading of the so-called "human element." You must consider and deal with a mental approach of officers and employees to all safety work. It is not enough that the physical plants be cleared of lurking hazards, nor is it enough that instructions as to the safe methods of operation be promulgated. Both of these things, of course, are vital. Of equal importance, perhaps of larger importance, is the molding of mental attitude toward safety movements, and toward safety itself. The number of accidents that are utterly unavoidable is surprisingly small. Everything that is done to impress on all the frightful cost of accidents in life, limb and money, is yeoman service. We must eternally seek to instill in the minds of all a serious respect for safety measures and a dogged determination to do, each one, his job, not only well, but safely. Your section is now, as it has been from its inception, in the vanguard of that movement, and it is but candid that I say to you that railroad executives generally, congratulate and honor you for what you have done and are doing.

The Art of Teaching Safety

By C. B. BOULET

Safety Director, Wisconsin Public Service Corp., Milwaukee, Wis.

The speaker said in part: Safety engineers and executives have learned that before you can stop accidents, the accidents must be analyzed individually and collectively, and proper remedies applied; and the only way to apply the remedies is through teaching the facts that the accidents disclosed must be taught. That cannot be done in a week or a month. It is a continuous job, year in and year out.

It is a generally accepted fact that teaching is made easier and more successful if the individual we desire to teach is in a receptive frame of mind. How are you going to do this? By appealing to the things that the man most desires to have. Put yourself in the position of the man who is working for you, and let's see what the things are that are wanted. Suppose he is a machine operator, a switchman, or whatever his job is—there are certain things he wants. First, if he is any kind of a man, he wants to keep his job. That is the first thing. Second, he wants to keep his pay. He doesn't want a job unless he gets paid. Third, he wants to be able to do his work in a satisfactory manner, not only satisfactory to himself but to his employer. Fourth, he is interested in his family, in his family's protection and in his family's welfare. Fifth, he is interested in his own pleasures, playing the violin, moving pictures, playing golf, etc. Sixth, if he is the right kind of an employee, and if you have taught him right, he is interested in the company's success, because in that he will find his own success.

We as safety engineers must absolutely first convince the man that an accident to him, no matter how minor, is a real loss to himself and to society. After that, I think you can show him first of all that your company is interested in safety, and you can prove it to him by saying, "Do you know that safety construction is in everything we have? Notice the guards on the machines, the type of operation we are carrying on, the type of equipment we are using. Safe construction and safe conditions are part of the management."

I used to be a teacher and there are a few things I believe I can pass on that will be helpful. First, the presentation of the subject that you want to teach. The presentation must first of all be simple. It must be brief. It must be absolutely to the point.

Second, the arrangement of the material that you teach must be logical. There must be a logical sequence to the things that you are trying to teach.

Third, the facts that you are trying to teach must be, wherever they can, related to the facts the man already knows, in order that by association with existing knowledge he can retain those facts.

Last, your word picture must be clear.

How can we accomplish these things we are going to try to present? Let us go back to the school situation. How did your teacher teach you arithmetic and spelling? First of all, by repetition. You remember how you learned the multiplication table. How were you taught spelling? Again, by repetition. You would spell the word orally, and if you missed it you would write it a hundred times.

Are you using that trick in teaching safety, or are you just telling the men once and forgetting it? That is one of the first principles of teaching safety, repetition. In connection with repetition, it is very important that repetition be made not over only one day, but over a long period of time. Experiments have proved that the

longer the period of time over which the repetition is made, the more firmly will the idea be fixed in the man's mind. The teaching of safety must not stop in one week, one month, or one year, but it must be continuous.

What do you get by continued repetition? You get reflex action, a sub-conscious working of the man's mind, so he cannot help himself. He has to do the thing that way. You do one thing, the same one, time and time again, and no matter how you try to break yourself of that habit, it is almost impossible. With an old employee who has done a thing a certain way for a long time, you may run into sales resistance, because he has formed the habit. The new man is the fellow to go after. When you are taking on new men it is your opportunity to teach them by repetition. Form the right habits.

Second, there is a proverb that practice makes perfect. Just telling a man something isn't going to teach him. He has to do it himself. Once having gained a fact or an idea, continued practice will improve technique and more firmly fix that technique in the mind. That is particularly true of complicated operations. It is the only way a man can learn them.

And right along with practice, you will remember another phase of your school work in high school or college, perhaps. You were taught how to experiment, and experimentation and practice are very similar, although actual practice is better than experimentation. To teach by experiment fixes the thing in a man's mind because he not only gets the lesson through the ear, but he gets it from several other sources. First of all, he works with his hands and gets the sense of touch. The thing is impressed on his mind through the sense of touch. Second, he hears it; third, he sees it; fourth, he has to be thinking about it while he is doing it. You are stimulating practically every sense the man has in teaching the subject, if you are doing it through practice or experiment.

I suggest to you that another old proverb might come in handy, namely, "Experience Is the Best Teacher." It ties right in with the other. What a man experiences he doesn't forget. What is told to him, as I am telling these things to you today, he soon forgets. If I were to do this job right, I would make each one of you write down the things I am telling you. I would have a board with slides or lights on it, and you would see it, and I would tell you about it. But the things I am saying to you here you are going to forget, unless you are making notes of them.

But we can also bring to any individual the result of somebody else's experience. That is where experience steps into the play. Every time there is an accident, make use of the experience obtained through that accident, because an accident is a real living issue. It is part of the man's life. If it happens to someone that he knows, or in some town that he is familiar with, he is going to be particularly interested in that accident. You picture the accident to him, explain the accident, and say to him, "How could it be stopped?" You are employing some of the best teaching in that way, a conference method. After he tells you how that accident should be stopped, do you think he will have an accident like that? No. He has analyzed that accident, he has told you the results and how to stop the accident, and he is not going to be queered by doing what he said should not be done.

Make use of every accident you can lay your hands on. Let the employees tell you about them; bring into play the last sense, the sense of speech. Make the man tell you how that accident can be stopped. Take him into your confidence and he won't have an accident of that type.

I mentioned a few moments ago that teaching could be improved by the use of a chart. That is known as visualization. There are a number of ways to visualize. A chart is one way, and there are also pictures, posters, actual demonstration of apparatus, just looking at it—all visual demonstrations. The only object of that in teaching is to get another entry into the man's mind through the eye. A man is given a certain number of senses. How many are you making use of? Make use of all the senses you can.

Few of us realize that we are all teachers, whether we want to be or not. Each of you, I venture to say, has some particular gentleman in mind as a person who has had influence on your life. You have set up somebody as your example. You have watched him and tried to do things as he did them. Every minute of the day, you also are a teacher, whether you want to be or not. Just the way you act makes you a teacher to somebody. And it is very easy to be a bad teacher by example. The case of railway officers standing on the tracks is a perfect example of terrible teaching. They are setting up a wrong example. They are establishing a wrong practice, and men are going to follow their example because they respect them and look up to them. It is like the case of the foreman who posts a "no smoking" sign, and the president of the road or some other officer comes through there smoking. The employee says, "I don't know what kind of fire he smokes, but I can smoke if he can."

We are today in difficult times. New men are coming on the job, and old men who have been laid off are coming back to work. They are sometimes unfamiliar with the operation; they have forgotten; the period that has elapsed since they practiced these things before has been so long that the practicing of them has become kind of lost in their minds, they are hazy, and they try to do the thing in the way they used to do it and they will get hurt. The new man and the old man coming back need especial attention, and ought to have it the day they come on the job. Don't delay, because, if you do, some of them will have trouble, perhaps a serious accident, before you can teach them again.

Address

By M. J. GORMLEY

President, American Railway Association, Washington, D. C.

The speaker said in part: While sitting here thinking about this question of repeating instructions in the interest of safety, I recalled to mind that good old war horse whom we all remember, Ralph C. Richards, one of the fathers of the safety movement. I worked with him on the North Western Railroad for a great many years. He was an inspiration to anyone, regardless of whether he was on the claim end of it or the operating end of it or the safety end of it. I remember one experience while a trainmaster in Minnesota. We had a switchman with red hair who got injured too often to suit me. One day he was coming down through the yard with a string of cars and made a stop, and instead of getting off the side of a flat car as he should, he reached over and took hold of the uncoupling lever, and fell off. He was laid up for a week, and I thought, "I guess I will write to Mr. Richards and recommend that he pay the gentleman nothing for the time he is off." He was off about ten days.

Well, Mr. Richards wrote the letter for me, and I presented it to the switchman. When he got home and told his wife that he wasn't going to get any pay for those

ten days, she became his safety supervisor from that time on, and he was never thereafter injured. That was one of those object lessons that cannot be forgotten.

I was also much interested in the idea of repetition of safety instructions. I have two daughters whom I taught to drive an automobile. I said to them: "There is just one rule in driving an automobile, that I want you to remember; and that is to learn to talk to whoever is sitting alongside of you without moving your head sideways." I drilled this idea into the head of the younger one time and time again until she got it down pat. One day she was driving alongside of me and I said suddenly, "There's a new house." Instantly she turned around and looked at the new house, and then she caught herself. I don't believe anyone could catch her on that kind of thing again.

I have heard it said that the railroads are obsolete, that their equipment is run down, under-maintained, and everything of that kind. I was greatly interested in that, so I checked up a while ago carefully and I find we have a decrease in ownership of freight cars of 337,000 compared with 1925. There has been a decrease in freight trains. We have better cooperation in loading and unloading. You do not get the full results of the efficiency and movement unless you reduce the units required to handle that business. How much has the reduction of 337,000 cars in the handling of a given business contributed to the safety movement? How much has the retirement of 1,091,000 cars since 1923 and the addition of approximately 900,000 new ones added to the safety movement? If you buy a new car that is better than the old one, it is a move toward safety. If you buy a locomotive that is better, you add to safety. If you can handle more cars on the train, you have less opportunity for employees to become injured. The more safely you operate the more economically you operate.

I saw some figures prepared by someone in a statement, I believe by Mr. Palmer, comparing the last ten years with the previous ten years, showing that the payment for personal injuries alone showed a decrease of \$160,000,000. To carry it further, to make a comparison on the question of the reduction in the cost of operation due to wrecks, derailments, etc., we have something in excess of a billion dollars saved during that same period.

Report of Committee on Statistics

By T. H. CARROW

Superintendent of Safety, Pennsylvania Railroad, Philadelphia

The speaker said in part: I want to summarize as briefly as I can some of the previous reports of this committee, because it is necessary to give a basis to what I am going to recommend today.

In 1921 the first report covered the question of accuracy. In 1922 we were able to report that the Interstate Commerce Commission had adopted a million man-hours as the basis for comparisons by roads and by occupations. In 1923 we made a general analysis of fatal and non-fatal injuries due to being struck by trains. In Salt Lake City in 1924 for the first time the possibilities of reductions were apparent, because up to that time we had no knowledge of what we might do, and even then our conclusions were predicated largely on our practical imagination, because the statistics were more or less in a crude state no further back than 1924. We, therefore, recommended the 35 per cent goal.

In 1925, recognizing the necessity of a definite program, the committee worked

up twelve skeletonized bulletins for publicity and recommended that the Association adopt these as a regular program. In 1926 we presented four resolutions on the basis that the remedy for accidents on the railroads rested directly with trainmasters, road foremen, master mechanics, and division engineers. In 1926 we introduced four resolutions appealing to these four classes of supervisors. There were miscellaneous analyses from 1927 to 1931, particularly in charts that were put out showing the different departments of each railroad, how they stood in comparison with each other. I think that was an innovation that marked great progress. In 1932, for the first time, we suggested the possibility of a standard rate; we suggested for the first time the possibilities of standard casualty rates.

I have here a statement which is a composite of the accident situation on all the railroads in the United States. It is one that shows casualties in the seven classes of service, from 1923, 1931, 1932. In maintenance of way and structures in 1932 we have, roughly, 4,000 accidents; in maintenance of equipment and stores we have also 4,000 accidents; and in "other transportation" which is nearly all station, we have nearly 2,000 accidents. Then in train and engine service, we have in round figures 7,000 injuries. If you examine those rates you will notice a very marked drop from 1923 to 1931. But we came to an impasse in 1932, and showed almost no improvement. As a matter of fact, in the maintenance of equipment department the rate was virtually the same each year.

There are two significant features to that statement. The first is the fact that we made no appreciable progress in 1932, and the second is the preponderance of accidents to train and engine service employees.

The total number of accidents to all employees last year was, roughly, 18,000; in the train and engine service, however, 7,000 accidents occurred, which is 38 per cent of the total, while the train and engine service had only 19 per cent of the man hours.

There is something, however, very much more significant even than that, and that is the rate in engine service is very small indeed, and in the passenger service there is no more hazard than with clerks.

The fact that the train and engine service predominates indicates that we must concentrate our energy on that department, and I am prepared to say that I don't believe that from a purely numerical standpoint the hazard in train and engine service is materially greater than it is in the shop or in the maintenance of way department, and that the explanation for the poor performance is that we as a body have not done our job, and that the trainmasters have not done their jobs, and that individually and collectively we have got to get together and find the solution for the train service accident situation, which is indicated very clearly by an analysis of the statistics.

I want to speak of the fluctuation in train service accidents. Fifteen trainmen were killed in 1923 on account of negligence in connection with train orders, and not a single one in 1931. That was good work, wasn't it? No, it wasn't good work, but just largely luck, because in 1932 there were ten of these accidents.

Now let me turn to another matter. I will not mention any roads specifically, but I have taken fifteen roads and designated them as No. 1 to 15, inclusive. Isn't it indicative that something is decided wrong when we find that the first road I have listed has a rate of 2.40, and the last road has a rate of 13.40? There is something wrong somewhere, there is some deficiency, as surely as figures can indicate it.

I have made a note of a railroad that has made a very fine record, and that still has a rate of 7 in the maintenance of way department and only 2 in the maintenance of equipment department. If I were president of that railroad, knowing safety as I do, I would say, "Look here, Mr. Maintenance of Way Office, what is the matter with you? Have you lost your interest in safety? What is the difficulty that keeps you from getting in line?"

I want to suggest to you the propriety of working up a statement similar to this for every one of your divisions, and at the end of each month using the cumulative figures, put a red ring around each one of them and pass them on to the boss, and say, "There are the individual officers who are not on the job."

Now I am coming to the purpose of my talk. Let's then begin to consider the future of our work on the basis of the possibilities of each department. There is no sense in assuming that train service will ever be exactly like the maintenance of way or the maintenance of equipment. For that reason, we have got to establish rates that will be reasonable for each department.

There are a lot of circumstances that enter into this thing. It may be that Mr. Warfel's report may change the basis of reporting. It may be that there are plenty of railroads in the United States that are just as honest as they can be, that would report more accidents if Mr. Warfel's report is accepted and adopted. I don't know exactly what the rates ought to be, and I think I ought to know if anybody else does know. But I have thought that the figure for the maintenance of way department ought to be less than three casualties per million man-hours; the maintenance of equipment department ought to be three and the train and engine service ought to be eight, and the total ought to be four.

I come to the important question, "How will this goal be reached, how will these figures be achieved?" By the same methods that we enunciated in Salt Lake City, namely, improved design, construction and maintenance to insure the greatest immunity from physical hazards, and all of the accidents from that cause represent only five per cent; improved training, supervision and discipline to insure the adjustment of the mind to the hazards of operation in the case of every railroad man in the service of our railroads, so that they will be literally capable and able to master the dangers of their work. This consummation, which is so devoutly to be wished, will be realized when required by the management of every railroad; that is, when safety is fully woven into the duties of all operating officers and supervisors.

Following Mr. Carrow's report, the suggestions he had made were embodied in a motion, and the recommendations of the report were duly referred to the committee of direction for consideration.

The Railroad Trespass Evil

By T. E. PRATT

Chief Special Agent and Superintendent of Safety, C. B. & Q. Railroad,
Chicago

The speaker said in part: I am not exaggerating when I inform you that there are at least one-half million trespassers using railroad trains as a means of transportation, 90 per cent of this number being under the age of 25. Men, women and children are now traveling via the hobo route. For instance, a man and his wife, with a three weeks old baby in a basket, were found on top of a refrigerating car

on the Illinois Central Railroad recently. In another instance, a mother and father placed their two children, 6 and 7 years old respectively, in a box car to send them to another city where they had relatives.

It is not an uncommon thing to see on a freight train as many as 150 hobos. When a derailment occurs, many are injured, or killed. Hundreds of them are injured while beating their way on trains, resulting in the loss of arms and legs, which is costing either the community or the railroad large sums of money. Some of them unconsciously turn angle cocks while climbing through trains, some of this being done maliciously, and this at times causes serious accidents.

Perhaps you may wonder why the special agents or the police department cannot do anything about this trespassing. Do you realize that we have communities where, if we arrest a man for riding on a train, he is not only turned loose but the officer is criticized by the court, and snitch lawyers are there to file suit against the company? In one instance we had a fine young man working for our company, who was killed in cold blood by a man taken off the head end of a passenger train. In that community, when the man was apprehended, upon trial he was not only turned loose but the citizens in the community made up a purse to send him back to his supposed home.

I say to you that because the public was not informed, they did not understand what a menace to society that man was. They did not understand what they were saying to the youth of our land who are going around under the guise of hobos. That is the reason, when we talk about trespassing, that we must, before we start in, educate the public, and this section of the American Railway Association, together with every other section, should assist the Protective Section in molding public opinion so that they will understand that it is to their interest to stop this undesirable traffic.

The Supervisor's Responsibility

By H. S. CORBIN

Supervisor of Safety, Atlantic Coast Line Railroad, Wilmington, N. C.

The speaker said in part: Working on the theory that every accident results from a definite cause, it is my belief that there is no greater cause of accidents than supervisor's responsibility covers all phases of operation.

Standard operating rules, along with special instructions, cover practically all conditions of service and, when there is an accident, or personal injury, it usually develops that some rule has been violated. Therefore, there can be no greater responsibility resting upon a supervisor than to see and know that rules and instructions are carried out.

From the standpoint of the maintenance of way department, the supervisor is responsible for condition of the roadbed and tracks on the territory which he covers as section foreman, roadmaster or general roadmaster. He is also responsible for the safety of the men under his supervision and the tools they work with. He should make a personal study of local conditions and needs in this respect.

One of the most hazardous conditions with which track men must contend is the operation of track motor cars. Because they usually carry more than one man, and an accident assumes greater proportion in the number of employees injured, and the extent of their injuries. Some employees will naturally take a chance in

the operation of track motor cars by: (1) operating a car at excessive speed; (2) improperly storing tools on the car; (3) permitting men to occupy unsafe positions on the car; (4) failure to protect against trains and other track motor cars; and (5) failure to observe switches and crossings, especially with respect to speed and obstructions.

The maintenance of way supervisor must know the standard operating rules, and should at all times have in his possession current time tables and be familiar with special instructions. There are few duties of a maintenance of way supervisor that we can well delegate to someone else, or avoid responsibility for.

From the maintenance of equipment standpoint, it is particularly the duty and responsibility of the supervisor to note hazardous conditions about the shop plant. He should be quick to hear any report of unsafe conditions of the premises, machines and tools, and his quick eye should personally observe these conditions. He should be of as great value as others working under him in foreseeing possible accidents and injury as the result of these hazardous conditions.

After a possible injury, the supervisor also has an important duty toward the injured employee. He should see that immediate first aid care is given the injured person and make sure that he gets into the hands of a competent physician as rapidly as possible. To call in a physician and a claim agent every time a man stubs his toe or skins a knuckle is, of course, a mistake. It is possible to make too much fuss over small injuries. But there should be at hand some simple means of preventing infection for minor injuries, and if an injury is serious, the personal attention of a physician is the only recourse.

The Green Book

The final feature of this session was a presentation of the current "Green Book" by L. R. Palmer, Conservation Engineer, Equitable Life Assurance Society, New York City. Mr. Palmer very briefly called attention to the fact that he had prepared a tabulation covering employee casualty rates for the six months' period of 1933, Class I railroads, in accordance with the standard Green Book grouping and will forward copies to Class I railroads.

WEDNESDAY MORNING SESSION

October 4, 1933

The Goggle Rule and How Enforced

By J. C. YOCUM

Manager, Safety Department, Chicago, St. Paul, Minneapolis and Omaha Railway

The speaker said in part: It has always been a puzzle to me why it is necessary to repeat over and over again to employees that one of the greatest things which has been given us is sight and how necessary it is that they use the means so freely afforded them to protect and preserve this blessed gift. To my mind, being blind is about the worst disaster that can happen to anybody.

Experience has shown that we cannot take it for granted that men will of their own accord think for themselves in this respect, and for this reason it has been

found necessary to adopt rules requiring men to wear goggles in performing operations that are hazardous to the eye.

The record of one of the largest railroads shows that there was a total of 124 eyes destroyed over a period of five years, as follows: 1928, 34 eyes lost; 1929, 32 eyes lost; 1930, 29 eyes lost; 1931, 21 eyes lost; and in 1932, 8 eyes lost.

The principal causes of these losses were as follows: struck by flying materials, 18; using tamping picks, 11; using track chisels, 6; cinders in eyes, 6; driving spikes, 5; driving nails, 4; struck clark bar with spike maul, 3; cutting cotter keys with hammers and chisels, 3; cutting nails with hammers and chisels, 3; striking steam hose coupler with hammers, 3; and struck by stones thrown by boys, 2. There were also reported 31 other causes, each producing loss of one eye. A total of 26 eyes also were lost due to dust, scale and other foreign particles entering the eyes.

In checking goggle rules issued by several of the lines, it is found that some are very brief and merely recite that goggles are furnished by the company and must be worn by all employees in performing operations hazardous to the eyes, while another road will use the above quoted rule and then follow with specific items covering operations in which goggles must be worn. To my mind, the rule should be as specific as a rule can be made, as it is more easily understood and violations more easily detected.

In my study as to the means of enforcing the goggle rule, my conclusions are that it is a matter of cooperation between the management and the employees, and that each has a duty to perform.

To further emphasize the enforcement of the goggle rule, I would gather together the foremen or supervisors under my direction who have direct charge of gangs and speak to them in the following language:

"The management expects me and my department to enforce the goggle rule 100 per cent, and I expect the same from you. I also expect you to know that each man working under you is furnished with the proper type of goggle for his work, and you must take especial care to have proper goggles for your men who wear glasses with corrective lenses. You are to see that these goggles fit properly, are in adjustment, are comfortable, and that they are afterward kept in proper repair. You will remember that the safety department has given you some valuable hints as to the wearing of goggles and the care of them. The most important of these hints are as follows:

"1. To prevent fogging, keep ventilating screens clean, and lightly rub glycerine soap over the lenses, then wipe off.

"2. A gauze band worn over a man's forehead above his goggles will prevent perspiration from running into and over the goggles and prevent fogging.

"3. There is a proper way to remove goggles. Bend head forward with both eyes closed, take off the goggles and with the eyes still shut, wipe off the forehead.

"All of the above are duties in connection with the saving of eyes which you owe to the men who work under you and will do much to assist you in enforcing the rules. When you carry out the above ideas completely, you have done all you can for their comfort, but you have a further duty and it is up to you to educate your men to have their goggles with them at all times during working hours. The fact that some of your men may think it a burden to carry the goggles on their caps or around their necks in the extremely hot weather is no excuse for you allowing them to do without their goggles when they need them—also, you are to consider that it is just as essential that goggles be worn in doing work dangerous to the eyes

which takes only a second or two as that work which takes a longer period of time. I expect that each of you supervisors will be smart enough to secure the full cooperation of at least 95 per cent of your employees in a 100 per cent obedience to the rules because your employees realize the wisdom and desirability of compliance. It is possible you may have 5 per cent of your men who cannot or will not obey the instructions and rules. I am back of you fully in the enforcement and discipline necessary."

Accidents to Yard and Train Employees—Their Cause and Remedy

By E. A. MEYER

Manager, Safety and Fuel Departments, Chicago, Milwaukee, St. Paul and Pacific Railroad, Chicago

The speaker said in part: In looking over the list of accidents to switchmen on the Milwaukee System, which comprises 11,207 miles of main line, I find we had 20 switchmen injured during the past 12-month period; 7 of these were injured by falling; 3 had their hands injured or fingers crushed while making couplings; 5 resulted fatally, 3 of these 5 victims went between moving cars to adjust couplers which is a direct violation of the rules, and one stepped in front of moving cars. The fifth fatal injury was to a man who crossed in front of moving cars to reach a platform.

During this same one-year period, we had 19 trainmen injured. Five of them were conductors and 14 brakemen. No conductors were killed although 5 were seriously injured. Four of these accidents to conductors could have been avoided: one scratched his hand on a train order book and neglected the injury until infection had set in; one was injured in opening a stockyard gate, the wind blew the gate against him, throwing him against the loading chute. Another was hurt while kicking a wood block out from under a wheel, and one was pulling a jack from under a derailed car on a bridge when the jack gave way and he fell backward off of the bridge. The fifth accident was one for which the conductor was not to blame. He was assisting passengers to alight from the train when a lady missed the top step and fell. He caught her and in so doing severely injured his knee joint.

Fourteen brakemen were injured, one of these being killed when a train was derailed. He was not to blame, simply a victim of the mistakes of his fellow employees. A majority of these accidents to brakemen were falls from cars or injuries received while the men were getting on or off moving trains. They were not particular about getting a good hand hold and foot hold and were not sure of the nature of the ground surface where they alighted. One brakeman was injured while standing alongside of an engine when the engine man opened the blow-off cock.

I have given a resume of the accidents to train and yardmen for a period of a year. What are the remedies?

First, safety education. By meetings, talks, and letters we are trying to have our men become safety minded. We also try to instill a competitive spirit in them by issuing statements showing the list of accidents in their departments in comparison with the same department on other divisions. We also compile comparative standings of divisions. This creates a desire to have the record of their craft or depart-

ment excel. It also generates loyalty to and pride in the safety record of the entire railroad.

A second remedy is stricter discipline. Whenever an accident happens, whether there is an injury or not, an investigation is held. The cause of the accident is determined and the responsibility placed. Very often several persons are to blame. The punishment varies depending upon the seriousness of the mistake and also on the man's past record. Sometimes a reprimand or mark against his record is all that is given. He is sometimes taken out of service for a certain period of time. Often it results in his dismissal from the service.

We are placing more and more stress upon supervision. The man at the head of the department should be held responsible. Even though a foreman does not personally disobey a rule, if he allows anyone to follow an unsafe practice or if an accident happens through the lack of his supervision, he is the one who should receive the punishment. For instance, a conductor is responsible for the brakeman, and if he allows his brakeman to do something contrary to rule, the conductor is the one to be held responsible and he should be disciplined as well as the brakeman.

Operation of Hand Brakes

By FRED BRASTRUP

Superintendent, Fargo Division, Northern Pacific Railway

The speaker said in part: In considering the general subject of hand brakes, the upkeep, I think, should be mentioned first. A great many accidents that result in personal injuries, as well as damage to equipment and contents of cars, occur as the result of defective hand brakes. Some of the items that contribute to this result are too much brake chain, which permits the chain to be wound around the staff and jammed before the brake shoes come in contact with the wheels. Defective ratchets and dogs that will not function after the brake is set are another cause of trouble that should be checked in making equipment inspection.

The styles of brake differ from the old style staff, mainly in that they are constructed with leverages that will respond promptly and bring a heavy load to a quick stop. In this connection it is important, however, not to provide excessive leverage that will result in sliding wheels, as it is a well known fact that too much breaking power is not good practice as it increases liability of flattening wheels which again is a source of danger.

The following are points that are essential in a hand brake:

1. A brake that can be applied and released with one hand. Both feet and the left hand are thus free to be used in retaining safe position on a car.
2. A brake that can be quickly applied with one hand with such small effort that the operator's mind and body are free to observe and act promptly in emergency.
3. Instantaneous release by the use of one hand only.
4. Graduated release for permitting a car to drift with the use of one hand only controlling the brake, thus permitting a trainman or yardman to maintain positive control of car movement with minimum effort and with safety to himself.

Some of the things to be guarded against in connection with the operation of hand brakes are:

1. Do not permit the use of a make-shift brake club. The use of the brake club in the spotting of cars on sidings and in yards, particularly in what is known as hill territory, is recognized, but the practice of train or yard men using a pick or

maw handle converting it into a brake club should not be permitted. Such a stick, frequently made of inferior material, is liable to break when stress is exerted against it, resulting in personal injury. Brake clubs should be selected from the very best of material.

2. The importance and necessity of securing every car left standing on a heavy grade, at way stations and at isolated points, should be stressed.

3. In controlling the speed of several cars that are being kicked or switched over a hump in the yard, or on heavy grades, the operator should not depend on one hand brake to control a greater number of cars than may be fully retarded with that amount of braking power. If necessary the brakes should be applied on several cars.

The bracket platform on the ends of high cars is favored instead of the deck location as it is quicker to ascend to this location and it permits the operator to have a double hold at all times—once he is positioned on the bracket platform he is enabled to watch in both directions, which is a decided advantage over the deck type of brake.

Operation of Air Brakes

By MARK PURCELL

General Air Brake Inspector, Northern Pacific Railway, St. Paul, Minn.

The speaker said in part: Mr. George Westinghouse invented the "Plain Automatic" Air Brake in 1872. The automatic feature resulted from the obtaining of an indirect application of the brakes through the medium of a valve device called a triple valve, and an auxiliary storage reservoir, which were added to the brake cylinder on each car.

The plain automatic air brake was a great improvement in many respects over the straight air brake, but chiefly from an emergency or safety point of view. Much of the flexibility (ability of the operator to increase or decrease the cylinder pressure quickly and in small amounts) for ordinary service brake operation had to be sacrificed. This brake served the purpose fairly well while trains were short and speeds, weight and frequency of trains low, but as these factors changed, its limitations became more and more apparent, particularly with reference to emergency operation. The propagating operation was too slow with long trains, which resulted in severe interchange of slack due to brakes becoming heavily applied on the forward portion of the train before the application had time to take hold on the cars farther back toward the rear. This limitation was overcome to a great extent by the invention of the "Quick Action Triple Valve" in 1887 and the equipment with which it was used came to be known as "Quick Action Automatic Brake." The quick action triple valve was developed by adding to the plain triple valve parts which brought about a local venting of brake pipe pressure in emergency applications, and thus caused a rapid serial application throughout the length of the train so that the time for the full application of all brakes on a 50-car train was reduced to about one-sixth of what is inherent with plain triple valves, and shocks are therefore lessened to a great degree and the distance for stopping greatly reduced.

Two of the features that exert a governing influence on braking are: First, the adhesion between the car wheels and the rails; this varies to considerable extent due to rail and wheel conditions, but changes little when the vehicle is moving as compared to when it is standing. Second, the adhesion or friction between the brake shoes and the wheels. This latter is greater when standing than when running and varies widely with a change from low to high speed and vice versa. The per-

centage of brake power used is based upon the empty weight of the car, unless an empty and load type of brake is used. For a long time it has been customary to use a somewhat higher percentage of brake power on passenger than on freight train equipment. Due to passenger train speed generally being greater than that of freight trains, making greater braking power necessary if stops are to be made in similar distances, the amount of brake power necessary to stop in the same distance increases as the square of the increase of speed; that is, if speed is doubled, it requires four times as much braking power.

To take care of the many conditions that affect the safety and economy of train operation, from a brake control point of view, such as the progressive increase in weight of cars, longer trains, high speeds, greater weight and power of locomotives and greater frequency of trains, has necessitated several corresponding changes in brake equipment for passenger and freight cars and for locomotives.

Getting On and Off Cars

By J. B. SULLIVAN

Road Master, C. R. I. & P. Railway, Burr Oak, Ill.

The speaker said in part: Quoting from the records of train service accidents, I find the following: Year 1930, 5,451 accidents in which 441 persons were killed and 5,010 injured; year 1931, 4,543 accidents in which 447 persons were killed and 4,096 injured; year 1932, 4,466 accidents in which 520 persons were killed and 3,946 were injured. These records further show that but four train service accidents and four casualties were caused by defective equipment, all of which goes to show that practically all those deaths and injuries were directly traceable to the old human element, better known as man failure. A great many of those injuries were caused by alighting from cars on unfavorable terrain, such as ice, switch stands, timbers and ties, rocks, lumps of coal, holes in the ground, etc. Alighting from, or trying to board cars moving at excessive speed, is also conducive to injury and should not be attempted.

The proper way to get off a moving car is, first, face the direction of movement; second, place the inside foot on lower tread of sill step; third, grasp convenient tread of side ladder (depending on height of person) with inside of hand. When sure of the ground on which you are about to alight, let go with hand hold, remove foot from sill step and with body slightly inclined backward and legs partly flexed, alight on outside foot, using the other foot to overcome momentum.

To get on a moving car, grasp a convenient grab-iron or tread of side ladder firmly and swing the inside foot onto the lower tread of step. Practice, natural agility, a sense of timing and judge of distance, all go toward simplifying the movements until they become almost second nature.

The standardizing of safety appliances, such as sill steps, grab-irons, side ladders and such, although considered adverse legislation at the time of its inception, proved to be a blessing in disguise and their uniformity has done more in my estimation to eliminate casualties than any other thing.

But it is to the unsung hero of the railroads that I would dedicate this theme. This is the man that is known in railroad parlance as the "end man" or "pin puller" on a switching crew. Invariably the youngest man on the crew in point of service, he has more mounts, dismounts and remounts than all of the jockeys in America put together, with all of Uncle Sam's cavalry men thrown in for good measure. On

a busy lead, that does nothing but swing switches, this man will get on, make his cut and get off on an average of 200 times on an eight-hour shift, and this in addition to his other duties.

Just a few hints to make his work easier and safer. Assuming that the crew is working in the orthodox manner on the right hand side of the switching cut, the pin puller in getting on, should grasp the second tread of the side ladder firmly with left hand, place left foot on lower tread of the sill step, and brace his right leg against the rear journal box. This position will give him all the necessary leverage to operate the cutting lever with his right hand and, what is most important, his body will be braced against all unexpected bumps or jolts.

Inspection of Trains In Yards and Enroute

By A. A. LOWE

Supervisor of Transportation, Southern Pacific Railroad, San Francisco

The speaker said in part: On the lines of the Coast division we work on the principle that the best way to avoid trouble is to remove the fundamental causes, and the best way to do it is by stressing the need for thorough conditioning of triple valves, tight brake pipes, paying attention to leakage tests by enginemen, testing of retainer valves at designated points, correct piston travel, close attention to draft rigging and air hose, careful education of enginemen in the handling of air brakes and constant attention to those numerous other details of maintenance and operation which have a vital bearing on avoidance of stuck brakes, break-in-twos, slid flat wheels and damage to brake rigging.

Our principal yards are located about 500 miles apart. Cars arriving and departing in those yards are placed in thorough condition and, as a rule, require very little attention after serving at these points. As a train arrives in yards where car inspectors are employed, they station themselves where they can give entire train a careful rolling inspection. Rush cars are usually blocked at the head or rear and are given first attention by inspectors for prompt release to yardmen. In some yards it is found advisable to have traveling carmen make the rounds of the industrial, team and house tracks to effect minor repairs.

When trains are made up, the usual inspection is made in accordance with Interstate Commerce Commission regulations and general practice. Trainmen are required to look train over to see that hand brakes are released and assist carmen in making rolling inspection as train departs. We have no hump yards with depressed inspection pits as the volume of traffic through any one yard is not considered sufficient to justify this investment. Standing inspection of freight trains is made every 50 to 80 miles in open country. Stops are made at intervals of seven to ten miles on heavy descending grades to permit wheel heat to equalize. Inspection is made at such points by trainmen. On these heavy grades where view is obscured we require a trainman to ride on rear of caboose to watch tracks for indication of derailed wheels and by night we light the track to the rear of the train with two inspectors' heavy lanterns. We make standing air brake tests before descending heavy grades and give train a rolling inspection at every opportunity as stops are made.

In snow shed territory we make use of electric reflector lights, permanently located on foundations at the wheel level and facing the track to aid trainmen in making rolling inspections. These lights are actuated by track circuits as trains

approach and depart. Trainmen are required to ride on the top of trains to change retainers as required and to watch for overheated wheels, excessive fire flying or other indication of trouble. In certain districts where operating conditions are especially difficult, such as through snow shed territory, we make use of emergency air hose cut in between cars and extended to top of train so that trainmen may apply air if an emergency arises and if obstacles cannot be seen.

Our records show we are remarkably free of accidents which may be traced to the quality of our train inspection, but that, on the contrary, both carmen and trainmen, including the enginemen, render a good account of themselves in detecting trouble at its inception and taking necessary action to prevent serious results.

The Car Department's Responsibility In Accident Prevention

By W. E. DUNHAM

Superintendent, Car Department, Chicago and North Western Railway, Chicago

The speaker said in part: The responsibility of the car department can be separated into three general groupings: 1st, the responsibility for accidents to car department employees themselves; 2nd, responsibility for accidents to employees of other departments; and 3rd, responsibility for accidents to the patrons of the road. As an example in the first grouping, our railroad in 1910, when matters of safety and accident prevention were first attacked in something like an organized manner, had in the car department about 289 reported lost-time accidents and 7 fatalities per year, with an average force of 3,356 employees. By dint of earnest correction of tools, exchanging methods that had in themselves any chance for accidents, by installing safety guards and similar devices, as well as trying to develop in the individual employee a personal interest in his fellow employee's safety, that original record, after ten years, was brought down in 1920 to 593 reported lost-time injuries, and to 6 fatalities.

However, the problem was studied from a different angle. Direct responsibility of the supervisory organization for the actual training of the employee under the individual jurisdiction was determined to be the most prominent line of attack on the causes of injuries. A few years of effort along those lines, in addition to the maintaining of the previous form of attack, brought the reported lost-time injuries for 1928 down to a total of 80 per year, and reduced the fatalities to 3, among a total of 5,234 employees.

Such a record, as compared with 1910, might have appeared to be very satisfactory, but there was still another step in accident prevention that was practical. That step was to eliminate the careless man and the man whose mind was not on the job at hand. The result was that in 1930, with an average force of 4,846 on the payroll, there occurred but 21 lost-time injuries and 2 fatalities. In 1932, with an average force of 2,434 on the payroll, 8 lost-time accidents were reported and only 1 fatality.

In considering the second responsibility, that to employees of other departments, it is rather more difficult to present concrete results. However, they can be brought out in a general way. The employees referred to are those who in their assigned duties use the active freight and passenger equipment which the car depart-

ment employees maintain and inspect daily on the repair tracks and in the yards. It is here that personal responsibility of the car department employee is demonstrated, and a full appreciation of that responsibility is shown, for underlying the duty of the department in the inspection of equipment is the keynote of safety. First and foremost in a review of the activities of inspection and maintenance of equipment, there properly comes to mind the elaborate system of safety appliances, such as hand-holds, ladder rounds, coupler releases, etc., as established by regulation on all cars for passengers or freight. The primary purpose is to reduce accidents to train and yard men. The condition of the brakes on the cars, including air operating features as well as the physical parts such as rods, levers, pins, beams, shoes, etc., is another of the car department's responsibilities in accident prevention. Every one of these parts is subject to constant wear and possible breakage. They must be watched with extreme care to know that at all times they are in safe and suitable condition for further service. Running gears, couplers, draft gears, etc., are parts with which many railroad employees are not familiar and their "diseases" are not known. To the carman they are vital parts of the safe operation of the train as well as in the prevention of accidents. Experience has taught him where to look for failures, what weaknesses to check, what wear to allow and what limits beyond which he must not "take a chance" under any circumstances.

Freight House Accidents—Their Cause and Remedy

By L. B. HINE

Agent, Erie Railway, Binghamton, New York

The speaker said in part: Freight house accidents do not happen—they are caused. It is the agent's responsibility to eliminate them. This can be accomplished only through untiring effort, investigation and developing the cause of every accident, and the application of a remedy or cure that will prevent a repetition.

There are many routines and manners to be followed by a successful agent, in his promotion of the safety movement, and it is needless to say that this goes hand in hand with efficiency.

One, know your men. Two, issue a daily bulletin, quoting a safety rule, and require each member of your force to know that rule. Three, adopt a suitable safety slogan and change it with regularity. Four, be fair with your men, create in their minds without a shadow of doubt that you are interested in their personal welfare; develop their confidence—get them to realize the requirements of the rules and necessity for compliance with them to protect themselves and their families.

Realize that the education of some men at the larger stations or piers is quite a task owing to the general class of men employed. You must not forget, however, they are human beings. It can be done.

Have the rules and slogans issued in languages in accordance with the nationalities of your forces.

Have the general foreman and the foremen give a short safety talk to their forces each day before starting work. Conduct a weekly safety meeting, at which the agent must preside.

Place bulletin boards at various positions in your freight house, indicating the number of days your forces have worked without a personal injury.

One of our large railroads has had what is known as the star system. A chart is placed in a conspicuous position, in which a space is shown for each day of each

month, covering the current year. The foreman places on this chart before the forces go to work each day a gold star if no accident has occurred the previous day. A blue star for a minor accident and a red star for a lost-time accident, also are used. It doesn't take long to create enthusiasm by such an arrangement. It is by the creating of personal interest that results are accomplished.

A contented man is an asset; and when the average man knows that his superior is interested in him, he is contented. When he is in that state of mind you can easily convert him into a safe man.

Report of Committee on Train Accidents

By G. H. WARFEL

Assistant to Executive Vice President, Union Pacific System, Omaha, Neb.

The speaker said in part: The subject of train accidents is one which oftentimes does not get the attention it deserves, particularly from railroad safety men, because only a comparatively small proportion of the casualties (and the casualty rate per million man-hours is the criterion upon which the safety men judge their work on railroads) result from train accidents, and men are apt to overlook their importance.

Of the 1,265 collisions occurring in 1932, 114 were head-on or rear-end collisions between trains. There were also 112 side or raking collisions and 10 at crossings with other railroads, leaving something over 1,000 occurring on yard switches and in similar operations.

More significant from a safety standpoint is the fact that more than 90 per cent of all collisions are directly ascribed to negligence of employees. In the analysis of these negligent cases, the principal items are: the disregard of fixed signals; the disregarding or misunderstanding of hand signals; failure to secure hand brakes; leaving switches set wrong; failure to comply with speed restrictions; improper handling of locomotives; and failure to keep proper lookout. We find, therefore, as we go through other classes of train accidents besides collisions, that that same old factor, which in the annual statistical bulletin is described as negligence of employees, insists on showing up.

Train accidents are important in another way, too. A railroad may have a very fine employee casualty rate; it may even have won an award because of its employee casualty rate on the basis of safety work among employees. It may have a good safety record all the way around. But one train accident of serious nature may largely undo in the public mind all the advantage of those long years of patient work in building up a reputation for safety.

So we get back to the same thing in train accidents that we have in the train service and in every other type of accident on a railroad. The all-important thing in any safety campaign on any railroad is the proper education and training of employees.

The first thing necessary for a trainer is that he know the thing he is training the men for. If he does not know it from his own experience he must study it very carefully, because the teacher cannot teach the student if the student knows more about the game than the teacher himself.

We have a situation on the American railroads today somewhat analogous to that in surgery a generation ago. Thirty-five or 40 years ago American surgeons knew almost as much about anatomy as they know now. The doctor knew where to cut and how to cut; he knew how to stitch; but of the number of cases that

went into hospitals, too large a percentage, sometimes 50 per cent of them died, although the operation was successful.

Our trouble is not that we don't know how to switch cars, it is not that we don't know how to get trains over a railroad, it is not that we don't know how to make those trains fine and comfortable for passengers or to meet the needs of the shipping public, but we cannot perform our operations without the infection of carelessness; and the only way we can eliminate it from our railroad operations is to make each individual man on our railroad an expert in the performance of his operations.

So we need to study each individual operation and see where the bug gets into that operation, and develop a technique that will assure efficiency every time that operation is performed.

WEDNESDAY AFTERNOON SESSION

October 4, 1933

Report of Committee on Train Service Accidents

By D. G. PHILLIPS

Superintendent of Safety, Wabash Railway, St. Louis

The speaker said in part: In 1932 there were 63 employees killed and 326 injured in train accidents, while in train service accidents for the same period there were 367 employees killed and 6,861 injured. So without minimizing the importance of safety work in connection to train accidents, these figures show us the much greater field for work in the prevention of train service accidents. In 1932 there were six times as many killed in train service accidents as in train accidents, and 20 times as many injured.

In 1932, 20 persons were killed and 307 were injured in accidents while coupling or uncoupling cars or locomotives. The remedy for this class of accidents naturally suggests itself, keep from between moving cars that are about to couple, do not attempt to make any adjustments in the coupling apparatus of a moving car that requires you to go in front of the car. Such adjustments should be made when car is still. We believe that proper supervision can eliminate entirely this class of accidents, but if a supervising official stands around seeing men doing work in this manner and says nothing, just so long will accidents of this kind occur.

During 1932, 9 persons were killed and 123 injured while coupling or uncoupling air or steam hose. The principal cause of employee injuries coming under this heading is due to attempting to do their work without proper protection and from inadvertently uncoupling air or steam hose under pressure. If accidents of this kind are to be prevented, it is absolutely necessary that where a blue flag rule is applicable, such a rule should be made and should be complied with. However, frequently in switching operations there is no opportunity for the use of a blue flag. In such cases, not only the men doing the work, but those working with them should be on the alert to see that no movement is made when men are between the cars. Of course, the man himself should be sure that air and steam are shut off before any attempt to uncouple hose, and even then they must be careful, as steam and air are frequently trapped and remain for sometime in a short section of hose. Supervising officials should not overlook the failure to blue flag when the rule so provides and should watch to see that the man understands the proper method to uncouple air and steam hose.

In 1932, 12 persons were killed and 593 injured while operating hand brakes. Injuries arising from operating hand brakes result largely through men losing their hold on wheel, slipping or falling, or by sudden move of train or when tightly set brakes are released, or thrown or knocked from the car by brake club or revolving wheel. While it is true that defective brakes are frequently found it is also true that if the employee properly braces himself and holds the brake wheel properly, a defective condition is not going to cause an injury. Employees must be taught when handling brakes to constantly be on the alert for sudden movement of cars.

In 1932, 2 persons were killed and 210 injured while operating switches. Before a man operates a switch, he should be in such a position that the switch lever cannot strike any part of his body or feet, especially where a switch is being thrown with the engine or car almost on the switch. There is a great danger of serious injury due to lever flying around, but if a man will place himself in a position free of the lever, all danger from flying handles is removed.

In 1932, 520 persons were killed and 3,946 injured while getting on or off cars or locomotives; however, 471 of those killed were trespassers. A number of railroads prohibit men from getting on or off moving locomotives and, of course, men are seldom injured; but on the other hand it is possible if a man has his mind on his work to get on or off of the moving engine or cars without danger of accident. No matter how careful a man may be he is liable to slip if attempting to alight on ice, snow or mud. When about to alight from a car or engine, he should make that his special order of business until safely on the ground and be governed by the conditions at the time and place he is about to alight. All rules are valueless, however, unless complied with and they will not be complied with unless those in authority exercise the supervision that they should exercise and see and know that the rules are being enforced.

In 1932, 1,445 men were killed and 3,911 injured in accidents (train service) at highway grade crossings. Although the subject of grade crossing accidents will be handled in a separate report, it also comes within the scope of this report. While it is true that nearly every accident could be prevented by the exercise of ordinary care on the part of the automobile driver, that does not mean that the railroad must not do what it can to lessen the danger of grade crossing accidents. The neighborhood of the grade crossing should be kept as free from obstructions as possible. The crossing itself should be kept in first class condition and, above all, our enginemen should comply with rules with regard to whistling. Good whistling has avoided many a grade crossing accident; bad whistling has been a contributing factor to many accidents that have happened.

1. Switch crews and train crews working at stations should be prohibited from dropping cars across highways, their engines going down one track and the car going down another track, without protection on the crossing by a member of the train crew.

2. Switch engines, switch runs and local way freights backing cars over crossings at uncontrolled speed and without proper protection on the crossing should be prohibited.

3. Passenger trains and switch movements backing up with tail hose at the rear over highway crossings, should reduce speed at all crossings that are not protected.

4. Cars being kicked over crossings without engine attached should be protected.

5. Switch engines, way freights and switch runs doing industry switching where it is necessary to shove cars by a building where there are alleyways where trucks and automobiles might be parked too close to the track, should be prohibited unless a member of the crew walks in advance of the movement to protect.

In 1932, 6 persons were killed and 1,042 injured while operating locomotives. We must again call attention to the fact that many of these injuries due to operating locomotives arise through failure to comply with operating rules and the general regulations. Men injured operating locomotives are generally doing something that they should not do.

In 1932, 71 persons were killed and 284 injured when coming in contact with fixed structures. Men are usually injured by fixed structures on account of forgetting their location, generally coupled with looking backward or rather looking in a different direction than the train or car is moving. Of course, if the fixed structures can be conveniently moved, it should be done, but frequently this is impossible. The remedy then is to get an employee, first, to have in his mind all these non-clearance points, and second, in switching movement always face the way in which the car is moving.

In 1932, 1,590 persons were killed and 911 injured through being struck and run over, not at public crossings. Nearly all of them come under one of the following three heads: failure to look before stepping on the railroad track; walking on the railroad track or foul of the track where possible to walk elsewhere; walking too close to the end of a car in a live yard.

It is all the more regrettable that we have so many men killed in this manner when we remember that this class of accidents can probably be more easily remedied than any other. Of course, the remedies, briefly stated, would be as follows: always look both ways before stepping on the railroad track; never walk on the railroad track or foul of the track when it is possible to walk elsewhere; never go within ten feet of the end of the car in a live yard.

Any railroad man will tell you that these three remedies are proper and reasonable things to do. They all know of the large number of men being killed by their violation, then naturally, the question arises why do men continue to do these things, knowing that they are wrong, knowing that every time they violate one of these three rules, it is merely a matter of chance that they are not killed or injured. The answer is "habit."

Maintenance of Way Accidents — Their Cause and Remedy

By G. C. WENDLING

Division Engineer, Louisville & Nashville Railroad, Louisville, Ky.

The speaker said in part: The key note of our safety endeavors has been the development of an interest in the safety situation in the minds of our foremen. We started with this idea and our experiences have strengthened us in our belief. If he goes safely, then the safety of the gang is assured, and he will go safely if he is held strictly accountable for the actions of his men and is given the proper training — by means of various pertinent printed matters: by instructions and by the example of his supervisor, his roadmasters, his division engineer and his superintendent. Without the moral support he receives from these men above him, all the printed matter we could send him would avail nothing; hence our first necessity was the

guaranteeing of this interest on the part of superintendents, division engineers, roadmasters and supervisors.

And realizing that the same principle prevails with them as with the foremen, that they would not reflect the attitude of the men above them, we went to the top, to our president, and secured from him a statement which served as a key note for the building up of our safety organization.

We then laid out our campaign under two headings, primary safety, and secondary safety. Under the heading of primary safety came the general policies designed to affect the masses of our workers, such as the development of the proper morale, creating in a man the desire to improve his record, and the development of a spirit of interest and a spirit of competition between the various units. Under the heading of secondary activities came the actual preventive measures to be taken on the ground, proper supervision, proper reports to be made when injuries occurred, instruction of the men as to the safe way in which to perform their various operations, supervision of tools, the inspection of equipment; in other words, the removal of the causes of injuries.

One of our first moves was the preparation of a book of rules on safety. Our foremen were instructed to make these rules the warp and woof of the pattern of their daily lives; they were to know the rules and teach them to their men. They were instructed that at the noon hour they should have the men get out their books and they should discuss with them the rules; that before starting out every morning they should remind the men of the necessity for working safely through the day. They should, in case special work was to be done, go over with their men the precautions that should be taken in performing the work; they should, in case injuries occurred, point out to their men the violation that caused the injury; they should impress the men with the fact that the rules were made for their protection and for no other primary reason; that to work safely does not mean to work slowly, our experience having proved that just the reverse is true.

In some cases we have been forced to resort to discipline and in my opinion it is these cases that are helping us to go forward in our campaign of education and enforcement. The day of the heavy hand is passed, but the day of right is still with us, and it is certainly the right of an employer to insist that after he has provided his employees with the proper equipment and conditions with and under which to work, that these men perform their work in a proper and safe manner.

The problems offered by the malingerers were virtually solved by insisting that every man who was injured promptly report his injury to the foreman, who followed up all the details.

So far I have dealt with our general problems; but I want now to go into details regarding the specific causes of injuries occurring in the track department. A detailed analysis of the injuries occurring during a typical period showed that while injuries were divided among 18 causes, more than 50 per cent of the total was chargeable to one cause—handling of rail and ties; 65 per cent of these while handling rail and 35 per cent while handling ties.

One of the most important steps toward improving this condition was in arranging for our new rail loaded on flat cars instead of in gondolas. This alone removed one of the principal sources of accidents. A close study of the situation proved also that a lack of supervision was responsible for a large portion of these injuries and we are insisting that supervision be given to all matters pertaining to the handling of rails and that all movements be made according to signals. The same principles are applied to loading, unloading, carrying and piling of crossties.

5. Switch engines, way freights and switch runs doing industry switching where it is necessary to shove cars by a building where there are alleyways where trucks and automobiles might be parked too close to the track, should be prohibited unless a member of the crew walks in advance of the movement to protect.

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Motor Car Operations

By F. P. GUTELIUS, JR.

Division Engineer of the Delaware & Hudson Railroad Corp.,
Oneonta, N. Y.

The speaker said in part: It is surprising, as we review the accidents occurring in motor car operations, the number of division engineers, roadmasters, or supervisors who are involved. As long as this condition exists on the roads, I suggest to them to look to themselves before they can expect safe motor car operation from their subordinates. This is the supervisor's responsibility and it is to be regretted the number of times justice has erred in dealing out discipline.

Recognizing the A.R.E.A. Manual of Rules and Instructions Pertaining to Maintenance of Way Employees, we used this information as a base for formulating a group of such instructions adapted to our local conditions. It was then a question of educating the individual operator. The old system of placing this in the hands of the roadmaster was discarded because many were of the old school and could not adapt themselves to this new mode of railroading. We, therefore, through the co-operation of his operating department, had the services of the Division Rules Examiner made available to us. This man, knowing the transportation rules, made an ideal instructor. The candidate selected for the course was one capable of passing the eye test satisfactorily. Classes were held once a week in the evening and were fully attended. After an instruction of six or seven weeks the embryo motor car operator was given a written examination, his paper reviewed by the Rules Examiner and graded. This course was also compulsory for roadmasters, track supervisors, region building masters and supervisors.

After the first aid course had been completed and the division safety agent felt his students were ready for examinations, they were sent to the company doctor who gave them an examination, if they passed in the first aid examination he made a note to that effect, arranged for a safety first certificate to be presented to them, and the railroad in turn gave them a portable first aid kit. Shortly after that it was made compulsory for every man in the maintenance of way department to wear safety shoes. But we did not stop there. There was a re-examination in motor car rules and in first-aid made compulsory every two years.

Handling Rails and Ties

By JOHN W. SIMS

General Supervisor, Maintenance of Track, Illinois Central Railroad,
Chicago, Illinois

The speaker said in part: The safe handling of rails begins with the loading; if improperly loaded there is serious danger of injury to the hands of employees. Frequently, when cars are loaded by using a magnet or crane in a haphazard manner, it is almost impossible to unload the rails without having serious difficulty. The proper loading begins with the placing of the first rail and the first tier of rails on the car. The first layer is placed ball-up along the floor of the car, then the second layer is rolled in ball-down across the first layer. This process provides proper footing for the men on the car both when loading and unloading.

To properly handle the loading or unloading of a car of rails, requires a gang of six men; these men should always be experienced. A power crane, either steam or gasoline, should always be used. Three men are placed on the car and the other three on the ground. In each group one man is clamp man while the other two are used to steady the rail. The center of each rail should be marked before the loading is commenced, so that the clamp man on the ground will know exactly where to place his clamp in lifting the rail from the ground to the car. When the clamp is placed on the rail, the clamp man gives a signal to the operator of the crane to lift the rail. As it is lifted, the two men on the ground steady it at either end until it reaches the level of the car, when the work is taken over by two of the men on the car, who continue to steady the rail and keep it from swinging. When the rail reaches its proper place, the clamp man on the car gives a signal to the crane operator to drop the rail.

The directions for unloading rail are very similar to those for loading.

Next in importance to proper handling of rail in loading and unloading, is the proper method of laying it in the track. In laying rail a power crane should always be used with three men besides the train operator. Again we have one man who acts as clamp man. He should give all of the signals and the train operator must not take signals from anyone except him. The rail should never be raised higher than two feet from the ground. This forces the men handling the rail to bend over, and in this position their feet are protected in case the rail should be dropped. In moving it to a position on the ties the man nearest the crane should handle the expansion shims. The rails should never be handled with bare hands, either rail tongs or rail forks should be used to get the rails in position for the clamp.

The source of almost as many injuries in handling rail is the work incident to cutting it. Many eye injuries and serious cuts have occurred in this work. The use of acetylene torches has eliminated much of this, but it is frequently necessary to cut a rail with a track chisel. When this is necessary the greatest of care should be exercised. Those men not directly engaged in the cutting should be stationed where they will not be struck by flying chips. The man holding the chisel should always wear goggles. The chisel itself should always be provided with some sort of a guard. Frequent inspection should be made to see that chisels with battered heads are not in service or used; a spike maul must never be used to strike the chisel, but instead a sledge should be furnished for this work.

The safe handling of ties starts with the loading of the tie. From a safety standpoint cross ties should be loaded flat and crosswise in coal cars. If loaded in stock cars or box cars the ties invariably shift during transit. This makes bad footing in the car and personal injuries result when men start to unload the car. In unloading ties from stock or box cars, the first consideration is safety. Not more than two men should be allowed to break into a car, since there is not safe room for more. These men should remove a sufficient number of ties, probably 100, to give a freer working space. It is then satisfactory to put in one or two additional men.

If ties are loaded crosswise in coal cars there is no chance for them to shift, the footing is better, and it is not necessary to carry them lengthwise in the car to unload. Two men are not enough to pick up a heavy creosoted tie and throw it out of a car. Three or four men, if necessary, can take hold of a tie in a coal car and slide it over the side, while in a box car two men always have to handle a tie. Unloading from coal cars requires special attention from foremen to be sure that

there are no men on the ground along the cars, as the men in the cars cannot see them on the ground. In handling ties, the men should be trained to watch each other. Invariably the man who gets pinched by a tie rolling or being dropped can blame the man at the other end of the tie.

Safe Use of Machinery and Tools

By W. O. LeBER

Safety Inspector, Canadian National Railways, Montreal, Que., Canada

The speaker said in part: The thought of being injured is generally associated with power driven machinery but you will find that a great proportion of the accidents today are still caused by the use of hand tools. The mishandling of hand tools, the neglect of proper care and inspection, and the leaving of these tools around in dangerous places are the most common causes of such accidents.

It is of prime importance that the material from which the tool is made shall be the best. Probably no one thing contributes more to safety in the use of hand tools than proper care in manufacture. The tempering of the tool is a very important factor, because it is possible to temper a tool sufficiently hard to stand the blows without mushrooming to any special amount, and yet soft enough to avoid fracturing, and that is an important thing to consider in your tool.

Shock tools, such as chisels, punches, hammers and sledges should be made of the best and most suitable class of steel. Frequently companies try to economize by buying cheaper handles for tools. There is no money saved in buying cheap handles for tools, the handle should be of the best grade possible, and preferably of hickory, ash or maple. When the handle of a heavy sledge hammer breaks, you may have a fatal accident as a result.

Probably one of the most common tools used is the hammer. There are various types of hammers, each of which is suited to a particular class of work, and an important factor is the choosing of the hammer suitable for the work. A machinist's hammer is not a good hammer to drive nails with, nor is a carpenter's hammer a good hammer to do a machinist's work with, and so on. On one occasion I found that our purchasing department had bought a hammer which was two pounds lighter than the usual one used in track work. The result was that the mistrokes that were being made were causing accidents. We immediately recalled these hammers and sent out hammers of the proper weight for the work.

The wrench is another tool with which we are having quite a few accidents. Men will use wrenches of a smaller or larger size than the nuts which they are trying to tighten or loosen, and as a result the wrench will slip and injuries will be caused. Sometimes a wrench will be used as a hammer and we all know the wrench is not to be used as a hammer.

Axes, adzes and other sharp edged tools frequently cause accidents, because if left lying around a workman is likely to stumble against them. When such tools are not in use, a good way of preventing an accident is probably by putting them into a tie where the cutting edge will be covered up. I have seen men using draw knives and trying to steady their work by using their knees to hold the material.

The lathe is probably one of the most common of the metal working machines. Every industry has one or more lathes and we have many lathes in our large shops. The most common accidents that happen in connection with the lathes are those in which the man's sleeve is caught in the revolving stock or chuck, because he is not

paying close attention while working, and that sometimes results in a very serious accident. We recommend that men who are working on lathes should not wear any sleeves at all.

Drill presses, driving pulleys, belts and things like that, of course, should all be properly guarded. The best types of modern machinery are properly safeguarded by the manufacturer. But you might have some antiquated machinery in some of your shops or roundhouses, and I assume that you men who have been in the safety department for some years have seen to it that these antiquated machines have been properly safeguarded. You have got to pay the necessary attention to the guarding of these driving pulleys and sometimes the drill presses.

Specific Remedy for Avoiding Foot Accidents

By O. F. JOHNSON

Superintendent of Safety, Minneapolis & St. Louis R. R., Minneapolis, Minn.

The speaker said in part: On one railroad, out of 27 injuries to the feet during the past two years, approximately 7, or 26 per cent, were reportable.

Adjusting draw bars with the foot, as cars are about to couple, is a dangerous and reckless thing to do. Years ago most every railroad had one or more of these accidents. What is the remedy? We must continue to impress upon our men the importance of compliance with the rules, by adjusting the draw bars only while the engines or cars are standing still.

A number of foot injuries have occurred while hopping off engines or cars while train is in motion, without looking down to see if the ground is clear of cinders, pieces of coal, wood or other obstructions. The result is often a badly sprained ankle.

A number of accidents to the feet each year are due to adzing ties or timbers. Sometimes in adzing one may strike a knot and on account of its being harder than other parts of the timber, the adz may glance off and cause an injury. Extreme care should be used in handling adzes.

Many other accidents are caused each year by stepping on nails, glass, etc. Boards or other scrap material with nails sticking up may be hidden in the weeds, etc. Sometimes infection sets in and you know the result. We should correct, where possible, any defects which may be discovered. As an example, turning down an upturned nail found in a dangerous position; removing broken glass from paths used by workmen, etc.

Soles of shoes should in all cases be free from holes that may catch on splinters in wood floors or that may allow the feet to be cut by stepping on nails, broken glass or other sharp objects. Heavy soles are necessary. Safety shoes which are made substantial and flexible, and look like the ordinary street shoe, can be purchased at reasonable prices. Men should become more interested in toe and foot safety.

Many injuries to the feet are caused in the handling of materials, rails, ties, timbers, etc. Failure to act in unison where two or more men are carrying a load and one end is dropped without warning, usually results in injury to others. Unless men are properly trained in handling ties, rails, piling and other heavy material, there is always danger of injury to the feet. Too much stress cannot be laid upon this subject and upon the importance of training men in co-ordinating their efforts when handling heavy material.

Handling Materials and Supplies

By F. W. CURTIS

Supervisor of Safety and Fire Prevention, Denver, Rio Grande & Western R. R., Salida, Colo.

The speaker said in part: How important is this phase of safety work? Here are some interesting figures, as taken from the I. C. C. Bulletin No. 100 for the year 1931: Handling rails, ties, bridge timbers, etc., accounted for 4 deaths and 1,874 injuries; handling explosives, flammables, hot or corrosive substances accounted for 8 deaths and 306 injuries; handling freight and supplies accounted for 6 deaths and 1,573 injuries. Thus, in handling materials and supplies in 1931, there were 18 deaths and 3,753 injuries on American railroads.

Let us proceed, then, with a consideration of the men who handle these materials. In selecting men who by reason of their positions must do much of the handling of materials and supplies the same general requirements applicable to all railroad employment should be followed, with these characteristics outstanding: intelligence, physical fitness and a co-operative disposition, for he must be able to team.

1. Men are cautioned not to show their strength foolishly, like the unnecessary handling of a barrel of oil alone. Setting a barrel of oil on a can is two men's work.
2. Never put green men at handling wheels, mounted or loose. It is a big hazard and a waste of time. Keep the wheel platform free of loafers.
3. Only capable men may operate alligator shears—those who know metal.
4. In handling scrap or salvage material men must know that way is clear and piles or bins must be kept orderly the same as with new material.
5. No man may enter nor remain in an oil tank without another man at the manhole.
6. Only experienced men may make hitches or hooks for train loads.
7. Men are forbidden to ride any load being raised or lowered by power.
8. Men must keep from under loads, magnets, etc., and be close only when loads are lowered to position. If necessary to guide loads, ropes or long poles must be used.
9. When any unusual load or unusual material, because of its weight or shape, is to be moved, the foreman must direct its handling.
10. Finally, the most important consideration in handling heavy materials is team work. An adequate number of men to handle the job who can be counted on to work in unison or harmony, each doing his share, lifting and reaching at the proper time and being watchful of his own safety and that of fellow workers is a prime essential. And don't forget that some men simply cannot do this. Their make-up is not rhythmic.

We may now consider methods. It is quite universally recognized that the first essential of safety in methods is good housekeeping. General suggestions on handling materials and supplies may be as follows:

1. Keep workroom supplies as low as practicable. Storage should not be allowed here. Likewise keep finished products moving; congestion makes hazards.
2. Piling stock safely is an obvious requirement of the safe method. Heavy materials low, light materials higher; height of piles governed by nature of shape, bulk and weight of materials; fillers to prevent piles from rocking, rolling or slipping; bins, boxes and trays for smaller articles; adequate aisles, runways and track clearances are all necessary general governing rules to follow.

3. Trucks, trailer wagons, etc. should be kept in first class repair, and good judgment used not to overload them. In placing and piling of materials on them work must not be slovenly and awkward; materials must be secured or held during the movement.

4. In store stocks, many good standard practices have been recommended. These should be followed and occasionally checked up. Then there is the standard method of stacking journal brasses, safe and which will protect bearing surfaces. All such standards should be followed religiously unless better methods are known and here we might mention the many standards prescribed for loading freight on cars, all of which may be obtained from the mechanical division, A.R.A.

5. Only standard signals should be used to direct train movements and one man at a time giving them, unless necessary to relay the signals. In directing the movement of timbers a long stick is helpful. All hitches should be telt out before lift is made. Lifts should not be made until operator knows men are in the clear.

6. Heavy loads should not be lifted until outriggers on portable cranes are placed.

7. Wheel platforms should be kept free of obstructions, smooth, free of ice, snow and frost when in use.

8. Perhaps it is the failure to foresee the unusual in the ordinary routine that causes more injuries in handling materials and supplies than any one of the whole range of classified causes, for pinched and bruised fingers and toes constitute the greater part of them all. The general cause is usually given as carelessness, but another name for lapse of attention.

Report of Committee on Non-train Accidents

By C. F. LARSON

Superintendent of Safety, Missouri Pacific Lines, St. Louis, Mo.

The speaker said in part: An employee in any department or occupation may suffer a non-train accident, but the general classes in which this type of accident predominate are maintenance of way and structure employees; shops, roundhouse, power house and store department employees; and station and office employees.

We are using the Interstate Commerce Commission figures for the year 1931, because these are the latest complete authentic figures that have been analyzed and made available to your Committee, and because 1931 was a more representative year than 1932 by reason of heavy repairs and betterment work having been almost completely out of the picture during 1932.

Attention is directed to the fact that the number of non-train accidents is greater than the train accidents and the train service accidents combined:

154 killed in non-train accidents in 1931 represents 24 per cent of the total killed.
12,598 injured in non-train accidents in 1931 represents 58 per cent of the total injured.

Thus a total of 12,752 casualties are recorded in non-train accidents in 1931, which represents 57 per cent of the total casualties.

The principal effort against non-train accidents should be carried on in the maintenance of way and equipment departments, since they produce 75 per cent of the total industrial accidents, and 95 per cent of the accidents in those departments are to non-train men; 38 per cent occurred in maintenance of way, with 4,965 casualties,

64 of these being fatal and the casualty rate being 8.52; and 37 per cent occurred in mechanical and stores, with 4,733 casualties, 46 being fatal and the casualty rate 6.59.

Before proceeding to a study of the occupations which produce the majority of the casualties in these maintenance departments, it is well to have in mind the six principal possible causes of these particular casualties, as follows: 2,103 falls of persons; 1,878 handling rails, ties, bridge timbers, etc.; 1,579 handling freight or supplies (3,457 handling materials); 1,476 in the use of hand tools; 1,466 falls of objects; and 825 motor cars. Thus, there were a total of 9,327 in these six causes of accidents, which represent 75 per cent of all non-train accidents.

When we view the results of our study of the statistics relating to maintenance of way and structures, we find a picture that is not satisfying and one that should excite railroad management to take more aggressive steps to remedy the evil that is causing so much suffering and economic waste.

We recognize that supervision in this department has, at its fountain source, a highly technically educated overseer in the person of the Division Engineer, and under him there are the roadmasters, bridge and building supervisors. From these offices must flow the instruction and inspiration that will, or should, bring about that understanding and knowledge among the workers that will cause them to be safety-conscious at all times. As a rule, we do not have a foreman directing the men out on the work, the same high class of men as you find in other supervisory positions, being drawn largely from the same class of employment over which they now have supervision, a class that is not always as susceptible to educational effort and training as those having a better opportunity, but who, when shown what is wanted, are willing to abide by instructions when made plain to them. We would here pay tribute to a class of labor, whose loyalty to the employer under all conditions is unequalled by any other class. Called at any hour in all weather conditions to do anything in emergency, he is there fulfilling every demand made on him to the utmost of his ability. We, therefore, feel that employees in the maintenance of way department deserve and should have, the closest and most intelligent supervision that can be given them. In this department we find bridge men falling from bridges due to wrenches slipping from nuts and bolt heads, causing all kinds of serious injuries, because they have not been told how to place themselves when doing this work so that they would not fall from the bridge; or, if they knew, the importance of it was not enforced by the foreman in charge who, if present, permitted it.

Section and extra gang laborers are being injured when falling from motor and hand cars while in motion, sometimes due to overloading and men standing up on the car. Eye injuries are due to flying steel when cutting rails, and from flying rocks, etc. from ballast when tamping, etc. Lack of understanding of intentions between men and groups of men when movements are to be made, or material is to be thrown, is causing many accidents. To avoid these and many other accidents is a matter of simple education, by giving instruction in language that can be and is understood by the worker, and the foreman seeing that instructions are invariably carried out, not winking at or encouraging violations.

Your Committee feels that it is incumbent upon all supervisors to enforce all rules and instructions through measures planned to promote the general efficiency and safety to their units. We further believe that, except in cases where all reasonable measures to correct an employee have failed, discipline usually is unnecessary, as effective leadership tends to overcome accident probabilities. We have not failed to recognize that due to recent business conditions, railroad organizations are greatly

reduced and supervision understaffed and which condition will, we greatly fear, continue for some time. But whereas many activities must be reduced, the one activity, safety education of railroad workers, cannot be allowed to be relegated or delegated to inefficient leadership. The safety organization on every railroad must function as never before in energizing and stimulating interest.

THURSDAY MORNING SESSION

October 5, 1933

Report of Committee on Proper Method of Reporting Casualties to the Interstate Commerce Commission

By G. H. WARFEL

Assistant to Executive Vice President, Union Pacific System, Omaha, Neb.

The speaker said in part: A year ago, in the Committee of Direction, the question was raised as to whether or not there was need for some other method of determining the relative progress of safety work on various railroads. The casualty rate per million man-hours has from time to time been questioned, particularly the very low casualty rate sometimes established, and there have been those who wondered if some other basis could not be developed. So our Committee was appointed to study the desirability or the practicability of developing some form of severity rating for casualties, as well as the frequency rating, to see if by that the relative standings of different carriers and the progress of safety work generally could be better determined.

After a very careful study of severity ratings and the conditions surrounding their reporting, and especially the very great difficulty of securing accurate severity statistics, we came to the conclusion that the casualty rate per million man-hours has been and is a very reliable guide and index to the progress of accident prevention work on railroads, and that the general casualty rate, as it has been established through the Green Book and our other agencies, is a good and reliable general guide to the progress of safety work among the railroads.

There is no question in our minds but what there has been some distortions one way or the other of the relative standings of individual carriers, due usually to different interpretations of what constitutes reportability. Your Committee believes, however, that what is needed is not some other yard stick to measure by, but the assurance that everybody use the present yard stick the same way. We come to the conclusion that what was most desirable was that everybody who had to do with the reporting of accidents on a railroad should understand alike the requirements of the Interstate Commerce Commission Reporting Rules. So this Committee undertook to put together an interpretation of the Interstate Commerce Commission Reporting Rules. We tried to make this interpretation as clear and concise as possible, so that anybody reading them could understand clearly whether or not a man's injury was reportable. I want to sketch for you briefly here some of the points in the text we have finally agreed upon.

Take, for example, "Accidents arising from the operation of a railway." I will read two or three things here: "This expression is intended to include not only accidents resulting directly from the operation, construction or maintenance of a

railway, but also those arising in connection with such activities. Reports are not required for certain kinds of accidents as designated in paragraph three of the General Instructions, nor for any accident occurring outside the railroad right of way or premises leased or used for railroad purposes, if such accident does not result directly from the operation of the railroad." The following kinds of accidents are not considered as arising from the operation of a railroad:

- a. Contact with poison ivy, nettles, and similar weeds unless received in required handling of shipments of same.
- b. Stings, bites, snake stings, etc., of insects, reptiles or animals, unless occurring in connection with necessary handling of same in shipment, driving off right of way, or handling animals being used in railroad work.
- c. Accidents at highway or street crossings, or on parts of highways within railroad right of way, not involving the presence or operation of trains, locomotives, cars, track cars or similar equipment and not involving employees engaged in the repair or maintenance on the crossing or the protection of highway traffic.

In other words, the brakeman who is out on the street crossing to act as a watchman, and is struck by an automobile has an accident arising from the operation of the railway, because his duty put him there. But the brakeman who has reported for duty and is walking down through the yard to get on his train, or report to the caboose, and who walks across a crossing and is struck by an automobile, has an accident that is not arising from the operation of the railway under this phrase.

You remember, also, the phrase of the original text, "Accidents arising from the operation of a railway, resulting in damage to railway property amounting to more than \$150, including the expense of clearing wreck."

There was considerable difference in practice of the reporting of such train accidents. Some roads did not consider that the breaking of a side rod or a main pin that did not result in the derailling of the locomotive, although it might result in serious detention of the train and \$400 or \$500 of repairs, as a train accident, if the detention of the train could be made up before the engine got in, or if they did not have to send out a relief engine. The fact is that anything that occurs in connection with the operation of a train that causes \$150 property damage should be reported as a train accident.

Now, let us take the word "injury." Here are a few paragraphs:

"For I.C.C. accident reporting purposes, an injury resulting from accident is defined as any physical impairment or damage to, or distortion of, any part of the body resulting directly from a specific act or occurrence, but not as a stimulating effect of repeated or continuous exposure. Thus, a bruise, laceration or sprain resulting from a particular swing or stroke of a pick, bar or other tool should be considered as an injury, but a blister or lameness developing from continued chafing or manipulation of the tool for several hours should not be classed as an injury or reported as such.

"Freezing, sunburn, sunstroke, dizziness or fainting are not considered accidental injuries, but if a person so afflicted should fall, or strike or be struck by anything as a result of such affliction, any physical damage thus received must be considered as an accident injury. Hernia, resulting from a fall or from the strain of violent effort and developing immediately thereafter, is reportable as an injury. Hernia developing gradually and not definitely connected with exertion at a specific time

and place promptly identified, should not be classed as an injury. Any sprain or strain of back or other part of body must be classed as an injury if it develops immediately from a specific act, movement or occurrence in the nature of a sudden and unexpected mishap at a time and place immediately identified."

The next word we have defined is "employee." I will read to you as follows:

"A person who performs joint service, and is paid directly both by the railway and another employer for their respective portions of such service, should be considered an employee on the railway only when engaged in that part of his duties for which he receives pay from the railway. Since depot porters derive their principal remuneration from individual tips and gratuities, they are not classed as railway employees for accident reporting purposes, even though under the general supervision of the railway. Persons employed only for emergency jobs, or intermittently as need for their services may arise, must be classed as employees during periods for which they receive compensation. Persons who contract to perform occasional services, such as carrying mail between depot and post-office at stated times, caretaking of non-agency depots, shelters, parkways, etc., will not be classed as employees but should be considered other non-trespassers."

Here is a paragraph on the term, "on duty."

"It must be understood that the phrase 'on duty' applies to an employee on railroad premises (or on industrial or private while actually engaged in train or switching operations), throughout his designated work, from the beginning moment to the ending moment of his shift, trick or tour of duty or time paid for, unless he has been definitely relieved from the performance of any or all service for a definite time, or has wilfully left his customary post contrary to accepted or tolerated practice, constituting a recognized violation of the carriers' rules. Brief absence just to get a drink, go to a lavatory, get a breath of fresh air, etc., are not to be considered wilful absence from post of duty. Regardless of whether his hours paid for have begun or ended, an employee coming to work or leaving work must not be considered as on duty during the time he is traversing company premises to reach the point where he customarily reports, checks in or registers, or otherwise assumes duty, nor after departing from such work when through work. An employee either on duty or off duty (other than a member of the crew in charge of the train) when riding in that part of a train open to the use of passengers, must be classed as a passenger. An employee dead-heading on a train, whether under pay or not, should be classed as an employee off duty, unless he is riding in that part of a train open for the use of passengers, in which case he is a passenger."

Here we have the phrase, always of interest, "injury to an employee on duty."

"The phrase 'sufficient to incapacitate' is interpreted as meaning sufficient to prevent a person from doing his usual work, by reason of possible injury consequences, or because of pain or limitation of motion or of function, whether such pain or limitation result from the injury, or from the bandaging or treatment. Thus, a laceration or fracture of a finger or toe might not in itself prevent a man from doing his usual work, but if the hand or foot is bandaged, splinted or placed in a cast in such a way as to prevent a man from doing his usual work, his injury should be considered as sufficient to incapacitate him. In like manner, if the dressing, bandage or medication of an otherwise minor injury to a dining car steward or waiter or ticket clerk, required to meet the public, makes it undesirable for him to do so in the opinion of the railroad management, it must be considered sufficient to incapacitate."

Under "performing his ordinary duties," we have the following: "The phrase

"performing his ordinary duties," is interpreted as meaning performing fully and acceptably and without extra assistance all the duties customarily included in a regular assignment to one of his title, payroll classification, and pay rate. For example, a brakeman or switchman must be able to walk, throw switches, get on and off cars and set brakes; a fireman must be able to fire an engine, take water, shake grates, etc.; a trackman must be able to walk, remain standing and work, use wrench, shovel, rake, etc. with both hands; a carpenter must be able to stay on his feet, walk, set and drive nails, use handsaw and other tools in a workmanlike manner, a machinist must be able not only to operate his machine, but to do the customary work in connection with placing material in position on the machine and removing same. Generally speaking, any injury which, if it occurred off duty, would be regarded as necessarily incapacitating an employee from performing his regular work should be likewise considered as incapacitating him when the accident occurs on duty. The best and most acceptable evidence that a person is able to perform his ordinary duties consists in his continuing to do his usual work and performing those duties throughout his regular working period without disability amounting to more than three days during the ten days following an injury."

I have heard contentious from railroad safety men that employees were trespassers, merely because they violated some rule of the company at the time they got hurt, and I am particularly anxious that we all have uniform understanding of this term, as well as others.

A railroad employee on the premises of a railroad, injured while on duty during hours paid for, should not be classified as a trespasser. The fact that he was violating the railroad rule, or even a law, does not justify such classification. Such casualties must be reported as occurring to an employee. A railroad employee on the premises of a railroad, injured while off duty or outside of hours paid for, cannot be classified as a trespasser if his presence on the property is for the purpose of getting to or from point of work, or for any other purpose connected with his service as an employee. Violation of a rule or law does not justify such a classification. Such casualties must be reported as occurring to an employee off duty. He may only be classified as a trespasser if and when his presence on the premises is for no purpose connected with his services as an employee."

Necessity of Uniformity in Reporting Accidents

By DR. M. O. LORENZ

Director, Bureau of Statistics, I. C. C., Washington, D. C.

The speaker said in part: "We are all agreeing that it is important to have these statistics based on the reports as accurate as possible, and if they show a favorable tendency, we can all rejoice. If they show an unfavorable tendency, you are the first person who wants to know about it so we can correct the condition."

I think the work of this committee is very important and will help a great deal toward securing uniformity. The definition which it proposes are, with very slight exceptions, in accord with the interpretation and rules, as I understand them now, aside from minor differences which we shall be able to iron out without any trouble.

There is one which I wish to mention especially, to which I take exception, and that is the proposed modification of what is a reportable train accident. Mr. Warfel has indicated that he proposes to cut out from the expense which is counted in building up to \$150, that being the limit of a reportable accident, the expenses of

going to and from a wreck. His proposition is entirely logical. Of course, the expense of going to and from a wreck does not affect the importance of a wreck at all, but this is a critical sign in the condition of the railways, and these particular statistics of train accidents are being watched, and it would be unfortunate to make any change just now that would destroy or affect to any material degree the comparability from month to month, or from year to year.

I would rather not see the statistics disturbed, even though they are not entirely logical or perhaps entirely uniform or complete, but I would let each railroad continue to report them as they have been, and the trend in this particular period will still have some significance. In fact, I think that instead of tinkering with this rusty old dipper, we might try to get a new dipper and frame an entirely new definition of what is reportable as a train accident, and make a fresh start, for that \$150 limit has very serious objections.

Passing to another part of the Committee's report, the interpretation by the Committee, that the three days' incapacity means 72 hours and not three calendar days, is in accord with our past interpretation. We put out a circular letter some years ago to that effect. On the other hand, as he has said, there is not complete uniformity at the present time. Some roads are using the calendar basis, and they have perhaps on their side of the argument the fact that the American Standards Association, in its plan for uniform accident reporting from all industries, suggests a three-day calendar day basis. I should be inclined to adhere to the Committee's report and our past practice, unless I heard from a good many more of you that the calendar day basis was preferable. Perhaps, we ought to issue a circular on the subject and gather our experience, unless the Committee is satisfied that the majority using the 72-hour basis is now so large that it would not be wise to change.

I am much pleased with that part of the Committee's report which Mr. Warfel explained, defining the phrase "performing his ordinary duties." As he pointed out, his proposed definition is, "The phrase, performing his ordinary duties, is interpreted as meaning performing fully and acceptably and without extra assistance all of the duties customarily included in the regular assignment to one of his title, payroll classification, and the pay rate. For example, a brakeman or switchman must be able to walk, throw switches, etc."

If we had had that strict definition and had adhered to it in recent years, I think it would have eliminated a good deal of the criticism that has been leveled against the statistics of injuries. I am sure that even if we had adhered to it, there would still have been a very considerable drop in the number of injuries reported because of the close attention obtained to what is a reportable injury, but I mean it would have eliminated the grounds for criticism that have existed. For example, it seems as though a switchman reported at work when he was merely answering a telephone. Things of that kind are magnified far beyond their real importance, and therefore this particular part of the Committee's report will help a great deal, I think, to verify the masses.

The following resolution was presented by L. F. Shedd, chairman of the Resolutions Committee:

Whereas, the Safety Section of the American Railway Association in session at the Stevens Hotel in Chicago, October 3-5, 1933—is not unmindful that the success of this Thirtieth Annual Convention and of those Conventions that have preceded it can only be attributed to the unceasing interest and untiring efforts of those in whose hands the responsibility for arrangement and necessary details were placed

and to the co-operative response and assistance of those called upon to contribute their thought, time and effort to promote such a commendable cause as the conservation of human life and limb, and desiring to recognize each and every one in a proper and fitting manner,—therefore, be it resolved—

That this Section recognizes and appreciates the contribution made by each and every one who in any manner arranged for or participated in the conduct of these meetings, including, and with particular reference to, those whose presence, although not upon the program, have added so much:

That the Section is not only grateful, but indebted to Messrs. F. E. Williamson, President, New York Central Lines; M. J. Gormley, President, American Railway Association, and Judge R. V. Fletcher, General Counsel, Association of Railway Executives and of the American Railway Association; for their sacrifice of time, and for the great and lasting benefits that must accrue to and aid in the advancement of this Section and its work because of the timely, well chosen and pertinent thought given us:

That our appreciation is also extended to the management of the Stevens Hotel; to the Press and to all others who have so kindly assisted in making our stay in "America's Chicago," so pleasing and so profitable:

That in our hearts, we cherish the memory of those who have been called to fields beyond, and express our earnest desire and hope, that to those of our Members upon whom burdens have been placed through physical infirmities and otherwise, lasting and effective relief may speedily come.

That these Resolutions be spread upon the records of this Annual Meeting.

Announcement of Election of Officers

The chairman then called for the report of the tellers who had canvassed the votes for officers of the Section for the ensuing year. This report was presented by Frank Strouse, Pennsylvania Railroad, who announced the election of officers as follows:

Chairman—C. I. LaFontaine, Great Northern Railway.

First Vice-Chairman—H. A. Parish, Chicago & North Western Railway.

Second Vice-Chairman—W. H. Failing, Central Railroad of New Jersey.

Members of Committee of Direction—

Eastern Territory (One-Year Term)—T. H. Carrow, Pennsylvania Railroad.

New England Territory (One-Year Term)—F. R. Bradford, Boston & Maine Railroad.

Southern Territory—L. G. Bentley, Chesapeake & Ohio Railway.

Canadian Territory—A. O. Beck, Canadian National Railways.

Western Territory—E. A. Meyer, Chicago, Milwaukee, St. Paul and Pacific R. R., and

G. H. Warfel, Union Pacific System

Committee on Nominations—

O. F. Johnson, Minneapolis & St. Louis Railroad; J. G. Fitzhugh, Gulf, Colorado and Santa Fe Railway; A. V. Rohweder, Duluth, Missabe and Northern Railway; J. L. Walsh, Missouri-Kansas-Texas Railroad; D. G. Phillips, Wabash Railway.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Textile Section

Officers 1932-33

General Chairman—DR. CHARLES H. EAMES, Lowell Textile Institute, Lowell, Mass.

Vice-Chairman in Charge of Program—IGNATIUS MACNULTY, American Woolen Co., Malden, Mass.

Vice-Chairman—M. W. HISS, Proximity Manufacturing Co., Greensboro, N. C.

Secretary and News Letter Editor—E. E. PLACK, American Mutual Liability Insurance Co., Boston.

Chairman Statistics Committee—J. T. TROINGER, Bomberg Corp., Elizabethton, Tenn.

Chairman Poster Committee—FRED W. SEHL, Aetna Life Insurance Co., Hartford, Conn.

Chairman Engineering Committee—PAUL W. VIETS, Plymouth Cordage Co., Northampton, Mass.

Members at Large—

ARTHUR BARLOW, Armstrong Cork Co., Lancaster, Pa.

RUSSELL T. FISHER, The National Association of Cotton Manufacturers, Boston.

WALTER HUMPHREYS, National Association of Wool Manufacturers, Boston.

E. G. PARGETT, North Carolina Industrial Commission, Raleigh, N. C.

TUESDAY MORNING SESSION

October 3, 1933

The session of the Textile Section was called to order by Will Cooper, representing the Executive Committee of the National Safety Council, who welcomed the delegates, and then introduced General Chairman Charles H. Eames, Lowell Textile Institute, Lowell, Massachusetts, who presided. Chairman Eames outlined the activities of the Section during the past year, praising the individual work of committee chairmen, and also called attention to some of the more outstanding problems which would have to be met during the coming year. He then introduced the first speaker.

How We Eliminated Hazards Encountered in the Manufacture of Textile Products

By B. R. BROWN

The Columbia Mills, Inc., West Pullman, Chicago

The speaker said in part: Previous to the time that we became a member of the National Safety Council and took an active interest in accident prevention, safety work in our plant was more of a spasmodic nature, only taking on an active interest when some misfortune befell a worker.

Soon after the institution of our safety program we furnished a room, centrally located in the plant, with equipment adequate to render efficient first aid and to handle emergency cases that might arise. A registered nurse was in charge of the first aid room with a resident doctor on call at all times. This step, while being nothing startling for industry, played a large part in our early successes, especially in getting our program to the individual workers through the daily contact the nurse had with them and through her ability to render timely advice.

Many articles have been written on the accepted procedure in employee educational work, and I shall attempt no complete description of our methods here; I do wish, however, to bring to mention briefly some of the items which have been brought into our educational program and have filled a place in the general scheme. Early in the work the National Safety Council's pamphlet "The Safe Worker" was brought to our attention and it was very apparent to us that the distribution to the workers of this little booklet, with its timely topics and characteristic cartoons, and its wealth of accident statistics in all fields, was an excellent way in which to help keep the safety spirit alive. Incorporated with this Safe Worker is an insert compiled by the safety director. The insert narrates happenings in our plant, with which we desire all the workers to be acquainted, personal notes, departmental standings in suggestion contests, no lost-time accident records.

Another phase of our educational program has been the institution of a sponsor group. This group is made up of a representative worker from each department in the plant, and these workers, needless to say, should be chosen with discretion if the group is to obtain satisfactory results. Once a month this group holds a meeting which is conducted by a member of the safety committee. The original purpose was to make each sponsor a secondary contact man for the new employee, to acquaint him with the new working environment and to keep before him our safety program, the primary contact man, of course, being in all cases the foreman in charge.

Other phases of our educational program include the periodic distribution of posters; general factory group meetings, when a safety plaque has been awarded to the plant or when an educational movie film has been shown; a suggestion system whereby we encourage written suggestions on safety from the workers; and bi-weekly foremen's meetings where the item of safety is the first topic of discussion and where the experience of the past period is thoroughly narrated and the individual foremen reminded anew of his responsibility in accident elimination.

Another way in which we have kept our safety program alive and active is through the installation of a yearly safety button system. The principle of the button scheme is patterned after a similar scheme which appeared in the August 1930 issue of the *National Safety News* under the caption "Individuals Make the

Record." Our button scheme is based on the service the individual has had with the company and the degree of safety with which he has performed his work during that period of service. The degree of safety is measured by the same yard stick that we use in compiling statistics for the National Safety Council.

Eye injuries have never been a large contributing factor in our lost time, nevertheless, past records are no proof that the lightning will not strike the next time, and with this thought in mind the safety committee was called on about a year ago to make a survey of our plant and to submit a report of the places where they thought goggles ought to be worn. It is surprising to note the large number of places where goggles should be worn that a survey of this type usually brings out, and in our instance it was timely and we have already been repaid for our effort and expense, as we have since had one case where a lens was shattered by a flying object and another case where a lens protected the eye from flying molten babbitt. In the case where the worker requires correction glasses, a goggle with a corrective lens has been provided.

Good housekeeping has its proper place in our safety program. While it is very difficult to give any concrete figures to show the value of good housekeeping in the elimination of hazards, and while someone may argue that he knows of plants that were spotless and had terrible accident records, and knows of others in which good housekeeping was given little thought and they had a fine accident record, we are of the opinion that safety and good housekeeping are closely related and that good housekeeping has a real value in our safety program. Once a month the entire plant is inspected by members of the safety committee and a detailed report is written up and recommendations made. Each department is given a rating by the committee of *good*, *fair*, or *poor*, according to the findings of the inspection. This report is read and further discussed at one of our bi-weekly foremen's meetings. Certainly, a good housekeeping program, properly carried out, is visible evidence to the workers that management, in asking for safe practices in performing the work, is ready and willing to do their share in making the plant a safer place to work.

Still another step toward the elimination of hazards in our work is a campaign recently put on to make the workers see the value of safety shoes in accident prevention. This phase of the program has never been made compulsory, it simply being left to the discretion of the worker whether he shall take advantage of it or not. But in the short time that safety shoes have been in vogue in our plant, we have had two instances, both of which would doubtless have resulted in lost time to the worker if he had not been wearing safety shoes. One instance was where a worker ran a heavily loaded truck of material onto his toes; the other was where the worker dropped a heavy casting on his foot.

The results obtained in our efforts to decrease the frequency and severity of accidents, since we have had a constructive safety program, have not shown a continual decrease each succeeding year, but have been subject to fluctuations which probably closely approximate the safety record of the average textile plant. The following figures show the plant record between 1928 and 1932, inclusive: 1928, frequency rate 19.23, severity rate .64; year 1929, frequency rate 1.13, severity .02; 1930, frequency rate 4.32, severity rate .49; 1931, frequency rate 1.86, severity rate .56; 1932, an entire year without any lost-time accidents!

This perfect performance in 1932 had been preceded by a run of 331 days in 1931, and was followed by a period of 25 days in 1933, for a total of 722 days without a lost-time accident.

Are We Making Progress in the Textile Industry?

By J. T. TROLINGER

Insurance Department, American Bemberg Corp., American Glanzstoff Corp.,
Elizabethton, Tenn.

The speaker said in part: Beginning with the year 1926 and continuing through 1932, the frequency rate of all industries has decreased 61½ per cent, while the severity for all industries during the same period has decreased 35.3 per cent.

Coming, now, to the records of our own industry, we find that the frequency rate has decreased since 1926, 34.6 per cent, while the severity rate shows an increase of 1.7 per cent. From the frequency figure we see that the improvement in this rate has kept pace with the average of all industries only to the extent of 44 per cent and that its improvement is only 48 per cent of the average of the four industries which I have referred to. On the surface, these rates would indicate that the textile industry has improved, but whether improvement in this sense can be considered progress is a different question, and is hinged upon the fact of whether or not anything less than the best is acceptable to us.

A study of the chart showing the severity curves of our industry shows that it is a repetition of ups and downs with no positive indications as to what the trend would finally develop. However, beginning with 1930, the curve took a downward turn and has continued definitely in this line since that time and, with the present good experience continuing, I feel that it is safe to predict that we have reached our stride and are making definite advancement in this direction. Another thought which may help throw some optimism on the disappointing picture painted by a portion of the severity trend of our industry, lies in the fact that our actual 1932 severity rate was only 0.45 and that there were only five other industries with rates better than ours. I also feel that we can safely say that at present we are among the leaders of the frequency group. It is indeed encouraging to know that in 1932 all fatalities dropped 50 per cent and permanent partial disabilities declined 8 per cent, while temporary disabilities were only reduced by one per cent. However, the temporary disabilities are not nearly so important as the fatal and permanent partial disabilities, unless they are accompanied by an unfavorable frequency rate. In our case at present, however, this does not exist and we are primarily interested therefore in the fatal and permanent partial cases. During 1932 the textile industry was responsible for only four fatal cases. Even this, naturally, is to be regretted, but when it is considered that approximately 15,000 persons were killed in the course of gainful employment during the year, it is encouraging to know that we were responsible for such a very small fraction of one per cent.

Nomination and Election of Officers

The report of the Nominating Committee was then called for and new officers of the Section for the coming year were elected, as follows:

General Chairman—Charles H. Eames, Lowell Textile Institute, Lowell, Mass.
Vice Chairman in charge of Program—Ignatius MacNulty, 81 Wallace St., Malden, Mass.

Vice Chairman—M. W. Helss, Proximity Manufacturing Co., Greensboro, N. C.
Vice Chairman—B. R. Brown, Columbia Mills, Inc., Chicago, Ill.

Secretary and News Letter Editor—E. E. Place, American Mutual Liability Insurance Co., Boston, Mass.

Engineering Committee Chairman—Paul W. Viets, Plymouth Cordage Co., Boston, Mass.

Membership Committee Chairman—E. G. Padgett, North Carolina Industrial Commission, Raleigh, N. C.

Poster Committee Chairman—Fred W. Sehl, Aetna Life Insurance Co., Hartford, Conn.

Statistics Committee Chairman—J. T. Trolinger, American Bemberg Corp., and American Glanzstoff Corp., Elizabethton, Tenn.

Members at Large—

Arthur Barlow, Armstrong Cork Co., Lancaster, Pa.

Russell T. Fisher, The National Association of Cotton Manufacturers, Boston, Mass.

Walter Humphreys, National Association of Wool Manufacturers, Boston, Mass.

Safety in the Textile Industry

By VOYTA WRABETZ

Chairman, Industrial Commission of Wisconsin, Madison, Wis.

The speaker said in part: The point of operation on machines is the principal source of accidents in the textile industry. In Wisconsin over 80 per cent of all textile machine accidents occur at the point of operation of the machines. Of second importance, on the basis of compensation costs, are disabilities incurred through moving parts of the machines, such as gears, sprockets, pulleys, rolls, and through belts and chains and the like. Mechanical safeguarding in textile plants is seemingly much less adequate than in metal working, woodworking, and many other lines of industry.

In the textile industry the ratio of machines to machine workers is much higher than in most other industries.

The employer who regards workmen's compensation as an insurance scheme to which he pays premium and thereby, in his opinion, ends his responsibility for accident prevention, is gravely mistaken. Unless employers maintain safe plants and influence their employees to become safe workers, there is no hope of getting lower compensation premium rates. In this relation, the employer should have the most dependable and definite information obtainable for his reports of injuries to insurance companies and state labor departments. The defense against certain types of non-meritorious compensation claims is often aided by knowledge which no one other than the employer can supply.

The textile industry has a higher proportion of infection injuries than any other industry group. In Wisconsin approximately 18 per cent of all workmen's compensation cases occurring in textile plants result from infection. The possible reasons for such high ratio of infections may lie in several directions:

(a) Textile plants create a considerable amount of dusts in the nature of broken down particles of fibres which are kept stirred up by the mechanical operations at the plant.

(b) Textile operatives require much manual dexterity and skill and they may not wish to submit to having small injuries treated and bandaged, because to do so would interfere with their work.

(c) The textile worker generally attends continuous operation machines and for this reason is less ready to shut down machinery and get first aid treatment than are workers in many other lines of industry.

(d) Puncture wounds frequently are not accompanied by much bleeding and readily seal at the point of injury and, therefore, introduce deep-seated infection without draining.

Small puncture wounds and small abrasions ordinarily do not impress themselves upon an individual and, therefore, are very frequently neglected. This is due principally to the fact that persons generally do not come in very close contact with the terrible results that may follow from such injuries. Puncture wounds and small abrasions are not minor in any sense of the word. When the experience of an entire state is brought to a central point and when one observes many cases of terrible suffering with frequent deaths after maddening torture, with amputated limbs made necessary by inattention, and of horribly crippled hands and arms that result from infection following neglected puncture wounds, the possibilities impress themselves upon the person who has had the opportunity to observe the results of such apparently "minor" injuries. In view of the fact that in the needle industry there is such a high percentage of infection cases, one must draw the inescapable conclusion that such injuries are not given proper attention and that with proper care the ravages of infection might be very materially reduced, with a tremendous saving not only to the industry but primarily to the workers.

Viewing the textile industry from the standpoint of one who deals with industrial safety problems in general, it seems to me that many persons having charge in textile mills feel that there is no real accident problem in the textile plant. On this question we have some statistical evidence to present. During the four-year period, 1923-1926, Wisconsin textile mills had a total of 1,091 compensation cases. Of this number 353 cases, or 32.4 per cent, arose in connection with textile machinery. During the following four years, 1927-30, the textile plants in Wisconsin had 854 compensation cases; and 257 cases of that number, or 30.1 per cent of all cases, arose in connection with textile machinery. In 1931 and 1932 machine accidents in textile plants totalled 30.1 per cent and 22.4 per cent, respectively, of all compensable injuries in Wisconsin textile plants.

What about the compensation cost of textile accidents? What is the bill? For the past six years, 1927-1932 inclusive, Wisconsin textile plants with perhaps not more than an average of about 14,000 persons employed, reported 1,175 compensable injuries which cost \$211,370. Of this amount, \$151,681 was for indemnity, and \$59,689 for medical costs. The figures indicate an accident problem in textile plants, and no doubt a large proportion of all textile accidents could be prevented. In the 1,175 cases costing \$211,370, there were 240 textile machine accidents costing \$70,483. There is here an opportunity to secure financial savings to the industry through the prevention of accidents.

For the United States as a whole, the U. S. Department of Labor reports that textile plants in 1929 had 12 tabulatable accidents per each one million man-hours of work done. On the same exposure basis, the mining industry had 74 accidents, the construction industry 50 accidents, paper and pulp mills 28 accidents, etc. The frequency of accidents is much lower in textile plants than in manufacturing and mechanical industry generally. Furthermore, accident severity rates in textile plants average only about one-fourth of the severity rate of industrial injuries generally.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Woodworking and Lumber Manufacturing Section

Officers 1932-33

General Chairman—ROLAND JONES, The Surty Manufacturing Co., Chicago.

Vice-Chairman—J. W. SMITH, Employers Reinsurance Corp., Kansas City, Mo.

Secretary—M. C. GOODSPEED, General Electric Co., Erie, Pa.

News Letter Editor—LOUIS W. KERBERG, Mengel Body Co., Louisville, Ky.

Chairman Program Committee—E. G. PADGETT, North Carolina Industrial Commission, Raleigh, N. C.

Chairman Statistics Committee—M. FRANCIS, T. H. Mastin & Co., Mobile, Ala.

Chairman Membership Committee—E. ROSS FARFA, Grand Rapids Safety Council, Grand Rapids, Mich.

Chairman Health Committee—F. W. BRAUN, Employers Mutual Liability Insurance Co., Wausau, Wis.

Chairman Engineering Committee—J. A. PUMBY, Michigan Mutual Liability Insurance Co., Detroit.

Members at Large—

R. C. BARR, Lumbermen's Mutual Casualty Co., San Francisco.

HARRY GUILBERT, Pullman Co., Chicago.

H. J. KELLY, American Seating Co., Grand Rapids, Mich.

JOHN H. LEE, Liberty Mutual Insurance Co., Rockford, Ill.

F. A. POLLOCK, Lumbermen's Mutual Casualty Co., Chicago.

MONDAY AFTERNOON SESSION

October 2, 1933

The first session of the Woodworking and Lumber Manufacturing Section was called to order by General Chairman Roland Jones, The Surty Manufacturing Co., Inc., Chicago, who presided. Chairman Jones welcomed the delegates, spoke briefly on the future year's activities of the section under the general heading "Where Do We Go From Here?", and then introduced the first speaker.

Trend of Injuries in the Woodworking Industry

By M. FRANCIS

Safety Engineer, T. H. Mastin & Co., Mobile, Ala.

The speaker said in part: In the woodworking and lumbering industries injury rates have shown an unfavorable trend during 1932. Woodworking companies continued to make progress in reducing the frequency of injury, but experience in severity was the worst since 1926. The 1932 frequency rate is down 15 per cent from 1931, but there is an increase of over 100 per cent in severity. The improvement in the general frequency rate is due entirely to a reduction in the number of temporary disabilities. Fatalities and other serious injuries increased in frequency. These increases, combined with higher severity rates for permanent, partial and temporary disabilities account for the sharp rise in the 1932 general severity rates.

Injury rates for all types of woodworking plants averaged 15.77 for frequency, and 1.71 for severity in 1932. These rates are based on the records of 109 plants whose employees worked over 28,000,000 man-hours during the year. Manufacturers of boxes had the highest frequency rate, 26.23; and the highest severity rate, 2.60. Sash and door manufacturers had the lowest frequency rate, 11.59; and manufacturers of miscellaneous wood products had the lowest severity rate, 1.37.

The lumbering industry also showed a reduction in frequency rate, but the severity of disabling injuries turned upward. In comparison with 1931, the 1932 frequency rate is down 12 per cent, but the severity rate is up 26 per cent. The increase in general severity rate is due entirely to a sharp rise in fatalities. There was an increase in the frequency of permanent partial disabilities in 1932, but their severity rate was actually lower than in 1931; which indicates that permanent partial and temporary disabilities in the lumbering industries are of shorter average duration than in the woodworking industries. For 1932, the lumbering industry averaged 47.96 for frequency, and 5.43 for severity. These rates are based on the records of 48 units with an exposure of over 13,000,000 man-hours engaged in logging, timber treating, the operations of saw mills and planing mills. The hazards of logging are exceptional, as shown by a frequency rate of 66.46, and a severity rate of 7.93. Timber treating plants had the lowest severity rates, 0.86, and saw mills and planing mills had the lowest frequency rate, 42.86.

Statistics for 1932 seem to prove that we are removing the causes of minor injuries, but that we are neglecting the major injury causes. However, this may be misleading. My observations lead me to believe that the difference between a minor and a major accident is frequently nothing more than a very narrow escape. The high frequency rate of major injuries during 1932 may be nothing more than the law of averages catching up with the callous operator who permits dangerous and careless practices to be carried on and who, in fact, frequently creates the hazard which causes the injury by requiring his employees to perform dangerous tasks in the interest of production; such as working on moving machinery, putting on or throwing belts without a shut down, and other similar dangerous acts. It appears to me that our most direct and urgent efforts for the future should be the reduction in the frequency of fatal and total permanent disabling injuries. It has always been my belief that if we eliminate the minor accidents we shall have very few major accidents.

But we must have supervision. The only accident prevention failures I have ever known failed because supervision was inadequate.

Report of the Nominating Committee

The report of the Nominating Committee was then presented by E. Ross Farra, manager, Grand Rapids Safety Council, Grand Rapids, Mich., officers for the next year being elected as follows:

General Chairman—Louis W. Kerberg, Meugel Body Co., Louisville, Ky.

Vice-Chairmen—

F. W. Braun, Employers Mutual Liability Insurance Co., Wausau, Wis.

William Haggerty, Edward Hines Western Pine Co., Hines, Herney Co., Ore.

Secretary—M. C. Goodspeed, General Electric Co., Erie Pa.

News Letter Editor—Robert Ormsby, B. F. Huntley Furniture Co., Winston-Salem, N. C.

Engineering Committee Chairman—Thomas J. Healey, T. H. Mastin & Co., St. Louis, Mo.

Health Committee Chairman—P. J. Brand, Pullman Car & Manufacturing Corp., Pullman, Chicago, Ill.

Membership Committee Chairman—E. G. Padgett, North Carolina Industrial Commission, Winston-Salem, N. C.

Poster Committee Chairman—Robert A. Shaw, Murray Body Corp., Detroit, Mich.

Program Committee Chairman—J. A. Purdy, Michigan Mutual Liability Co., Detroit, Mich.

Statistics Committee Chairman—W. H. Culver, Klise Manufacturing Co., Inc., Grand Rapids, Mich.

Members at Large—

R. C. Barr, Lumbermens Mutual Casualty Co., San Francisco, Calif.

E. Ross Farra, Grand Rapids Safety Council, Grand Rapids, Mich.

Harry Guilbert, Pullman Company, Pullman, Chicago, Ill.

Roland Jones, The Surtz Manufacturing Co., Inc., Chicago, Ill.

W. S. Paine, Aetna Life Insurance Co., Hartford, Conn.

F. A. Pollock, Lumbermens Mutual Casualty Co., Chicago, Ill.

E. K. Prichett, Prichett-Powers Co., Grand Rapids, Mich.

Accidents—Their Cause and Prevention on Shapers and Stickers

By GEORGE H. GIBSON

Foreman, Wood Cabinet Shop, The Pullman Co., Chicago

The speaker said in part: Accidents do not just happen. There is a reason for every one, and I believe that a great deal of benefit can be derived by exchanging views on the hazards surrounding the two dangerous machines I have selected to discuss here. What are some of the causes of accidents on the shaper?

1. No person should be allowed to operate a shaper who does not understand the grain of wood.

2. Material should not be piled up around the machine so as to interfere with the operator, as he should concentrate on the point of operation at all times.

3. When making a set up, the operator should first make sure that the knives balance and that the bevel on the knives is the same so that they will fit the slot in the shaper collar.

4. Great care should be exercised to see that not too large a cut is taken at one time. It is far better to take two cuts and be safe than one cut and be sorry.

5. A great many shops still perform shaper operations by simply cutting a shaper form on the band saw, smoothing off the edges, driving a couple of brads through it, and using this as a shaper. This practice should be discontinued as much as possible. A shaper form is made with two clamps to hold down the piece, and it should also have two handles for grabbing and holding down the clamp blocks. These forms will practically eliminate any possibility of an accident and will speed up production, and they can be used on a live or dead collar.

6. When an operation is performed without a form, a guard should be placed over and around the head and should be clamped down tight enough on the piece to hold it firmly to the table, thus preventing the operator's fingers from coming in contact with the knives in case the piece should split or kick back.

7. In my opinion, the operator should concentrate as much as possible on sound and feel, as I am firmly convinced that a great many times one is forewarned that a piece is about to split or break by the sound of the cutters or the feel of the material in hand.

8. I believe that we can benefit most by studying where hazards are and how to minimize them. I also believe that the supervisor of any wood mill should be a man capable of pointing out the hazards which are apt to confront the operator.

And now a word about the sticker. While it is true that this machine is not considered as dangerous as the shaper, great care must be taken to see that the knives are properly capped and absolutely tight before the machine is started. The greatest difficulty seems to be with the knives throwing themselves or, in other words, slipping from under the caps. A great many operators use sand-paper under the heel of the knives, but if much trouble is experienced, it would be well to remove the heads to the machine shop to have them trimmed.

Handling Material Accidents

By ROBERT WILLIAMS

Safety Director, Thomasville Chair Co., Thomasville, N. C.

The speaker said in part: Accident statistics tell us that injuries from handling materials not only occur more frequently than from any other cause but often are more serious. More than 50 per cent of accidents in an industrial plant come from handling or transporting materials. This is not surprising, however, when we stop to consider that a large part of manufacturing operations consist of loading, unloading, piling, unpling, lifting, carrying or transporting material by hand or power.

This is as true of the woodworking plant as of all other industries. In the following paragraphs an effort is being made to suggest some specific safeguards in reference to handling materials.

Piles should be started on good foundations, and lumber should never be piled too high. Platforms used in passing lumber up should be made of good stock and the top boards should not extend beyond the bracings to prevent their tipping by a man standing outside the brace. Lumber hoists obviate the necessity for much labor. Ladders used at lumber piles, and elsewhere, should be spiked. Lumber pilers should wear leather aprons and gloves or square leather pieces strapped across the inside of their hands as protection against splinters. Care should be taken in fastening the

covers, or roofs, on lumber piles, as many serious injuries have been inflicted through loose covers being blown off.

Many accidents in woodworking plants are caused by overloading of trucks or careless piling of lumber on them. If a truck is overloaded, a wheel may break and the load be thrown on someone nearby. Care should also be taken in loading the truck to avoid the possibility of the load tipping over. Trucks should be examined frequently to see that their wheels are in good condition and that the fastenings are secure.

Hand Trucks: Handling material on and off the truck results in many injuries. Men should be instructed in the proper way of piling, to avoid pinching of fingers, shifting or falling off the load, or breakage of the truck from overload. Often it is worth while to provide a truck body of special size, shape, or strength, or with special sides or stakes, so that material may be transported safely.

When trucks are in motion, wheels sometimes run over the employee's foot, sometimes the feet of men working alongside the aisle where the truck is pulled, which is due to the thoughtlessness of the trucker or to the employee injured. Sometimes the trucker slips if the handle of the truck is too short. The risk of this kind of accident is greater if more than one man is necessary to move the truck. Men pushing the load too often push with heads down and do not watch the man pulling, who may trip and fall. Trucks equipped with ball and roller bearings are much easier to handle than others, but the temptation to speed must be overcome by supervision or collisions may result.

Three-wheel trucks should be designed with a low frame, so that the center of gravity of the load will be close to the floor surface. This will prevent tipping. Loads sometimes shift because all bolts and nuts are not tight and great vibration occurs. One company was able to handle its material with trucks much more safely after every truck had been thoroughly inspected and all bolts tightened with the aid of lock washers.

It is much safer to locate wheels within the outside members of the truck frame. Men will instinctively regulate their path of travel so as to avoid being struck or run over by a large object, while such is not the tendency with the small object such as a wheel. Also, the men pulling or pushing the trucks are less apt to be run over by the wheels if these are set inside the plane of the frame. This is especially true of trucks of the four-wheel type with small swivel wheels set under the center of each end.

Two-wheel trucks should never be operated with any of the parts in need of repair. If any of the wooden members are broken or split, they should be repaired before failure results in an accident. Wheels with a portion of the rim broken should be replaced with new ones because these trucks are often operated over rough surfaces and a broken wheel may unexpectedly change the direction of the truck and injure other employees besides the operator. One company recommends the painting of truck frames with alternate black and white stripes, similar to railroad crossing gates, so they can be readily seen when on the floor.

Guards should be attached to truck handles to prevent abrasion of knuckles. The knuckle guards should be so wide that they cannot be grasped as readily as the handle. Brakes are an important asset for the safety of the truck operator. When loading, the operator can keep one foot on the brake and prevent the truck from moving and at the same time the dangerous practice of blocking the wheel with the foot is eliminated.

Orig. paper -
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Conveyors: One hazard of the operation of conveyors is the falling of materials from the conveyor itself. This can be reduced to a minimum by controlling the loading of the conveyor and guarding its sides, especially at turns, as in the case of belt and apron conveyors. All conveyors running overhead, especially over passageways, should be guarded underneath by a net of wire mesh screen so as to prevent injuries from falling objects to men passing below.

Hand injuries, and sometimes foot injuries, occur in the taking off and putting on of materials on conveyors. Fingers are pinched between the pieces of material or between the conveyor and the material; if the piece is not properly picked up by the worker, he is liable to drop it. It is possible in many cases to determine the safe way to handle material and so to instruct the workmen. With some types of conveyors, which automatically pick up and discharge their loads, this is not a serious habit. But it is often desirable to have a standard method of loading the conveyor and removing the stock, especially if the shape and size are odd.

Piling Materials: Special care should be exercised when piling material near aisles and passageways, to see that the danger of falling or knocking over material is minimized. The piles should not be too high, neither should parts of the pile project so as to be bumped into by passing men or trucks. In constructing piles, it is many times advisable to place every second layer crosswise. Piles should not be placed too close to benches or other work places. Workers should have enough room so they will have freedom of action to perform their duties efficiently. Guard rails or other devices should be installed at necessary points to prevent moving parts from causing piled material to fall.

The amount of material stored in work rooms should be kept as low as is consistent with efficient operation. Material should not be brought in from the store rooms except as production needs demand, and finished articles should be moved from work rooms as soon as practicable. Briefly, the points to consider when piling material, either in work rooms or in store rooms, are: effort required to handle materials, number of pieces needed in a given unit of time, space available, maximum safety when working around material or when taking from or adding to piles. Bins or shelves can often be used efficiently. Specially shaped racks are often of great value in preventing accidents when piling round or irregularly shaped articles.

Elevators: The unused sides of the elevator car should be enclosed with substantial enclosures not less than 6 feet high. The top of the car, unless the hoistway is provided with trap doors, should be provided with a cover of sufficient strength to withstand a load of 150 pounds at any point as a protection to the operator against falling objects. All elevator cars should be provided with safety catches or devices which will prevent the car from falling if for any reason the cables should break or become slack. These car safeties should be operated by springs, mechanical devices or governors and should preferably be located under the car platform.

All elevator cars should be equipped with an operating mechanism so located and so operated that the car cannot be moved unless the operator is within the car, or if the elevator is controlled by a shipper rope a device should be provided which will lock the shipper tops and prevent the car from being operated at any landing other than where the car is stopped. All elevators should be installed, maintained and operated in accordance with local and state requirements. Valuable safety information on freight elevators will also be found in the Safe Practices Pamphlet No. 15 of the National Safety Council.

Finishing: The two chief hazards in finishing operations are danger of fire and explosion and injury to the health of the worker. The fire and explosion hazard is

due to the use of flammable materials, improper protection, and poor housekeeping. Some of the ingredients used, particularly in spraying, are harmful to the health of the operator if breathed into his lungs, if swallowed, or if absorbed through the skin. To insure safety in the storing, mixing and handling of finishing materials, these operations preferably should be in a separate building.

Care should be taken to remove all possible hazards of igniting flammable vapors from finishing materials, particularly those in spraying. This includes precautions against spontaneous ignition, improper heating, open flames, faulty electrical installations and possible static electricity. These precautions should, of course, include adequate fire protection. This can be accomplished in part by the installation of a wet-pipe sprinkler system, which opens automatically in case of fire. Where a dry system is in use, additional protection will usually be required to control a fire.

The location of spraying operations is important. Such processes preferably should be in buildings separated from other work or in a one-story cut off addition for protection against fire hazards.

One of the most essential steps in safety is to maintain cleanliness around all operations which involve the use of paint, varnish or lacquer. This may be summarized in the term "good housekeeping." To accomplish this, there should be a regular daily cleanup period. All enclosures and equipment should be cleaned at frequent intervals. This cleaning program should include attention to splashes, drippings and other waste on ceilings, floors and walls, removal and burning of oily rags and other waste material.

Warehouses and Shipping Rooms: Although warehouses and shipping rooms are not usually looked upon as hazardous places, they have been the scene of many accidents. These departments involve a large amount of hand labor, under changing and often disorderly conditions.

Railroad tracks are usually laid alongside the buildings, with access through doors of the building to cars spotted opposite, or alongside a loading platform, sometimes uncovered, running the length of the building. Changing weather conditions make either of these two arrangements hazardous from an accident prevention standpoint. Where ice is a hazard dry sand or salt should be used.

Machinery in the packing room should be fully guarded especially as it is likely to be used occasionally by all employees. Glass and furniture having glass sections sometimes break in packing due to shock. The practice of concealing glass can very easily be discontinued; it serves no particular advantage and will be a great benefit to others who must handle the same package. Freight handlers would be more careful if they could see glass, and they would be safeguarded if they could see the broken edges.

Strapping wooden boxes and crates with round or flat wire or metal strapping is often necessary for shipment. Practically all round wire is applied with a tool that cuts off the wire in such a way as to tie the ends securely and leave no barbed ends. Flat steel strapping is often applied to the ends of a box or crate by driving nails through the strapping as well as the wood. This too often results in the edge of the strapping running over the edge of the crate and leaving a small piece that will cut the man who takes hold at that particular point, or the ends are not turned down and thus leave a sharp place.

Flying nails are probably the greatest hazard of the packing and shipping room. Companies operating large shipping rooms and employing a large number of people report many accidents due to these flying nails. Frequently eyes are lost. One remedy

is simple and is capable of universal application. Corrugated hammer heads are known to prevent nails from flying and can be used in any shipping room. The only disadvantage is the objection of the workmen to the corrugated hammer. If a man misses a nail and strikes his hand he receives an ugly wound. Skilled men, however, do not strike their hands.

Very likely, one out of three accidents from handling materials is a strain and the bugaboo of this class of injury is the hernia. It seems that nature, provident in most cases, has been rather negligent in regard to the strength she has given to the muscles of the abdomen, with the result that man finds himself peculiarly susceptible to constitutional weakness in that region. From our study of hernia cases we know that a weight of 75 to 100 pounds is dangerous for some men, even though they be of the big brawny type. An improper method of handling material, especially when the height is over three feet, may develop such a strain as might later help to produce hernia. The handling of material which is too bulky and consequently unmanageable also causes weaknesses in the abdominal regions to become acute. The proper method of lifting heavy or bulky material will prevent 75 per cent of the cases in which hernia is alleged. Squat, then lift, is the warning issued by our safety department. Push your entire body upward with your legs; it is easier and safer; and this is a lesson that should be taught to every employee.

WEDNESDAY MORNING SESSION

October 4, 1933

The Use and Abuse of Woodworking Saws

By H. SCHREIBER

Deputy, Industrial Commission of Wisconsin, Oshkosh, Wis.

Mr. Schreiber spoke only from notes, and unfortunately no complete transcript of his interesting talk is available.

However, he prefaced his discussion of saws with a resumé of the safety history of woodworking. He has personally been engaged in this work since 1880, starting in a match factory and doing practically every sort of job pertaining to the woodworking industry. He recalled that in those early days there were no so-called safeguards for machinery and the prevention of accidents by mechanical means or safety instruction was practically unthought of. Accidents were considered a necessary part of the work, serious injuries were common, and a fatality was not an unlooked-for occurrence. Accidents which injured, or broke down the machinery were sometimes considered more serious than those, which involved the human element. In those early days machine accidents approximated about 37 per cent of the total; now they are approximately 3 per cent.

In discussing woodworking saws, Mr. Schreiber pointed out and discussed at length the following points:

1. Saws must be sharp. A dull saw is more liable to catch in the material, causing kick-backs, broken saws, etc.
2. The spread of the saw must be correct. Too high a peripheral speed may mean a broken saw; also, the speed should be changed, depending on the type of work, hard wood requiring approximately 10 per cent less speed than soft wood.

3. Saw filing is extremely important. The shape of the teeth, the amount of under-cut and the set are important and to a certain extent are changed, depending on the type of work.

4. Cross-cut saws not properly sharpened are particularly liable to split or crack. A cracked saw should be scrapped. In this connection, Mr. Schreiber was asked how saw speed could be regulated on a constant speed arbor for different types of work. He answered that this is in some cases impracticable, but the same result can be secured by changing the speed of the material as it is fed to the saw.

Mr. Schreiber also pointed out that many accidents are due to changing men into unfamiliar jobs. Men seem to be especially susceptible to accidents who have been on one type of work for a long period of time and then are required suddenly to take up other types where the various operations are unfamiliar.

Orig. paper 10876 How Do You Select Your Sawyer? By JAMES C. WILSON

Vice-President, Lumbermen's Mutual Casualty Co., Chicago

The speaker said in part: The information contained in my paper has been assembled from many sources in answer to a number of questions submitted to men who should know. I shall give the results of this questionnaire briefly.

Question 1. "Should men be advanced from other jobs to that of sawyer?" All employers answered by saying they would advance men to the sawyer job.

Question 2. "If so, how should they be trained?" This is answered very completely in one reply which reads: "They should be educated by mill superintendents, first as block-setters, and gradually trained in the principles of sawing. Both sawyers and block-setters should be educated by continual meetings, with mill superintendents and sales managers. The idea that sawyers do not need to know anything about prices as long as they know what the mill is trying to get out of the lumber, is faulty. Every sawyer and block-setter should know the differences in the price of each grade, so that he will understand in dollars and cents what a mistake costs the company for which he works."

Question 3. "If an outside sawyer is employed, what procedure should be followed to determine his ability before he is given a permanent job?" Various replies are as follows: (a) "We learn what his experience has been and, if possible, get the ideas of the men he has worked for as to his ability. The next thing to do is watch his work and reach your own conclusions as to whether he is getting out of the logs the quality and quantity that you have reason to expect." (b) "In my opinion he should be trained in the niceties of sawing, as these exist in your particular mill, under the other sawyers for a period of time before he is allowed to saw." (c) "Inasmuch as our machines are of a special design, any sawyer from the outside would have to be trained and familiarized with the operation of our machine before he could be given a permanent job."

Question 4. "Are size, age, physical condition and eyesight factors to be considered in selecting sawyers? If so, to what extent?" The replies agreed that size has no bearing; that the age should be between 30 and 50; that good physical condition and perfect eyesight are essential. More particularly, one reply is as follows: "The matter of size has no bearing. A middle-aged man is preferable and naturally one that is in good physical condition. The reason for this is that the job is a strenuous one and demands 100 per cent attention to work every minute that the mill is operat-

ing. There are no intervals for rest and a division of his attention away from what he is doing is apt to result in an accident, which may mean injury or loss of life to the men on the carriage, as well as the smashing up of equipment. Therefore, the qualifications that are necessary to make a good sawyer are steady nerves, good eyesight, a mentality that will admit of making decisions quickly and correctly and, of course, a knowledge of what a log should produce in quantity and quality."

Question 5. "Can literature be secured from saw manufacturers or from other sources which is of value in instructing sawyers?" All replies were negative.

Question 6. "Should a sawyer be mechanic enough to change saws, etc.?" Here is a good answer from a large Wisconsin saw mill: "The ordinary methods to be used in the modern mill require very little knowledge on the part of the sawyer in the matter of changing saws or the general care of them. This work is left to the filer, in a large measure. The sawyer, however, should be able to adjust his guide on either a rotary or a band saw; also be able to adjust the strain that is used on a hand saw, and naturally he helps in making the change. The responsibility, however, of fitting up a saw in a way that it will run properly is all in the hands of the filer, and when the sawyer gets on a new saw that will not run properly and consequently not make good lumber he calls for the filer and a change is made."

Question 7. "What, if anything, should the sawyer know about various conditions, grades, and types of wood?" Apparently he is not a sawyer unless he has a complete knowledge of wood. Here again is the complete Wisconsin reply: "It is absolutely essential that a sawyer be familiar with the grades of lumber a log will produce and be able to judge pretty accurately after he takes a slab off about what the log should be worked into, both in the matter of grades and thicknesses. This knowledge he gets by experience. In other words, he should be able to know approximately how far he can saw into the log without running into knots. You will realize that this is necessary because you may find that it is desirable to have the clear portion of the log made into 8/4, 10/4 or 12/4 and the sawyer must be able to judge by the looks of the log how far in he may go without making a piece which would be clear on one face and possible #2 or #3 common on the other. The lumber, as you probably know, is graded from the low face."

Question 8. "Should a sawyer be able to condition a saw? If not, how much of the theory of saw conditioning should he know?" A large western manufacturer answered as follows: "An intelligent filer and a sawmill foreman will keep after sawyers so that saw conditioning will be complied with by the sawyer. In general, the sawyers are very important to a saw mill. The saw mill foreman is directly in charge of the sawyers. He must not only be a millwright and a good mechanic, but it is vital that he have a keen interest in quality sawing. The sales manager and plant manager, or whoever has to do with actual selling and pricing of lumber, should keep in very close touch with the foreman, and at least once a week should have meetings with the sawyers. It is also the conviction of most modern plant managers that a long day is no longer practical for sawyers, particularly in high class timber, such as white pine, ponderosa pine and fir."

The final feature of the program was the presentation of a moving picture entitled "Safety in Logging Operations" presented by F. W. Braun, Employers Mutual Liability Insurance Co., Wausau, Wis. This picture showed many very interesting scenes depicting the operations in and around a logging camp, including vast stretches of timber, hauling, loading, and the "timber" call.

ADJOURNMENT

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