

TRANSACTIONS

29th
NATIONAL SAFETY CONGRESS



GENERAL AND INDUSTRIAL
SESSIONS

CHICAGO
OCTOBER 7-11, 1940

NATIONAL SAFETY COUNCIL, INC.
20 North Wacker Drive, Chicago

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Foreword

THE Transactions of the 29th National Safety Congress and Exposition of the National Safety Council, October 7-11, 1940, are published in two volumes. Volume I contains the General Sessions and the meetings of the various Industrial Sections of the Council. Volume II contains the Street and Highway Traffic, the Commercial Vehicle, the Transit, the Child Education and the Home Safety Sessions.

Volume I is distributed automatically to all industrial members of the Council. Volume II is sent to members who are believed to be interested chiefly in the sessions it contains. However, other members of the Council may obtain Volume II upon request.

Many Council members have found it advantageous to distribute copies of the Transactions Volumes to the individual executives, foremen and supervisors of their organizations, who make use of the practical safety information the volumes contain to organize accident prevention programs. The volumes contain a vast amount of standard reference material. Extra copies of the Transactions may be obtained as follows: Volume I, one to 10 copies at \$2 each; 11 or more copies \$1.75 each. Extra copies of Volume II may be had at 75 cents each.

THE Transactions are a condensed record of the proceedings of the Congress. The papers and addresses and many of the discussions have been edited to delete extraneous matter, abbreviate the less important portions, and emphasize those parts of particular usefulness in promoting effective safety organization and other accident prevention measures. The volumes are, therefore, a somewhat abridged version, compact, practical, and of particular value to the student, the supervisor and the executive in achieving more thorough accident prevention success. The original manuscripts are available for additional reference, if desired, in the files of the National Safety Council.

THE National Safety Council, at its Congresses, seeks to eliminate from discussion matters which are not pertinent to the aims of the Congress or which may be contrary to the Council's policies. However, it cannot accept responsibility for all the views expressed either in the papers presented or in the discussions based upon these papers.

NATIONAL SAFETY COUNCIL, Inc.
20 North Wacker Drive
Chicago, Illinois

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Council Purposes and Program

The National Safety Council is a non-profit, cooperative association whose objective is the elimination of accidents. To achieve this objective the Council advocates the following program of safety activities:

1. Creating Interest in Safety. People will try to prevent accidents only when they are convinced of three things: (a) that accidents are really a serious problem, threatening personal happiness, industrial efficiency and economic security; (b) that accidents don't "just happen," but that each one has definite, ascertainable causes; (c) that accidents can be prevented. The basic requirement in a national safety program, therefore, is a dramatic and effective presentation of these facts to more and more people.

2. Finding Accident Causes. Accident causes are not the same in any two plants, in any two cities, in any two schools. They are not the same from one time to another. Every industrial plant, every city, every school and every other public or private organization, therefore, must study the causes of accidents in its own group, so that prevention efforts always will be directed at the things really responsible for accidents.

3. Maintaining Interest in Safety. People retain interest in very few things of which they are not continuously reminded. Therefore, it is the task of the newspaper, the radio, the magazine, the school, the public speaker and every other educational influence to keep reminding the worker, the driver, the pedestrian, the housewife and the school child that freedom from accidents depends on personal caution, and 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.

4. Engineering Improvement. Many accidents occur because equipment is faulty. The punch press is unguarded, the auto-

mobile brakes are worn, the stairway is crudely built, the propeller is defective, the stop sign is obscured. The avoidance of accidents, therefore, requires that safety be built into every piece of machinery, every home, every school building, every highway. We must insist that the things we buy—whether a stepladder or a stop sign, a band-saw or a blast furnace—be safe things. And we must be willing if necessary to pay a higher price because of this built-in safety factor, realizing that it is true economy to do so.

5. Training for Safety. Many accidents occur because the injured person or some other person acts in an unsafe manner. This unsafe act often is committed because the person involved never has been taught how to do the job in the safe way. Therefore, boys and girls, men and women, must be taught how to work, how to drive, how to cross the street, how to live safely. This teaching and training is a joint responsibility of industry, of schools and colleges, of governmental groups and of parents in the home.

6. Supervision for Safety. Many who know well the safe method of performing an act nevertheless are involved in accidents because, due to hurry, fatigue, thoughtlessness or some other reason, they do not perform the act in what they know is the safe way. Therefore, we need good foremen in industry, alert patrol boys in our schools, diligent police officers on our streets, thoughtful parents in our homes. These, through wise guidance of those under their supervision, can greatly minimize the chances of accident.

7. Legislation for Safety. Avoidance of accidents requires the adoption and scientific enforcement of sound legislation—legislation on traffic, on industrial matters, on public transportation, on home construction and maintenance, and on many items of per-

sonal conduct. Such legislation provides a standard to which a large majority of people are willing to conform and thus live together harmoniously and safely. It also provides a basis for requiring the conformity of a small minority, who would not otherwise be willing to submerge their personal desires, for the sake of safety in the entire group.

8. Safety Responsibility. Leadership in every walk of life should involve leadership in safety. Those who administer our industries, our schools and our governmental agencies of every sort should carry on those activities so that safe products and services are provided for the general public, so that accident hazards for the persons directly involved are reduced to a minimum, and so that those persons, in all their public and private relationships, will set a personal example of safe living.

9. Safety Organization. Every organization, regardless of its principal purposes, can and should find some place for safety in

its program of activities. Accident prevention should have a large place in the activities of trade associations, chambers of commerce, service clubs, welfare organizations, educational associations and similar groups. Every community and every state also should have one organization which takes responsibility for coordinating the safety efforts of all groups into a unified accident prevention program.

10. Leadership. This program of activities can be effective only with the interest and cooperation of everyone—men, women and children. It is the desire of the National Safety Council to provide national leadership through which these safety efforts of all our people may be coordinated and made most effective. To this end the Council offers fullest cooperation to all individuals, industries, organizations, communities and states that are in accord with its purposes. It likewise seeks cooperation from all these in carrying out an effective national program of accident prevention.

Annual Meeting of Members

MONDAY MORNING SESSION

October 7, 1940

The Annual Meeting of Members of the National Safety Council, at the 29th National Safety Congress and Exposition, convened with President Col. John Stilwell presiding.

While the members assembled they had listened to organ selections of patriotic and

stimulating character. Each member found at his seat a copy of the following declaration, which had been adopted for distribution as an expression of the attitude of the National Safety Council toward Safety and Defense of our Country:

Our Part

"We, the members of the National Safety Council, come together in our Annual Meeting today with a full realization of the significance of this occasion.

"In this room are men and women from every part of the country—assembled in a united effort to save human life at a time when most of the world is intent upon destroying it.

"This 29th National Safety Congress and Exposition is symbolic of America and the principles and ideals Americans are determined to preserve—the fundamental right of every citizen to life, as well as to liberty and the pursuit of happiness.

"We join with all Americans in abhorring the tragedies of war. Yet we do not for a moment subscribe to the doctrine that no principle, no ideal, is worth fighting for. There may be times in the affairs of man or Nation when human life is not supreme—when it must be sacrificed if that Nation

and the common welfare are to endure.

"But this only strengthens our conviction that under no circumstances can needless and purposeless destruction of human life through accidents be tolerated. It is easy, when death and destruction are so commonplace, to confuse human values and to cheapen human life.

"We therefore pledge redoubled effort to reduce accidents of every kind, and we ask the help of every American citizen.

"We also offer the entire resources of the National Safety Council to our country's preparedness program in the belief that in time of national emergency an accident is unintentional sabotage.

"We are ready to play our part."

The Secretary of the National Safety Council, having reported that an official quorum of the members was present, the Calling of the Roll was dispensed with.

Annual Address to Members

By COL. JOHN STILWELL

President, National Safety Council, Inc.

On behalf of the Directors, Executive Committee and Officers of the National Safety Council, I welcome you to this Annual Meeting of Members. I know that

your experience will be enriched by participation in the Congress and that you will return to your duties better prepared for the increasing responsibilities before us.

It has been a privilege to serve you as president during the past year. Through this association I have gained a new appreciation of the meaning of Universal Safety and of the Council's activities on behalf of the Nation and its citizens.

As we meet today, Europe's tragedy—or rather the world's tragedy—weighs heavily on our hearts. I do not need to remind you that our own country is also facing critical days which will demand our utmost loyalty and devotion.

The Republic is menaced from within as well as from without and the internal enemies are by far the more dangerous. Nor are all of them foreign agents. Along with the fifth columnists we might include those who destroy the nation's wealth through negligence which leads to accidents. Employers who are indifferent to conditions in their shops which lead to accidents and occupational diseases are giving actual aid to the enemy, as are those whose driving menaces other users of the highways.

The world is seeing the destruction of untold billions of wealth, the aftermath of which will require penny-saving economies for years to come. Accident losses, which seem trivial in contrast to the destructiveness of war, will not be regarded as tolerantly as in the past.

But we must turn from this depressing picture of world affairs to the work at hand. We can serve both America and the world to best advantage by giving our best efforts to this job so that our country can maintain its program of daily life as well as defense. And above all, we might well emulate the courage of those across the seas who are carrying on business and industry in the face of perils we can scarcely imagine.

Looking back over the busy year that is culminating in this 29th National Safety Congress and Exposition, we can see many additional things which we should like to have accomplished, but we can also point to some substantial gains. From both successes and failures we can learn important lessons to guide us toward our objective—an accident-free America.

The National Safety Council as the recognized leader of the Safety Movement in America has a two-fold duty—to secure acceptance of Safety ideals by more persons, groups and organizations, and to make available to them the information and ma-

terials with which to realize these ideals. Out of long experience we have built a multitude of services which have great value to all those who use them in carrying on practical accident prevention work. The Safety Movement grows in power as our Council grows in membership and in the number of cooperating agencies which it enlists.

During the past year the organized structure of the Council has been strengthened. The numbers of vigorous men and women who are the volunteer leaders in the Council activities have been increased. The sectional structure of the Council is broader, more able, more forceful. New committees, new groups for research, new studies and conclusions, are all factors in the strengthening of our program.

Countless individuals and groups all over our country have given their time, their energies and their resources to effect progress in organized safety. Substantial gains have been made largely through their co-operation and able assistance. Each year sees more of the units of strength, but the past year has emphasized anew the critical need for large numbers of new safety workers, if we are to meet and contend effectively with the forces of disorder and destruction.

As our country grows in population, in productive activities, and in the development of new processes and inventions, the potential hazards to life are multiplied and changed. The single item of highway travel, increasing in size and complexity year by year, exemplifies the need for new methods and more vigorous control. Changes in industrial operations challenge our ingenuity in preventing occupational accidents and diseases.

In looking back over the past year, we must confess some disappointment. As 1939 drew to a close, we had high hopes of renewed activity and much greater gains in safety during 1940. The 800 lives saved in 1939 seemed small in comparison with the 11,400 saved in 1938. Today, we find that accident deaths have slowly increased so far during the months of 1940. This may be partly explained by increased travel on highways and increased employment in industry so that with actually lower accident rates we have a higher total number of deaths. We must not, however, accept these as excuses but, without yielding to discouragement, must consolidate our gains and

go on to new reductions. The sobering fact is that the war against accidents can be lost, but we know it is within the power of the people in this room to see that it shall not be!

Definite gains can be reported. Many industrial plants made gratifying progress during 1939. The average frequency rate for all plants reporting to the National Safety Council decreased 5 per cent from 1938, and the severity rate went down 10 per cent. Compared to 1926, frequency showed a drop of 69 per cent and severity 50 per cent. Forty-six plants, each working more than 500,000 man-hours in 1939, reported to the Council that they went through the year without a single lost-time accident. The best 1939 no-accident record, 2,177,000 man-hours, covers an average of 1,067 employees. That record is excellent compared to any goal achieved in earlier years.

Motor vehicle grade crossing deaths in 1939 were 1,303, the lowest since 1922, despite the fact that there are now more than twice as many motor vehicles as there were then.

The scheduled airlines' record seventeen-month period of operation without a death ran well into 1940.

Individual cities are continuing to establish records in preventing motor vehicle accidents. Providence, Rhode Island, set a record of 111 deathless days in 1938. In 1940 it achieved a total of 156 days—the equivalent of almost 40 million man-days without a death. Kansas City, Missouri, had 85 deathless days, equal to more than 37,000,000 man-days. In addition, the Council has reports of 101 other places each with deathless man-day totals of more than 10,000,000, all recorded in the last three years.

Many companies, fleets, organizations and other groups in Council membership have been only a little less successful. Some of them have reduced their accident losses by 50 per cent or more, and are working hard to continue these reductions. There is no truer saying in the field of Safety than this: "What one company, one group, or one community has done, others can do."

One job that is cut out for us is to increase the number of companies, cities, schools, civic organizations and individuals organized and working for safety. Each safety-minded unit needs to become a nu-

cleus around which others will grow until safety becomes a national ideal and way of life.

Certain fundamental facts must be accepted to bring this about. The first fact is, that accidents are a serious menace to all mankind—so serious that they threaten the life and happiness of every individual man, woman and child.

The second fact is, that accidents do not merely "happen"; each one results from definite causes which may be detected and dissected.

The third fact is, that there is a remedy for each accident, and that all accidents can be prevented by removing or safeguarding against the causes.

The chief reason we continue to have so many accidents is that not all men and women have accepted these fundamental truths, or, if they do believe them, they do not work hard enough to apply them.

Experience is a cruel teacher and safety lessons learned by human suffering are at great cost. Only through careful, conscientious safety study and work can the sad lessons of the past be applied to prevent future suffering.

We must not only believe in and accept these principles of safety, but we must apply them every day of our lives. Where there is ignorance, ignorance must be corrected; where there is apathy, apathy must be replaced with interest and enthusiasm. The key-note is persistence. We must go at this business of safety as if it were a life-long job—which it is!

I have said that the National Safety Council must provide leadership. This responsibility is shared by every individual in our Council membership. Every professional safety worker has his own work to do in his own job and locality, but, no matter what this work is, I conceive that the responsibility for leadership of each one of us extends throughout his community, embraces all other fields of safety endeavor, and does not cease until he has contributed his part toward the state and national programs which round out our American Safety Movement.

I have spoken of the great body of co-operating organizations, groups and individuals whose influence is so important a force in support of Council ideals. Most cordial relations have been maintained with

numerous national organizations engaged in specialized safety work. Contact has been maintained with safety organizations in Great Britain and Canada and we are hoping that some day the exchange of safety knowledge will again be world-wide. Working with us are countless municipal, state and national governmental officials whose influence and active participation in accident prevention work are essential to success.

The leadership of our national government has assumed a new significance in safety. The time may soon be at hand when governmental leaders will assume broad responsibility for better safety and health conditions among workers producing materials manufactured for the national defense. Today all our members are profoundly interested in the larger part which the Council is capable of taking in support of governmental measures for the conservation of manpower to increase and promote our national strength and safety. Our Executive Committee has recently passed a strong Resolution offering the Council's services to the Federal Government and other agencies engaged in defense activities.

From the beginning, in all safety work, we have depended greatly upon the skill of trained people whose labors have solved many of the problems in accident prevention. Outstanding assistance has been contributed by safety engineers, personnel men, traffic engineers, physicians, nurses, laboratory workers, statisticians, journalists, educators and other experts.

We need great numbers of new safety workers in every field of accident prevention, literally thousands of new men and women who will devote themselves to acci-

dent prevention problems. Here our job is two-fold—finding and creating specific jobs which will attract these people and enable them to serve efficiently, and training the people and placing them where they are needed.

We need to multiply the numbers of community and state safety councils, so that every community and every state will have the advantage of local safety service. We need the active participation in organized accident prevention of every industrial company, every corporation and every workplace, no matter how small. We need the public-spirited cooperation of every organized group. And finally, we need the powerful and sincere interest and influence of every public official and of every government leader in each community, in each state and in our National Government.

Our greatest obstacle has always been indifference and the spirit of defeatism. Now, with our sense of values paralyzed by the wholesale destruction of war, the mental difficulties are multiplied. But if there should be any doubt about the value of accident prevention, even in a world that seems in imminent danger of collapse, let me cite the example of Britain where the safety organizations are carrying on valiantly in spite of war's tension and alarm. And in revolution-torn Spain, accident prevention activities are coming back with the rehabilitation of industry.

With such examples, how can we doubt the usefulness of our efforts? Our own firing line is wherever men, women and children live, work, travel or play, and their preservation must remain our constant objective.

of the Nominating Committee, which was presented by H. J. Spoerer, Chairman of this Committee, as follows:

Report of Nominating Committee

"Complying with your instructions, we, the Nominating Committee, appointed by you, with the approval of the Executive Committee, and as provided for in Section 4, Article VII of the By-Laws of the Council, and as further provided by Section 5, Article VII of the By-Laws, present herewith the report of the nominations for Directors to serve until the Annual Meeting in 1943.

"The names of the following Directors, whose terms expire October 7, 1940, are submitted for re-election:

W. H. Cameron, National Safety Council, Chicago.

C. W. Dempsey, The Liquid Carbonic Corporation, Chicago.

James B. Douglas, The Philadelphia Gas Works Co., Philadelphia.

Harold F. Enlows, American National Red Cross, Washington, D. C.

D. D. Fennell, Consulting Engineer, Chicago.

Howard B. Fonda, Burroughs Wellcome & Co. (USA) Inc., Tuckahoe, N. Y.

W. A. Griffin, American Telephone & Telegraph Company, New York City.

Harry Guilbert, The Pullman Company, Chicago.

Frank H. Harrison, International Harvester Company, Chicago.

G. T. Hellmuth, Chicago Rapid Transit Company, Chicago.

C. L. LaFountaine, Great Northern Railway Company, St. Paul, Minn.

Thos. H. MacDonald, Federal Works Agency, Public Roads Administration, Washington, D. C.

R. B. Morley, Industrial Accident Prevention Association, Toronto, Canada.

A. V. Rohweder, Duluth, Missabe & Iron Range Railway Co., Duluth, Minn.

Frank T. Sheets, Portland Cement Association, Chicago.

No other ticket having been placed in nomination, when members were invited to do so in the usual manner, it was moved and seconded, and the motion was regularly carried, instructing the Secretary to cast the ballots for all the persons named in the Report of the Nominating Committee.

The Tellers of Election, by George G. Traver, Chairman, reported that a total of 2,530 Votes had been cast in favor of the Directors named.

The President then introduced the following distinguished speakers:

Safety and War

By BRIGADIER GENERAL CHARLES H. BONESTEEL

Chief of Staff, Sixth Corps Area and Second United States Army, Chicago, Illinois

It is a privilege and a pleasure for me to appear before you to discuss "Safety and War" because you and I have a good many things in common.

You are interested in reducing industrial and traffic accidents among millions of people employed in industry and driving or travelling about the country; in other words, you are promoting "Safety" among the civilian population. And that is a worthy and profitable endeavor that must go on, year in and year out. As an officer of the United States Army, and particularly as Chief of Staff of the Sixth Corps Area, and of the Second Army, it is my responsibility to see that all safety precautions possible are taken to reduce to a minimum accidents among the armed forces under my direction.

I am sure there are many ways in which you, as safety experts of long experience, can help us achieve even greater safety in

the Army, and I am hopeful that our experiences may be helpful to you.

As a matter of fact, our Army has been promoting safety for a good many years. Let me cite a few examples.

When a recruit enters the military service, and regardless of previous education, he is taught the fundamentals of personal hygiene and of camp sanitation. This is important and pays good dividends, for by reducing the number of days per year lost by each soldier through sickness, each man's health is maintained at a higher level, and he is more valuable to his military organization and to himself. All food is thoroughly inspected before it is cooked and served; the source of the water supply is inspected and the water tested at periodic intervals. The soldier is not fed on hard tack and beans day after day, but is fed a balanced ration prepared by Army-trained cooks and bakers.

Waste containers are provided, garbage is

disposed of regularly, kitchens and mess-halls are screened, cleaned and scrubbed, and at all times kept in a sanitary condition. It has been said that the "proof of the pudding is in the eating," and the fact that Army fare is wholesome and nourishing is proved by the gain in weight by a majority of recruits during their first two or three weeks in Camp. We believe that healthy, well-nourished and well-trained soldiers contribute immeasurably to the safety of companies, regiments and divisions of the Army.

Leadership in group health which the Army enjoys has not been attained by any complicated procedure, but by the practice of preventive medicine through the medium of simple, well established methods and means which have proven necessary for the well being of any group. The fact that we can observe and control the soldier continually during his entire period of service aids materially and is a dominant factor in keeping him in good physical condition. The principal means which we employ are:

Vaccination of all against small-pox and typhoid fever on entry into the service and further immunization of individuals when indicated for specific diseases.

Monthly physical examinations and oftener when special occasions demand.

Instruction for all military personnel in hygiene, first aid and sanitation.

Prompt hospitalization of the sick and injured.

Close, continuous contact and cooperation with local and national health agencies.

And last but not least in importance is the full support which we in command afford the medical officers of our service in all matters pertaining to the health of the Army.

In the combat units, the soldiers are instructed in the right way to handle rifles and other weapons; in the right way to handle and ride horses; the right way to operate tanks, airplanes and motor trucks, all in the interest of safety and efficiency.

Drivers of trucks, combat cars, caissons and other vehicles are instructed in the operation of their machines on the road and in maneuvers, and maximum speed limits are enforced, again to promote safety and reduce accidents.

In the Camps, Posts and Stations, we have a system of guards or sentries who are constantly on the alert for anything out of

the ordinary, such as accidents or fires; again—safety.

Anti-aircraft units, which now constitute a part of our Coast Artillery, are given thorough and precise instruction and training in the operation of the guns. If they are firing at a target towed by a plane flying over Lake Michigan off Fort Sheridan for instance, all shipping is warned beforehand not to come within eight miles of shore, and the plane, which tows a sleeve target at the end of a 1200 foot wire cable, must be at a certain altitude and certain distance from the shore, before the order to "Fire" is given. Thus we provide for the safety of the pilot, the plane and coast-wise shipping.

"Self protection is the first law of nature," someone has said. This applies not only to the individual, but to cities, states and the nation as well. Nature has provided many animals and birds with protective coloring, or with a coat of fur or feathers which blend with the natural scenery, affording a high degree of protection from natural enemies. With this in mind, the Army years ago tested several different colors and combinations of colors for soldiers' uniforms. The well-known O-D, or "Olive Drab" was then adopted as being the least conspicuous color when troops are operating in open country, fields and woods. And, reminiscent of the campaign in Finland last winter, some of our troops clad in white uniforms, have participated in maneuvers among snow clad hills and mountains, to try their skill at defensive warfare in the winter time. Again—safety for our troops.

Only a few years ago riding in an airplane was considered a dangerous undertaking, but today we fly from one part of the country to another with less concern than used to be occasioned by going for a street car ride. In fact, today we have commercial airlines that have flown millions of passenger-miles without the loss of a life or a ship. It probably is not necessary to remind you of the pioneering which your Army has done in the field of aviation.

Year after year, in cooperation with manufacturers and civilian agencies, the Army has ever sought better, faster and safer airplanes. A great deal of study, designing and testing must take place before the Army will accept a new-type plane for military use.

The men who are to pilot these ships are

selected according to very high standards. They are then given a three months' course at a Civilian School, where they learn to solo; then three months at Randolph Field, or some other training center, and they are graduated after another three months at Kelly Field, in Texas. It takes an average of nine months to train a pilot to the high degree of efficiency required by the Army, before he gets his "Wings." One of the mandatory regulations is that of donning a parachute every time a student or pilot takes his place in the cockpit, and every student-pilot has had hours of instruction and practice in operating his parachute, which may some day stand between him and death.

The Chemical Warfare Service not only trains specialists in the handling of chemical agents in time of war, but also assists in training our troops to protect and defend themselves against the effects of chemical agents used by an enemy. This training includes practice maneuvers wearing gas masks, instructions in the use of special clothing and gloves in contaminated areas, first-aid measures to be applied to men who have been exposed to gas or chemicals, how to decontaminate an affected area, the posting of gas sentries, and erection of warning signs and signals. In other words, we do everything we can to prevent our troops becoming casualties from the effects of the enemy's gas or chemicals.

In more ways than most citizens realize, our Army has contributed to the comfort, security and safety of our country and our people.

The Army pioneered and helped develop telegraphy, aviation, certain fields of medicine and sanitation. An outstanding achievement in the latter field was the ridding of the Panama Canal Zone of Yellow Fever; helping to combat malaria in our own South, and in many other ways the Army has contributed to the future welfare and safety of our citizenry.

About the beginning of the World War No. 1, as some writers designate it, the United States Government completed one of the engineering feats of the century—the Panama Canal. You will recall that one French company worked on the project for eight years and failed; a second French company worked on it several years and failed. Then, after purchase by the United States, the completion of the Canal was carried out under the leadership of Colonel (later Ma-

jor General) George W. Goethals, an Army officer with an engineering background that was outstanding. Since the first ship passed through the Panama Canal on August 3, 1914, shippers and passengers have saved millions of dollars and millions of hours, and have made the passage from one ocean to the other with greater safety and comfort than was possible when ships had to go around Cape Horn. And from a Military and Naval point of view, the Panama Canal, as a factor of national safety to our country, has a value beyond measurement.

In the camps and forts close at home; in far away Alaska, and in the Philippine Islands—in fact wherever there is a unit or detachment of the United States Army—our officers and enlisted men are ever on the alert to perform their duties with the maximum safety to themselves, to government property, and to the civilian population.

Through the Meteorological Service, by use of weather stations, by the use of radio, by long training and by a generous application of good old American common-sense, the safety of men and property is always a consideration, whether the task be that of flying an airplane, firing a 16-inch gun, or pulling a truck out of the mud.

We in the Army believe that such a program pays dividends not only in peace-time, but will also pay dividends, through the training and knowledge gained, if our Army should again, by force of circumstance, be called upon to function in war-time.

We are fully aware that in time of war accidents are even more disastrous than in time of peace. In terms of congestion alone, an accident can seriously hamper movement of troops and material, or bring dangerous delay in the top-speed production of vital defense industries.

It is heartening to us in the service to know that we have available this vast reserve of experience and safety knowledge in the civilian ranks that the National Safety Council and other safety organizations have accumulated.

In closing, I want to say that the Army—your Army—can be counted upon to continue to promote safety in every way compatible with the fulfillment of its mission, which is to provide safety and security on land for more than 135,000,000 men, women and children to whom the United States of America is "home."

Conserving Our Greatest Asset—Man Power

By W. E. MITCHELL

Vice-President and General Manager, Georgia Power Company, Atlanta, Ga.

We are entering into a great program of National Defense. It means a tremendous industrial expansion, a conversion to new fields and a building of the mechanical instruments of destruction or defense undreamed of by us one year ago.

If the program is to be successful, it means organization and training for mass production in new fields. It means the taking of hundreds of thousands of men out of their present work and their replacement by new, untrained people. The brilliance and efficiency of Germany's technical preparation for their attempt at world domination is a challenge to us who have always prided ourselves on our superior production.

But isn't it also a challenge to us in another way? Doesn't it drive home as never before the necessity of an organization in every industry and in every company for the intensification and revitalization of our safety programs, to the end that the defense job (and every one of us are involved in it) is done not only efficiently and rapidly, but also SAFELY?

The great numbers of new employees must be started off right, must be trained to work safely as well as rapidly. Because we are preparing to defend ourselves from possible destruction doesn't lessen the need to avoid injury and death during the preparation. It seems to me the present situation presents a great opportunity to improve our safety records, not simply because we like records, but because they will denote individuals saved from death or partial disability for useful work and to the enjoyment of their families. In other words, conservation of our man power.

American industry is safety-minded. It has grown much more so during the past twenty-five years, as any of us who have been a part of it during that period can testify, and as the records amply prove. We Americans may be exceedingly careless of human life and limb when we get behind the steering wheel on our broad highways, but not so in our factories.

How can this great job of preparedness and safety be done? It will require—

A definite, complete, adequate and integrated plan.

Thorough preparation.

Full utilization of industrial knowledge and skill.

Extensive use of research and invention.

Thorough training and discipline.

Hard work and devotion to duty.

Any Safety Program, if it is to last and be worthwhile, must start from the top. It must be genuine—no flash in the pan—and must proceed from an honest and sincere interest in the workman's welfare. That from a purely selfish viewpoint, it is also good business, should only make it more desirable.

It must not become mechanical, a lot of forms, reports, etc. Accident prevention must be kept personalized, humanized and dramatized. We ought to dramatize safety more! While a sound program must make a permanent, lasting appeal to the intelligence—an appeal to the emotions may often be the starting point. Let's be as smart as Hitler in appealing to the emotions. Interest must be maintained. New methods, where they are improvements over old ones, should be publicized. There must be high morale or *esprit de corps*. To say foremen are key men is trite, but true. If they are sold head and heart on safety, the job is two-thirds done.

Most of us have talked a lot about safety. All of us have given it lip service, and some have done a really constructive job, but many of us are like that farming community in Northeast Georgia that I heard about. They were experiencing a drought and they called on Farmer Jones, a very successful farmer in an adjoining county, who was also somewhat of a preacher, to come over and pray for rain. He consented; they had a big gathering, and his prayer went something like this:

"Oh, Lord, these people have asked me to pray for rain and so I'm praying, Lord, but, Lord, You know, and I know, and they ought to know that what they need isn't rain, but deeper plowing, more fertilizer, and better cultivation."

I think this applies to many safety pro-

grams. Lots of wishful theoretical thinking, not enough sound, practical human understanding.

Some 37 years ago as a young college graduate serving an 18 months' apprenticeship, I saw six or eight men who lost their lives through electric shock. Nearly every one of them was a preventable accident. Every one of these men was above the average in intelligence, all were college trained men. One night I carelessly stuck my finger too close to an ammeter in a high voltage circuit. I only got the static but it set me back on my heels and rattled my teeth. It was a salutary warning that white tape was strung around the test to keep us out of danger, and that there seldom was a second chance if you got careless with the "juice."

Going from there to Brazil on hydro-electric power plant construction, almost the first Portuguese word I learned was "Quidado"—Be Careful! For a time it seemed to be only a slogan, for we had so many serious or fatal accidents that the superstitious workmen would come and beg us not to start any new work on Friday. It seemed that every job started on a Friday brought bad luck. But the trouble wasn't with Friday nor with "Quidado"; it was much more fundamental. We hadn't learned to actually be careful. It was tough schooling for a young engineer, but unquestionably it drove home certain lessons that can never be forgotten.

The passing years have only served to make me have a greater respect for the hazards the electrician and lineman face daily, a greater appreciation of the importance of sound safety work and an understanding of the importance, and ultimate economy of sound operating practices and training in accident prevention in a necessarily hazardous business and the value of these as real conservers of man power in the truest sense.

If the time to make friends is before you need them, if the time to prepare for war is in time of peace; then certainly the time to prevent accidents is before they happen! This means the ground work of any sound safety program must be well thought out, painstakingly checked for its weaknesses, thoroughly organized, and last, but far from least, constantly and consistently followed up.

The warring nations have taught us how

effective propaganda can be and how far it can penetrate. If so effective for subversive purposes, why not equally so for desirable aims, such as safety? Let's make better use of it!

It is particularly difficult today when our hearts and minds are so full of what is happening in Europe, where England, hardly bigger than the State of Illinois, stands alone with her fleet and that handful of magnificent youngsters of the Royal Air Force, the last barrier between the totalitarian tyrant and our own rich, unprepared country. Belatedly, we are now awakening to the danger of our present position, to the need of extraordinary measures for National Defense, for National Unity and a willingness to sweat and sacrifice such as our founding fathers displayed 165 years ago.

The time is desperately short; it's not credit, it's not money now, but gruelling hard work by every one of us that is needed. We may be soft and unprepared, but we are not rotten at the core; we are sound at heart, we have the facilities and can train off our surplus fat, harden our muscles and do this great job of preparing our National Defense in a way that will surprise the world. Courage and broomsticks won't stop tanks or dive bombers. In the present mad world our only hope is to be so strong none dare attack us.

As Roger Babson says:—"Planes and guns are not enough for National Defense. Physical fitness of recruits is not enough. To succeed, the entire country must experience a spiritual rebirth. Only righteousness will save a nation."

How those quiet words of King George—"We have just begun to fight. All of us must trust, as I do, in the help of God to bring victory to our cause" stir our hearts! The trouble with democracies is that their emotions are quick but their minds are dilatory. Therefore, we face the great job of training hundreds of thousands of men, not simply as soldiers, sailors and pilots, but as mechanics, electricians—skilled workmen of all types, and they must be taught how to protect themselves at the same time.

So after all, perhaps it is fitting here to turn our thoughts to saving life; to training men; to building morale. In our speeded up program we'll need every skilled workman, we'll need as never before even more

loyal organizations, more willingness to sacrifice. We must prepare training programs to insure that the new men are ready to take over the jobs made vacant by the shifts due to the National Defense Program, which is now, thank God, gathering momentum!

How better can we conserve our man power than through a sound safety program? Surely we'll want loyalty and employee morale. But morale, or esprit de corps, isn't something you get by direct action. It must come as a result of certain conditions and attitudes of the management which denote the genuine and continued interest of management in the personal well-being of every employee, and which thereby merits the employee's loyalty. I maintain it should be the natural result of a sound safety program.

Safety isn't simply a slogan, something to make cartoons about and to fill files with records. It is much more than that! The steady reduction in industrial accidents, fatal and otherwise; the development of safer operating practices, didn't just happen. I know there are still some slogan writing, swivel chair safety directors at their mahogany desks studying at great length their never ending reports and records—fine, theoretical chaps who think they know a lot about psychology and social values, but who never wore a pair of overalls and to whom the language and mental processes of the normal, two-fisted mechanic, steel worker or lineman are the purest Greek.

Don't misunderstand me, I believe in records: they are necessary details, and there is a place for psychology, but the main issue is making industry safer for those who make up its back-bone—our American working-man. It often means doing so when those whom we are most anxious to protect think it is just a fad of the boss. That it is no fad is readily seen if you run through the files of the National Safety Council conferences, and note the men who have been most outspoken as to management's responsibility. You will get further proof of the great interest in safety by scanning the advertisements in the National Safety News and seeing the many and diverse articles available for the protection of the worker and for the promotion of safer working conditions.

These things I submit are essential to any

sound safety program. *It is management's first and primary responsibility in accident prevention to make the conditions of the work place physically safe. Only when this is done, can management successfully ask the workers to take their active part—and a very necessary part it is—in any safety program. When management does its full part, however, it is easy to get the employees to understand the importance of safety, and educational measures will be readily accepted and followed.*

The wages paid must be fair and adequate and there must be reasonable permanency in the job if we expect the workman to become interested in accident prevention.

It is the duty and obligation of a company to take the leadership in activities of this kind from which the employees benefit. *The president or general manager cannot delegate the organization of the safety program to some minor subordinate. This is not the way management gets results in production, or in purchasing, or in selling. Management must realize that the functioning of the safety program is just as important to efficiency in the plant as any other major activity. Accidents are pure waste of men, materials and money! The primary objectives of the safety program are to eliminate these needless wastes, and, therefore, safety is an important part of management's business.*

The management must take the leading part in a program of accident prevention that amounts to anything. *The management has to initiate it, see that it permeates the whole organization, give it emotional appeal, and keep it alive and going after the first interest has died down. You can employ safety directors to advise with the management, and with the men about good techniques; safety directors can help to carry out the policies of the management, but they can't do the job all alone, without the assistance of management. You can't hire a safety director and say, "Now, George, you do this job and don't bother me any more." Safety can't be bought, any more than you could go out and buy character for your business.*

The foreman is the key man in any safety program, but he'll never truly enter into it, nor sell his men on it, unless the superintendents and supervisory staff, clear up to the general manager and president, are also thoroughly sold on the worthwhileness of

it. So I say a sane safety program must be organized from the top down.

Has it ever been your job to work for several hours in a vain effort to resuscitate a fine, young lineman, knowing in your heart it was an unnecessary accident, and then have to go and break the news to a poor, frightened, crushed young woman, whose only means of support that man was? Unfortunately, that has been my painful duty a number of times. If nothing else had done so, this would have made me a firm believer in safe practices.

Management must, of course, have strong hands upon which it can depend for carrying out the accident prevention details. But management cannot depend merely upon receiving reports. Management must meet with the committees, must participate in some of the investigations, must know personally the procedure of training and must actually lead all employees in the campaign against accidents.

Employees are sensitive to every attitude in the president's office. If safety is thought of great importance there, this attitude will certainly be reflected down through the supervisors and foremen to every employee. If safety is merely a side issue, a half-hearted experiment in the president's office, without question the supervisors and all employees will have exactly this same attitude toward safety work in their work practices.

Accident prevention is good business. Safe methods of work save money for the company. It is good enough business for the management to give it full and serious attention. You all know that accidents cost money. In my own company we have a very active safety program. It has been carried on for years. We devote much thought and study to it. Our record has steadily improved, though we have occasional lapses. Nevertheless, in spite of the fact that our employees are thoroughly trained in both the technique and spirit of safe work, we do have accidents. The direct measurable expense of these accidents to the company amounts to \$40,000 to \$50,000 per year. That includes only out-of-pocket expenditures for medical treatment, hospital bills, workmen's compensation and funeral expenses. But that is only a small part of the total cost.

When an accident occurs, work is disrupted, possibly equipment is damaged; if

a new man has to fill a vacancy caused by an injury, there is a slowing up and loss of efficiency for a time until the new man learns his job. There is always the possibility that the new man will make a serious mistake on unfamiliar work. When the injured man returns to the job, after recovering from his accident, he is still far from his peak of efficiency as a worker and does not reach that peak again for a long time. These are what we might call indirect expenses, but they are just as real as direct expenses.

Looking at it cold-bloodedly, simply from a profit and loss standpoint, management owes just as great an obligation to the stockholders to initiate, direct and stimulate safety work as to direct the production processes. You wouldn't turn over your production machinery to your foreman and laborers and say, "Here now, boys, you know how to operate these machines. Just go ahead and turn out our product and don't bother me with the details." You wouldn't hire a group of salesmen and tell them to go out and sell what they could and come back at the end of the year and tell you what they had done. To imagine running a business that way is simply absurd. It is just as absurd to think of running a safety program that way. Safety is just as much a part of the responsibility of good management as good operating practices or good sales methods—and I may say it pays just as good dividends. We go to great lengths to conserve our companies' physical assets; why not more attention to conserving its greatest asset—its employees?

Here is another aspect of safety—perhaps as important as the dollars and cents cost of accidents. *The safe way of doing a job is, in the long run, the best way of doing it. The safe way is the most efficient way, the least expensive way, and the easiest way for the men. A man who does his job safely will do a better job. If he is in a manufacturing plant he will turn out a better piece of work. He will put into his work the ingredient of safety. Thus the safe workman is also a better workman. He has a sense of responsibility. It makes him a better citizen. A safe worker is likely to be a careful automobile driver; he is likely to be a safety man in his own home. He helps to reduce the frightful toll of traffic accidents and home accidents insofar as his own conduct and his own influence extend. Safety work extends far beyond just*

showing a man how to do a job properly and providing him with the right tools and safety devices. A foreman cannot be expected to take the responsibility and carry it out unaided. *Nor will superintendents and supervisors and safety directors continue the work, once started, without constant stimulation from the management.* Safety training, in the larger sense of the word, extends into the workman's private life. A man who is beset by worries over poor health, personal debts, or other domestic or private difficulties, cannot do his best work. He cannot concentrate fully on his job, but is distracted by his personal problems. This distraction and lack of concentration make him a dangerous workman. Sooner or later he will have an accident through inattention.

To get to the cause of accidents, management must assume a social responsibility for the welfare of its employees. The executive heads of large businesses are frequently called upon to take the leadership in various charitable and public welfare movements. By reason of their executive ability they are able to assume these responsibilities, and indeed they ought to do so for the good of the community. Nevertheless, (and I think many executives are inclined to overlook this point) their first duty is to their own employees.

The workman naturally grows careless. Familiarity may not breed contempt, but it does dull the sense of danger. Mere talk won't rouse him. It's the foreman's job to watch out for him. Also the helper's. But his best protection is thorough training in the fundamentals of safe methods of work. Then habit and instinctive reflex action may save him in a tight spot. "Psychology," Henry C. Link says, "is simply a scientific study of habits and their formation; first so those habits may be better understood, and second, so they may be better controlled." He proves it very simply and conclusively with the question: "Did you ever hear of a child being born with the multiplication table or the ABC's already in his mind? These are habits, and no matter how good a child's heredity, no matter how high his capacity at birth, these habits, like most habits, can be acquired only through practice, repetition, imitation and discipline."

Are not a lot of our failures and disappointments in connection with safety due to our failure to appreciate, to continue to

everlastingly practice, and imitate the best, and to discipline until definite habits are formed?

Perhaps the most important thing about a safety program is that it is habit-forming. It forms habits of the right kind, and therefore, it builds character and makes better men. A man who has become conscious of "tripping hazards" by reason of his company training, doesn't leave a pile of rubbish or an empty bucket on the dark basement stairs in his home. Automatically, he puts the bucket or trash where it should be. It has become a habit. He does it without thinking about it. It has become almost reflex action for him to follow correct safety practices in all the circumstances of his life.

Now you say, fine, but does safety really work? What proof have you that it will conserve man power; that it will reduce labor turnover; that it will improve efficiency? Fair enough. I can only answer from my own company's experience, where we have had an active safety organization for the past 14 years, but from Georgia Power Company's experience, I can answer emphatically in the affirmative to all these questions.

We have handled our safety work with a setup of a safety council and a secretary or director of safety, similar to those usually in vogue. Because of the hazards involved in electrical work, special attention has been devoted to definite, practical training in first aid and the prone pressure method of artificial resuscitation by every line and sub-station crew and by all inspectors, meter-men and appliance service men. Approximately 2,500 men in these groups have had this training.

In the past ten years a great reduction had been made in fatal and serious accidents, but we were still having too many. So two years ago we reorganized our general safety committee, with the general manager as chairman, and the division managers and department-heads as members. Under this group we organized two main sub-committees—the Electric Operating Department Safety Committee and the Transportation Department Safety Committee. We placed renewed emphasis on the proper training of the men, on the foreman's responsibility, and we continued our training in artificial resuscitation. 1,563 employees have completed the standard 20-hour Red

Cross First Aid course during the past three years. They did this voluntarily and on their own time. And 200 non-employees took the course along with our employees.

We were not satisfied, for we had, it seemed, an epidemic of serious accidents—five fatal ones—in the summer and fall of 1938. The men were discouraged, for in the last eight cases they failed to revive the men who had touched the "hot stuff." Then, through my old friend, Mr. E. C. Stone, vice-president of the Duquesne Light Company of Pittsburgh, we learned of their success with what is termed "Pole-Top" resuscitation. We decided to try it.

Mr. Stone kindly loaned us his safety engineer, Mr. W. T. Hawkins, and two of his regular linemen, Messrs. Ed. Rebel and Frank Hartman, for a week. In August of last year we held a training school in Atlanta under the direction of these three men and brought in from ten to fifteen linemen and foremen from each of our five outside divisions, and all of our foremen and linemen (about 200) from the Atlanta Division. These men didn't simply look on—they worked on each other. Also, we invited about 50 safety engineers, linemen and foremen from other electric companies in the Southeast from Maryland to Louisiana, attended. Along with this training, we stressed more than ever before that the use of rubber blankets, pigs, etc., to cover up all wires, was the one sure way to prevent accidents. I cannot speak too highly of the excellent instruction Mr. Stone's men gave us. The result—a new interest in safety, more careful work, and a belief on the part of the men that there was something to this safety stuff.

But let me give you the sequel. It happened last November 9th, and how well I remember it. I was at dinner with Mrs. Mitchell and our daughter when the phone rang. It was A. C. Henderson, Assistant Division Superintendent at Columbus, calling: "Mr. Mitchell, we have had a bad accident." Their instructions are to call me at the earliest moment on serious accidents. My heart sank and I thought: "Another fatality." Then from Henderson: "Lineman West was checking voltage on an 11,000 volt circuit and in some way contacted a live wire. He was dead as a mackerel. Mr. Mitchell, but his buddy, Lineman Poyner, who was opposite him on the pole, had had the training in pole-top resuscitation and he

didn't lose a minute, but went right to work and West is alive! Poyner brought him to in about five minutes. He has a severe burn, but he's all right." I went back to the table. Mrs. Mitchell asked what happened and my daughter said it sounded as though someone were killed but wasn't. "Right," I said, "a man was dead but he's alive again. It's the best news I've had about an accident in many a day." Nothing has so vitalized our safety work in the past five years.

Every serious accident that occurs on our system is promptly investigated by a committee, the majority of whom have no direct responsibility for the work where the accident happened. In this manner a more impartial, thorough and prompt report of the actual causes of the accident is made. It is also this committee's duty to make specific recommendations and thus prevent a recurrence. This report is mimeographed and sent to every division, where it is made the subject of discussion, and believe me, these discussions are free and frank. Many a foreman who thought he had no responsibility and that the accident couldn't have been avoided, changed his mind before the "court martial" was finished. An impartial, thorough investigating committee can usually find the true cause of every serious accident. The important thing is to prevent a recurrence by a thorough explanation and discussion of the accident with all other crews liable to be caught in similar circumstances. Firm, prompt penalties for carelessness or infraction of safety rules are applied. In our business the foreman's first duty is the safety of his men and it is our endeavor to never let him forget that fact.

In the regular quarterly divisional operating practice meetings, where all phases of the company's operations, such as rural line specifications and construction, cost of fuse replacements, servicing customers' appliances, unnecessary automobile expense, high line and substation maintenance methods, etc., are discussed, safety and safe methods of doing difficult and hazardous jobs are discussed by foremen as much as by engineers, and their effect upon costs brought out.

Last fall we persuaded one of our ablest construction line foremen to take a job as safety engineer under our safety director. He accepted the job only when we showed

him what an opportunity it offered not only to train men in safe operating practices, but also to do better work and to do it more economically. He travels from crew to crew all over the state, spending from one to three days with each, observing how they handle their jobs and offering sane, practical suggestions from his wide experience; checks up on their tools and protective equipment, and makes safety something very real and very practical to a very live, smart crew of hikers. This fall this man was promoted to a still more important job and his successor as safety engineer is another up and coming, able, young line foreman who two years ago was a journeyman line-man on his hooks. He knows his line work, its hazards and the value of safety. *Yes, safety training prevents accidents and conserves man power.*

Our distribution costs per customer are as low today as ten years ago, although hours have decreased from 50 to 40 per week and wages have increased over 25 per cent. *Yes, sound safety training and organization improve efficiency.*

Some 562 automobiles and 175 trucks have traveled 31,500,000 miles in all kinds of weather over all kinds of roads in all parts of Georgia since the last fatal accident, whereas the average for the State of Georgia for all vehicles is only 5,900,000 miles per fatality. Our record is nearly five and one-half times as good as the average. *This means real saving.*

Our appliance repair department, employing approximately 70 men, have worked 1,480,000 man hours since Feb. 14, 1929, the date of their last lost time accident. *Certainly we think safety training pays!*

A really complete and socially useful safety program involves, in addition to accident prevention training, such additional benefits as health and accident insurance, provision for hospitalization in case of illness, annual medical examinations for all employees over a certain age, credit unions through which employees can borrow money at reasonable rates of interest, and so on.

One of the best things management can do is to become acquainted with the personal problems of the individual employees and to take the trouble to advise with them about their difficulties. The executive should be a friend and confidant, as well as an employer. His office door should always be open to any employee. Paternalistic,

some will say. Perhaps so, but if done with a genuine interest in the employee's well-being, it will work wonders.

Of course every person entering our employment must pass a medical examination. That's the very beginning of the safety program. *Greater and greater care is being taken in the selection of each new employee, not simply to be sure he is sound in mind and limb, but that mentally he is fitted for the job.* We hope we are hiring him for life; we are going to invest a lot of time and money in training him, and will incur definite obligations to him, which obligations grow greater with each additional year of service.

But we don't stop with the initial or entrance examination. Some years ago we started examining annually our trainmen who were over 40 years of age. We were astounded to find the number who had serious physical disabilities. We now apply this annual examination to all employees over 40, (approximately 2,000 people) office and field alike, free of charge, by physicians selected by the company. This has lengthened the useful life of many employees and probably has prevented some serious accidents. *The value of these examinations is reflected in a decrease in the death rate and improvement in the general health of employees as indicated by the decrease in insurance claims during the past several years.* Again I hear someone say this is too paternalistic. *We call it plain good business sense.*

Does the stipend in the semi-monthly pay envelope discharge the company's full obligation? I don't think so. In times of stress, whether from outside political attack, or labor disturbances, or operating emergencies, we want employee loyalty and usually get it, but let us not wait until these emergencies arise before we begin doing those things that create loyalty. Sometimes it does take a bad accident to wake us up, but generally we believe in the ounce of prevention.

This past year we added hospitalization to the former Accident and Health Group Insurance available to employees. A great many employees have had needed operations performed that they had previously been putting off. Again we consider this just part of a sound, sane safety program, of genuine value in conserving man power.

Another experiment we made last winter

was giving oral vaccine to 112 of our older trainmen. The results were so striking in reducing lost time that we are going to continue the experiment this year with this same group and in addition apply it to a group of 80 men in another department.

Because we found so many of our men in debt to loan sharks, we established eight employee credit unions under federal charters. These unions have 3,447 employee stockholders and nearly \$200,000 in deposits, which is almost constantly on loan. Today company advances to employees in distress amount to \$2,500 where it was \$25,000 a few years ago. We found that these employee credit committees soon knew a bad risk and were much harder-boiled than the company. Yet any deserving employee now knows he can borrow in reasonable amounts and at reasonable rates of interest.

The men who work for you are far more important than your construction programs or budget problems; give more thought to them and their welfare and happiness. Don't patronize them. Treat them as you would want to be treated. It would help labor relations and safety tremendously if executives would leave their offices more frequently and get out into the shop or on the job and get their hands dirty and maybe a smudge of grease on their faces. *There is too much distance between top executives and skilled workmen.*

Labor union contracts are no bar to deserving and winning employee loyalty—quite the contrary if properly handled.

Example: Our Jitney competition.

But in spite of all the safety organization and all efforts to carefully select and train men, human nature being what it is and our business being what it is, there will be accidents. What then? Shall we say there is nothing to this safety business? No, if we are made of the right stuff we'll carry on. But what of the man permanently disabled on the job? Will you stop with the letter of the law, paying him the exact amount demanded by the Workman's Compensation Act? *How you treat these men will have a tremendous influence on all em-*

Following the delivery of these two outstanding addresses, President Stilwell thanked the speakers with a few gracious

ployees. Do they know that you go way beyond the letter of the law? That you try to rehabilitate the man and fit him into some other job? We consider this a very real part of safety.

I am thinking right now of a case where a man cut into a "hot" cable and was terribly burned around the legs. He was in the hospital over three years. The expense was enormous. The company paid it. The company not only paid all compensation called for by the law, but set him up in business at his request, and when the business failed, gave him a course in accounting. But he wasn't fitted to be an accountant. Finally we took him back as a telephone and trouble clerk. Today he is doing a fine job as chief telephone operator in the system load dispatcher's office—a happy, satisfied, responsible employee. Were the thousands of dollars we spent beyond the letter of the law wasted? I think not. Every line-man and helper is proud to work for such a company. I could tell you of similar cases of rehabilitation and fitting crippled men into jobs, but I think you get what I mean.

"Gold," the old prospector says, "is where you find it." But Safety is where you make it.

Safety ultimately implies responsible men and women, satisfactorily adjusted to their positions in life, contented with their work. They have been trained to look out for themselves and their fellow workmen. These people are good citizens and neighbors. People of this sort have pride in their jobs and in doing their work well. They are the essence of a successful business. Individually and collectively, they have character, a quality which you cannot buy, though you can hire any number of people.

So we are convinced of the value of Safety as a means of conserving man power!

Preparedness and National Defense are a definite challenge to American Business. A challenge to the free enterprise system that we have been so proud of. It is a challenge also to management and to labor.

Let us all utilize every means at our command and toil together safely to protect all that America stands for!

words, and then called for the Report of the Resolutions Committee.

This report was presented by Charles W.

Bergquist, Superintendent of Public Relations, Western Electric Company, Hawthorne Station, Chicago, and Past-President of the National Safety Council, and the Resolutions were adopted, as follows:

Resolution

BE IT RESOLVED, That in recognition and appreciation of the distinguished services of Col. John Stilwell as President of the National Safety Council during the past year, in which this cooperative association has made outstanding progress in service, in membership and in national influence under his leadership and devotion to the Cause of Safety, now, therefore, we mutually extend to him a rising Vote of Thanks, and assure him of the sincere admiration and good

wishes of the entire Membership of the Council.

Resolution

BE IT RESOLVED, That the thanks and deep appreciation of the National Safety Council have been earned and are hereby extended to all the volunteer Officers, the Directors, and the Executive Committee of the Council, who during the past year have given so generously of their time, their energies and their resources, to the end that the National Safety Movement shall be advanced, and who through their counsel and their personal efforts have succeeded in furthering so notably the service and the prestige of this great organization.

ADJOURNMENT

Annual Banquet

WEDNESDAY EVENING SESSION

October 9, 1940

The Banquet Meeting for delegates and guests at the 29th National Safety Congress and Exposition of the National Safety Council was held in the Grand Ballroom of The Stevens Hotel, and overflowed into rooms adjoining, where some two thousand persons were entertained and served.

The rooms had been handsomely decorated with the flags of our country and of Great Britain, and the stirring theme of

Safety and Defense was carried out in music and in the entire program. President Col. John Stilwell presided. After the serving of the banquet, President Stilwell called upon John E. Long, Chairman of the Nominating Committee, and Past-President of the National Safety Council, to announce the results of the election of officers. Chairman Long reported as follows:

National Safety Council Officers

1940-1941

President—COL. JOHN STILWELL, Vice-President, Consolidated Edison Company of New York, Inc., New York City.

Vice-President for Education—NED H. DEARBORN, Dean, School of General Education, New York University, New York City.

Vice-President for Industrial Safety—WALTER S. PAINE, Manager, Engineering & Inspection Department, Aetna Life and Affiliated Companies, Hartford, Conn.

Vice-President for Public Safety—LESLIE J. SORENSON, City Traffic Engineer, City of Chicago.

Vice-President for Finance and Treasury—I. W. MILLARD, President, Industrial Gloves Company, Danville, Illinois.

Vice-President for Community Councils and Public Relations—LEW R. PALMER, Conservation Engineer, The Equitable Life Assurance Society of the United States, New York City.

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

Vice-President for Home Safety—A. V. ROHWEDER, Superintendent of Safety and Welfare, Duluth, Missabe & Iron Range Railway Company, Duluth, Minn.

Assistant Vice-President for Finance and Assistant Treasurer—G. T. HELLMUTH, Claims Attorney, Chicago Rapid Transit Company, Chicago.

Managing Director and Secretary—W. H. CAMERON, Managing Director, National Safety Council, Inc., Chicago.

President Col. John Stilwell then presented the distinguished guest who was the speaker of the evening, Dr. Allen A. Stockdale, National Association of Manufactur-

ers, New York City, and Trustee, Emerson College of Oratory, Boston, Mass.

Dr. Stockdale's address was entitled: "Safety and The American Way." It was

an outstanding contribution to a great Congress—perhaps the greatest in the history of the National Safety Council—and Dr. Stockdale carried his audience to stirring heights of eloquence as he mirrored national problems and human struggles in these difficult times of American Safety and Defense.

No copy of this talk received by N. S. C. Notes not taken at the Banquet.

ADJOURNMENT

Agricultural Safety

THURSDAY MORNING SESSION

October 10, 1940

The session was planned as a Panel Discussion of pressing farm accident problems, to be preceded by a formal paper outlining farm accident causes and who may be responsible for corrective action. The session was called to order by the Chairman, Harold L. Miner, Manager of Safety and Fire Prevention, E. I. du Pont de Nemours & Company, Wilmington, Del., and Chairman of the Farm Safety Committee of the National Safety Council.

Chairman Miner stated at some length the purpose of the session, quoting farm accident statistics from "Accident Facts—1940 Edition," published by the National Safety Council, and also paragraphs from the widely circularized pamphlet, "Organizing for Farm Safety," also a Council publication. He called attention to the fact that

4,200 persons were killed in farm accidents in 1939, compared with 3,500 accident deaths in trade and service, 2,700 in construction, 1,800 in transportation and public utilities, 1,800 in manufacturing, and 1,500 in mining, quarrying and oil and gas wells.

Farm fatalities therefore were 27 per cent of all industrial accident losses. The farms also furnished some 25 per cent of all the non-fatal work injuries, and about 25 per cent of the economic losses due to work accidents throughout the United States. The chairman then pointed out that we know how to prevent accident losses of all kinds, and that the National Safety Council and other public spirited organizations are beginning to organize their resources to stop these losses. With this preamble, he introduced the speaker, Mr. J. C. Mohler.

Farm Accidents—Why They Occur and Who Is Responsible for Corrective Action

By J. C. MOHLER

Secretary, Kansas State Board of Agriculture, Topeka, Kan.

There have been more fatalities from work accidents on the farms of the United States in 1940 than from the air battle that has raged over England. This statement is based on the average annual loss of 4,200 from farm mishaps and the newspaper reports of deaths from bombing in Britain.

While agriculture is the oldest, the largest and fundamentally the most important of industries, it is only within the past decade that it was found to be the most hazardous industry of all. Compare the 4,200 deaths in farm work with the 3,500 deaths in trade and service, 2,700 in construction, 1,800 in transportation and public utilities, 1,800 in manufacturing, and 1,500 in mining, quarrying and oil and gas wells, the latest country-wide figures as released by the National Safety Council.

It is true that the progressive influence of safety work during the past thirty years did occasion frequent inquiries concerning the status of agriculture; but it was not until 1934, when Kansas took the first state census on farm accidents that definite facts were made available. This census showed one accident for each fifty farms, with an average of 4.7 persons injured for each 1,000 inhabitants; and that persons injured had been disabled for a total of 132,934 days, or the equivalent of 350 years of lost labor. This was an average of more than 40 days for each accident. The toll included 112 persons killed and 127 others permanently injured. As most of these casualties were males in the prime of life, trained for farm work and management, these figures had a special significance.

It should be noted that these data pertain only to farm work accidents and do not include accidents in the farm home, which would greatly increase the total. Two subsequent Kansas censuses, the latest in 1940, confirm these facts, although there are strong indications that the farm safety program has brought about a decided decrease in both the total number of casualties and fatalities.

The census also showed that about 29 per cent of the accidents were in connection with machinery and 20 per cent with live stock, the two major causes together accounting for approximately 50 per cent of the total. Applying the facts as revealed by the Kansas census to the country's agriculture as a whole, on a per farm basis, the results are closely in accord with the fatality estimates of the National Safety Council and go to establish without doubt agriculture is our most perilous industry.

Publicity emanating from various investigations developed a widespread interest in the problem of agricultural accidents, and considerable concern. A number of agencies, here and there, began feeling their way toward attacking this problem. The first great impetus given to these endeavors was the recognition accorded by the National Safety Council by incorporating in its twenty-sixth National Safety Congress, at Kansas City, in 1937, an Agricultural Safety Session, with a separate farm safety program, which has since been regularly continued; and the second momentous step was taken also by the National Safety Council, when, after much study, it finally developed and recently published a comprehensive plan of organizing for farm safety and a cooperative national program.

This national program fills a great and urgent need, and with this well-thought-out pattern available, it is confidently expected that the states will promptly respond by working out a system of procedure along the lines it so clearly sets forth. In order to better understand the problem, I must briefly quote from this excellent document:

"It is essential to recognize, first, that accidents do not 'happen'—they are caused. To prevent accidents, then, it is necessary to discover the causes and eliminate them. In general, there are two main causes of accidents:

1. Mechanical causes, or faulty physical environment.

2. Personal causes, or faulty human behavior.

"To apply these causes to farm accidents, or to accidents in any other class of human activity, is a simple matter. Mechanical causes are those produced by unguarded machinery and processes, by worn and defective ropes, tools and other equipment, by faulty structures, holes in platforms and flooring, and similar hazards.

"The personal causes of accidents are still more numerous, although they can be named in three general groups: (a) Lack of knowledge or skill; (b) Wrong attitude; and (c) Physical or mental defect in the individual. These human faults include all those commonly referred to as carelessness, thoughtlessness, ignorance, stupidity, recklessness, insubordination, 'horse-play,' and many others.

"The important thing is to recognize that all of these causes are within the realm of human control and that they can be removed or rendered impotent; first, under the name of 'Engineering,' by removing the physical causes of accidents wherever possible, and providing safeguards for all hazards that cannot be eliminated; and, second, under the name of 'Education,' by training the individual to use only safe tools, appliances and safe procedures, and so teach him by continual suggestion that he will consciously follow only safe methods in whatever he may do."

Since the facts concerning farm accidents are well established, the application of these fundamental procedures to farm work is plain, and also with respect to farm home, roadway and street accidents.

This historical view is made to provide the groundwork or a common starting point for a discussion of the most interesting and important part of the subject assigned to me—"Who Is Responsible For Corrective Action?"

The best answer, in my opinion, is found in the cooperative program of the National Safety Council. It is all-embracing, and I would recommend its careful study. I do not, however, intend to dismiss this question so summarily. There is something of a very practical nature to be learned from what has already been accomplished in farm accident prevention that may prove exceedingly useful in organizing and proceeding under the general plan of the National

Safety Council. Notable results have been achieved in recent years in some commonwealths, with promise that future headway may dim their records of the past.

In order to ascertain how extensively farm safety work was being done and who was doing it, inquiries were addressed to every state. The replies from 41 indicate that in 21 states no farm safety work of any kind is being done. In 11 some work is being done, mostly by single agencies concerned with special groups—as the Red Cross, state extension service, farm bureaus, the grange, 4-H clubs, farm security administration, etc. In four states very excellent work is being done with the various groups working separately and independently; and five other states are doing likewise with the addition of strong organized support as represented by agencies that qualify for state-wide leadership under a broad program.

These five are: Illinois and its State Agricultural Association; Minnesota, Michigan, Kansas and their state safety councils; and California through its State Bureau of Industrial Accident Prevention. It may be possible that through lack of adequate information I have excluded some states that should rightly be included in the latter list, and, if so, this is my apology. As single, independent agencies, I want particularly to pay tribute to the 4-H clubs and to the grange which are doing such effective work in many states.

Most progress has been made in the states attacking the farm accident problem in an organized way, and hence their experiences should be exceptionally valuable. Unfortunately, time will not permit outlining the programs of each, and so, with your indulgence, I shall present the example of my own state, not because it is superior to others or as praiseworthy, but simply because I am most familiar with it and have some check on its accomplishments.

So far as I know, no one was giving thought to farm accidents in Kansas until in 1933 when Dr. Earle G. Brown, Secretary of the State Board of Health, in an address before the annual meeting of the State Safety Council, invited attention to rural risks by citing from the vital statistics compiled by his board, showing that in fatalities from occupational accidents, agriculture led all others by far, and in some years was more than all the rest combined.

This exposition was a challenge to action.

Immediately, the State Board of Agriculture interested itself. It planned and carried out two state-wide surveys, in 1934 and 1935, which secured more facts about farm accidents than had been marshaled previously. Much helpful publicity resulted from the dissemination of these facts. They were basic—indispensable in the most intelligent consideration of methods of attack. That was the beginning from which slowly developed the organization that was perfected in 1937 by the president of the State Safety Council appointing a Farm Accident Committee. This committee was authorized to proceed in accordance with its judgment. It promptly evolved a plan which has been in successful operation ever since.

Care was exercised in the selection of the committee, and its personnel was composed of representatives of agencies whose cooperation was regarded as of the utmost importance. Hence, its membership consisted of the State Superintendent of Public Instruction, State 4-H Club Leaders, State Supervisor of Vocational Agriculture, Managing Editor of *Kansas Farmer*, and the secretary of the State Board of Agriculture as chairman. Incidentally, there has been only one change in membership, due to a new State Superintendent of Public Instruction, the only one subject to results of general elections. Permanency of the committee is an important factor.

The character of the committee in itself may indicate what was in mind and decided upon: a scheme to enroll the youth of the state in farm safety—the public schools, the 4-H clubs, Future Farmers and grange juveniles. Realizing that it was necessary to supply them with something that was interesting and appealing, a thirty-two page, illustrated booklet was prepared and printed, 100,000 copies, entitled "A Farm Accident Primer." It gave in a simple way, mostly in the form of questions and answers, rather full information about farm accidents, their causes and prevention. Details of county and state safety contests, which the committee decided to conduct to add interest and encourage competition, were also included, with the announcement of prizes for state winners. To aid in the county contests, county committees were set up—composed in the main of the county superintendent of public instruction, the county agent and a representative of a farm organization.

The State Superintendent of Public In-

struction sent the primers to the county superintendents, who distributed them to rural school teachers, the teachers in turn passing them on to the pupils. The State 4-H Club Leader saw to it that the members of this organization were supplied, and the State Supervisor of Vocational Agriculture did likewise in his field. The children were instructed not only to study the primers but to take them home and to discuss with their families the observance of safety practices, as well as plans for their entering the contests. Every boy and every girl in Kansas who was enrolled in grade or high school or a regular member of 4-H clubs or of vocational agricultural classes was eligible, and awards were based on personal accomplishments in safety work on the farm, leadership in community or school activities in safety, of which a record was to be kept and a report made, and the writing of a story of not more than 300 words on, "The Prevention of Accidents and the Conservation of Human Life in My Community."

Interest was manifested in every county. Thousands of youths were enrolled. It is estimated that practically all of the 175,000 farm families in the state have been reached with the safety gospel and mostly through their own children, many of whom became ardent safety champions. As it worked out, the youngsters in studying the primer to prepare for the contests not only became fully informed generally but their enthusiasm often resulted in getting the entire household interested. As a consequence, there was developed in many cases a family enterprise, with rivalry among the members to see who could make the best record.

Achievements of some individuals were really remarkable, in one instance led to the improvement of the entire local community. Many rather similar examples might be cited. They make the finest type of human interest stories, too. Once the imagination of a child is captured, there is no estimating what may be accomplished. In addition to the individual rivalry, group competition between schools and clubs has been keen also.

Quite a number of the county committees provided prizes for the winners in the county contests, and the tops of these, individual and groups, automatically become entrants in the state contest. These contests have been stimulating and are a feature of the campaign. As a whole, however, the gratifying results must be mainly attributed

to the thousands of families who participated, not because of the prizes but with the principal object of making the farmstead a safer place.

The judges in the state contests are chosen from the farm organizations, women mainly, are admirable cooperators, and one member of the State Safety Council, thus far its secretary. The annual awards are \$50 gold watches to the winning boy and girl, given by Senator Arthur Capper, and a free trip to the American Royal Live Stock Show to the winning school or club, sponsored by the State Safety Council. Each fall the winners are entertained at the capital city and take part in a special radio broadcast. The newspapers, of course, give these events state-wide publicity, and they are the spectacular feature of the program, as are the county contests locally.

While the foregoing is a résumé of the organized effort stemming from the State Safety Council, the picture would be far from complete if mention were not made of what other agencies are doing, separately and independently, and full credit is given for their exceptionally fine work, as well as for their unflinching cooperation in the general state program. Institutional activities are carried on most efficiently and in a comprehensive way by the 4-H clubs, and vocational agriculture students and Future Farmers, under their state leader and state supervisor, respectively; and by the grange, which features safety in its regular programs at their meeting houses throughout the state and which enjoys the unique record of being the only state that has won the national grange safety essay contest two different years. The extension specialist in farm machinery of Kansas State College has incorporated safety in the hundreds of co-operative machinery and rural life meetings held annually.

It would require an article of length to do justice to the achievements of each of these; I shall have to be content to extend grateful acknowledgements on their praiseworthy achievements. The state farm bureau and the state farmers' union, while having no organized program, strongly endorse the campaign, and the former has been active in highway safety in connection with its motor vehicle insurance business. It should be noted, too, that the farm security administration is doing excellent farm safety work in Kansas, as elsewhere. The more partici-

pants, the better. Agencies proceeding independently are likely to have a special interest in their individual programs and a peculiar pride in their accomplishments, and their incentives for progress, and their opportunities for useful service are unlimited.

Results have been secured. There is no yardstick by which they may be definitely measured, but an indication is found in the vital statistics of the State Board of Health. These show farm accident deaths in the past three years of 83, 57 and 61, respectively, as compared with 109 in 1936 and the high of 112 in 1934; and also in the 1940 state-wide survey, just completed, recording a total of 2,119 accidents as compared with 3,235 in 1934 and 2,860 in 1935. The all-time low in fatalities was 57 in 1938, a decrease from the preceding year of over 30 per cent, and from the high year (1934) of 49 per cent. In commenting on this record, the State Board

of Health observed, "It is a strong indication that safety education is proving effective."

So far as the Kansas program is concerned, what has been achieved has been due chiefly to education. Engineering might have contributed, and no doubt did contribute in more or less degree. Unquestionably, many farmers more closely checked their tools and equipment and facilities. Just what headway manufacturers have made toward further safeguarding farm machinery, I am not advised, but most assuredly they are fully sensible of their responsibilities. As the National Safety Council has pointed out, farm accident prevention depends upon the two powerful forces of engineering and education. May the two operate together as an invincible tandem in promoting safety on the farms of America.

Panel Discussion

CHAIRMAN MINER: In thinking about today's program, I was impressed with the fact that practically all of the occupations are represented in farm work activities. We have even the aviation hazard, as well as those of the machine shop, the use of toxic materials, and the handling of livestock. With few exceptions, all of the occupational classifications are found among farm hazards and should be included in the Farm Safety Program. It is a problem of tremendous scope.

We shall now proceed with the Panel Discussion provided for in our program. Our committee has suggested certain subjects, various phases of the big problem, and they have invited a number of distinguished gentlemen here to present various views on these subjects. I take pleasure in introducing to you the following gentlemen:

C. M. Seagraves, Director, Department of Safety, Illinois Agricultural Association, Chicago.

H. G. Davis, Director of Research, Farm Equipment Institute, Chicago.

S. H. McCrory, Assistant Chief, Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture, Washington, D. C.

Richard W. Thrush, Assistant Director, First Aid, Life Saving and Accident Pre-

vention, The American National Red Cross, Washington, D. C.

T. A. Erickson, State Club Leader, State of Minnesota Agricultural Extension Division, University Farm, St. Paul, Minn.

Kenneth H. Anderson, Service Director, National Committee on Boys and Girls Club Work, Chicago.

E. W. Lehmann, Professor, Agricultural Engineering, University of Illinois, Urbana, Ill.

Association Safety Work

CHAIRMAN MINER: The best plan will be to call individually upon these gentlemen in turn. Mr. Seagraves, may we hear first from you?

C. M. SEAGRAVES (Director, Department of Safety, Illinois Agricultural Association, Chicago, Illinois): Our work in this state is confined almost entirely to Farm Bureau members and their families, of whom there is a considerable number. We have directed our work largely along publicity lines.

We have pointed out constantly, insofar as we were able, the seasonable hazards, especially as farm machinery and livestock would work into such warnings, and in pointing those out we have used weekly

news releases that go to all rural papers in the state—articles in our *Illinois Agricultural Record*, which goes to all of our Farm Bureau members—posters that are placed in the Farm Bureau offices throughout the state—and we have also done considerable work among the 80 rural youth groups which we have organized in that many different counties.

Now, so far as the question indicated on the program here is concerned, "What can we do to further the Farm Safety program?" insofar as it pertains to our organization, we can do little else than what we have already done until such time as a coordinated program can be made available to us—when we will be told, "Here is what you can do because you are fitted to do it," after which we will go ahead and offer our entire cooperation.

I would like to say here that after we received the pamphlet on "Organizing for Farm Safety" from the National Safety Council, we would have been very happy to have had a follow-up on it saying, "Just what have you folks done as suggested in this report? Will you submit to us some physical evidence of what you have accomplished?" From the wide sources of material that you folks have available to you, I believe that we could make up a suggested typical Farm Safety Program and we might even point out our place in it.

In all our cooperative efforts (and I presume that this is true of all work) we have discovered that it takes just a little prodding from time to time in order to have folks do something, and we would be willing to go ahead and do more and follow your suggestions on the thing.

CHAIRMAN MINER: May I interrupt you for a moment, Mr. Seagraves? The only reason you didn't receive a follow-up was because of the problem of finances. We have asked for some additional money to carry on this Farm Safety program and I can assure you that in the future you will receive not only one follow-up but many.

MR. SEAGRAVES: As regards the operations and occupations in which farm accidents occur most frequently, frankly, we don't know. Here in this state we have some ideas of trends. We have more people killed from horse kicks, as a matter of fact,

than we do from tractors, but until we know the comparative hazards involved in so many hours of handling tractors and in so many hours of handling livestock, we cannot feel confident in saying that this or that or the other is the most dangerous hazard. However, we do believe from the statistics we have compiled that farm machinery needs some immediate attention insofar as safeguarding devices are concerned. It is pretty hard to put boxing gloves on a horse's rear feet, but it is not impossible to install a back to a tractor seat, let us say.

I believe now that I have opened a friendly relationship with Mr. Davis and so I shall resume my seat.

CHAIRMAN MINER: What have you to say, Mr. Davis?

Farm Equipment

H. G. DAVIS (Director of Research, Farm Equipment Institute, Chicago, Illinois): The interest of the farm equipment industry, in addition to that of the general interest of every good citizen in movements of this kind, has been, of course, specifically directed to our own products. We have made a considerable investigation of the farm accident problem. We made a survey some four or five years ago in which we covered the whole United States, but it was not a very intensive survey. It was made by subscribing to a clipping bureau service for farm accidents in all parts of the country. We tabulated several thousand clippings to find out just what problem was involved and to what extent our farm machinery was involved as an injury factor.

I have been rather impressed, from the reports which I have heard and read of other surveys, that we had one that was nearly typical as any survey would be. For instance, in checking with Mr. Seagraves' report, we found that we had about the same total percentages in cases where farm machinery was involved as an injury factor.

Then we wanted to see what we could do to put the boxing gloves on the rear end of the tractor: in other words, we wanted to see to what extent these accidents were occurring where the blame might be placed upon the machine. We knew that there were some fundamental weaknesses. We also believed that there are many ideas about safeguards for machines that sound very nice in theory but are not practical in operation.

We found among the accidents which were occurring that a great many very serious injuries and a good many actual deaths were taking place as the result of a person's clothing being caught up in the power takeoff of power-driven machines, and we immediately recognized that as a defect. While we are an industry where we do no standardizing—each machine is an individual production and is made without reference to any other machine manufactured—we found that it was necessary to do a little standardizing in the name of safety in order to cover the power takeoff rod which goes from the power takeoff on the tractor back to the operating machine that is towed behind it.

We have 15 or 18 manufacturers who are producing tractors in this country and a large number are producing machines that are operated with a power takeoff. Now it was a simple matter for the manufacturer of the machine to put some kind of a shield over this revolving rod, but when the farmer put the machine into use there was the necessity of connecting that shield with the tractor. It was a simple matter to do that when the machine and tractor were both made by the same manufacturer. But when one manufacturer's machine was bought by a farmer who owned a tractor made by another manufacturer, there was no way to attach that shield to the tractor. As a result, we devised a guard over the power takeoff on tractors that is similar in all cases at that connecting point, and today when a farmer buys a combine or a power mower or a power cornpicker or any of those power machines from one manufacturer, he can still back the tractor of another manufacturer into his machine by just turning a turnbuckle and he will be hooked up to it.

We went even further than that. We went over our machines, I might say, with a fine toothed comb. We enclosed some gears that previously had been exposed, we put shields around sprockets, and we cleaned up the line completely until we felt that we were absolutely safe. But we wanted to know whether we really were or not, and so last year we devised a survey which we are now carrying on and we have had nine months' experience on that. To date I believe that we have tabulated 226 farm accidents where machines were involved.

Now, this is a more accurate survey and a little more detailed type of information

than you usually obtain in surveys. It is made by the individual manufacturer who made the machine that is involved in the accident. The whole affair is reported by a man who is quite familiar with the machine and who in his report mentions the point of injury, the date of the accident, the name of the person injured, his address, the type of machine involved, the nature of the injury, and the exact point on the machine where the accident took place. After that he describes the accident in detail, giving a clear word picture of how and why it happened.

Some of the other questions which this same fellow answers in his report are these: "Do you think this particular accident could have been avoided? If so, how?" If he thinks the machine was at fault in any way, he is to report that fact. "Was the machine running at the time of the accident? Was power takeoff under power? Were manufacturer's guards removed? Was weather or the condition of the ground a factor? If so, in what way? Give briefly any statement made by the injured. State your suggestion, if any, as to how similar accidents might be avoided in the future."

These reports are made up in duplicate. One copy comes to my office and the original is sent to the manufacturer, where it is handed over to the engineering department. Out of 226 accidents which have been tabulated, we haven't found anything further that we can do in the way of redesigning our machines.

Now just a few words as to the educational feature. The first thing that we did when we became active in this accident campaign was to ask the National Safety Council to prepare for us a statement which might be included in the instruction book that accompanies each machine sold, and this is the statement which the Council has prepared for us. It is headed, "Safety First":

"Most farm accidents, just as most industrial, home and highway accidents, are caused by the familiar failure of some individual to observe certain simple and fundamental safety rules or precautions. For this reason farm accidents, just as other types of accidents, can be prevented by recognizing the cause of the accident and doing something about it before the accident occurs."

"Regardless of the care used in designing and constructing farm equipment, there are many points that cannot be completely safeguarded without interfering with the accessibility and efficiency of operation. A careful operator is the best insurance against an accident. The complete observance of one simple rule would prevent many thousands of serious injuries each year, and that rule is this: NEVER ATTEMPT TO CLEAN, OIL OR ADJUST A MACHINE WHILE IT IS IN MOTION."

That warning is included in every instruction book that accompanies every new machine sold. I checked over with some of our companies recently and asked them to give me a list of tools or machines that had these instruction books with that warning in them inside the package in which they were delivered. Then I turned to the census bureau records, and I discovered that our annual distribution of these instruction booklets to farmers throughout this country amounted to about two million a year, one of them accompanying each new machine sold.

We have gone still further. We have a preliminary form of a poster which we are contemplating putting up in every dealer's place of business throughout the United States. We provided for transfers to be placed on the machines at the various danger spots, with such warnings as: "Safety First" . . . "Keep clothing and hands away from chains and moving parts" . . . "Stop machine to oil and adjust." etc., etc. We have purchased literally millions of these transfers and there are machines carrying anywhere from two to a half-dozen transfers located at various danger spots.

We have also prepared a number of rules for safe tractor operation. There are 17 of those rules, which are printed on a handy card. These rules, by the way, have been printed in all of the trade and occupational papers that circulate to the farm trade. These cards have also been purchased by oil companies and as they deliver oil to the farmer's place one of these cards is tacked up in his oil shed or in his tractor shed.

As I have said, there are 17 of these safety rules. But I might say here that in the 30 fatal tractor accidents which we have tabulated this year, the observance of one or more of these rules would have prevented every one of those accidents, with one exception.

A farmer down in New Jersey was backing his tractor into the shed when the seat spring broke. Of course, he was running in reverse. Perhaps a dozen or so seat springs break in the course of a year's time out of a million or three-quarters of a million tractors, and I suppose that a farmer runs his tractor in reverse probably one-millionth part of the time that he runs it altogether. In this particular case both of these things happened at the very same time.

Now that is the sort of work that we are doing. We are ready to cooperate in any way that we can with you people. There is nothing more in sight so far as we can see at the present time in the way of additional progress. If we find something that is wrong tomorrow and that requires correcting, we will go right ahead and correct the fault. However, we can't do some of the things that have been suggested to us. For instance, Mr. Seagraves has suggested putting a back to a tractor seat. I don't know how you are going to reach around the back seat of a tractor and adjust the levers. A back just can't be put on the seat. We have also received suggestions regarding some automatic means of turning the ignition on or off. We have made tests on that but we have been unable to find any way in which this can satisfactorily be done.

I can assure you of one thing, however: we never put a safety device on a farm machine unless it is one hundred per cent safe. We will never lull a farmer into carelessness by having him believe that because he has a certain device on his machine he is perfectly safe when we know that he is likely to be injured when that device does not work.

We will cooperate with all of you in every way that we can in this educational work. I do want you to know that our experience has shown us that more than 90 per cent of the accidents in which our farm machines are involved are the result of carelessness on the part of the operator of the machine.

CHAIRMAN MINER: It is certainly encouraging to find out what the farm equipment people are doing, and I am deeply appreciative of their attitude of cooperation.

I shall now call upon Mr. McCrory, Assistant Chief of the Bureau of Agricultural Chemistry & Engineering, U. S. Department of Agriculture, Washington, D. C.

Governmental Interest

S. H. MCCRORY: The Department of Agriculture is very much interested in this problem of farm safety. We have been working on some phases of it for a long time. One thing that has impressed me is the difficulty of finding out accurately what happens when you have an accident; and if we could find some way of getting better reports on farm accidents and what causes them, such information would be very helpful in planning safety campaigns.

One thing that is perhaps needed more than anything else is a continuous educational program that will make farm people safety conscious. We have observed the need of that a great many times. I don't think we have done as much in the past as we should have done along that line. However, I am sure that if we could educate the farm people to the dangers of many of the practices that they are following, we would do a great deal to cut down the number of farm accidents.

To me accident reduction seems to be largely a matter of what you might call good housekeeping. If you keep your buildings and your equipment in good order, you do a good deal to cut down the possibilities of accidents. Many farm people do not appreciate that fact. You see them doing a lot of things on many farms that they shouldn't be doing, and when you call it to their attention, they will say, "Well, that's the easiest way to do it," or something like that. And I think that we must commence to educate the children. We have found in the Department of Agriculture that that is one of the most effective ways of carrying out educational programs.

Now, I think that these educational programs should be made as broad as possible. All of the farm agencies should certainly cooperate in them. I think, too, that it would be most helpful if we could bring into those programs the smaller manufacturers and agencies that are serving the farmers—such agencies as the public utilities and others who have rather frequent contacts with farmers. Those agencies can do a great deal of good in preventing farm accidents by educating people in regard to what is happening, providing they are informed as to just what they should tell them. There is a field there which hasn't

been explored as fully as it might be and which, if opened up, might bring good results.

CHAIRMAN MINER: In '39 or the latter part of '38, when the National Safety Council sent our first statement out to the various associations, we included all of the organizations either directly or indirectly concerned with safety—the National Electric Light Association, the National Electric Manufacturers, and all similar organizations—and we hope eventually to have all of the organizations either directly or indirectly connected with farm safety enter into the picture. Your suggestions have been very fine, Mr. McCrory.

I shall now call upon Mr. R. W. Thrush, of The American National Red Cross.

Fact Finding Is Important

RICHARD W. THRUSH (Assistant Director, First Aid, Life Saving and Accident Prevention, The American National Red Cross, Washington, D. C.): The thing which is of primary importance to us is how to stimulate or discover some means whereby we can have a better system of fact-finding on this problem of farm accidents. You will perhaps recall the two reports which were made this past year. One was by Doctor Powers at Cooperstown, New York, and the other by Doctor Baker, who went quite extensively into the matter in the State of Alabama; both of these were almost unique in that field with the exception of spotted reports that we have had from different parts of the country, a very good job having been done in Kansas as well as in the State of Illinois. I have no doubt that those of you who have looked over the reports made by Doctor Powers and Doctor Baker were impressed with the variety of the types of accidents those reports dealt with.

For instance, on any reports from Kansas, let us say, you don't see anything about logging accidents; yet on those reports from Cooperstown it was indicated that people had been brought into the hospital as a result of logging accidents, because during certain seasons of the year lumbering in a small way is a very definite part of the activities of those farmers and contributed to their accident problem. From a reading of Doctor Baker's studies any of you who are

familiar with conditions in the South will see that part of the country reflected in his reports. They are entirely different from what you might expect about conditions in Illinois, for instance; and both men refer to the fact that there is very little in the way of background, that there hasn't been much in the way of medical studies or scientific reporting on these accidents.

Really, I am wondering how those who are interested in this field can get very far on the job until we know where the enemy is? We go into our local communities, let us say, and we make studies locally. As regards these service organizations, that is a sort of generalized term and somewhat difficult to define as to just exactly what we mean. Anyway, thinking of these community groups, we can readily see that any such group can make local studies of accident problems. In a measure at least they can discover from local statistics the number of farmers who have been injured, certainly in cases where they have been brought to the hospital; but there ought to be a possibility in practically any community, where there is local leadership through service groups of one sort or another, of arriving at some plan for discovering what has actually taken place in that county or in that particular district. Having found out something about the problem at hand, they can then proceed upon a program of education.

These community organizations (I have heard them referred to as "pressure groups" although I do not believe that is a particularly good term to use) are more or less independent, are voluntary in their nature, and they do hound local and state governmental authorities to do things. This is a part of their function, apparently. A number of them are prepared to carry on definitely with programs, are prepared to make demonstrations of the effectiveness of a program before the public at large is willing to take on such a program. Take the Anti-Tuberculosis League, for instance, or the private charities . . . you can name any list of things . . . or the matter of volunteer fire protection; you may have a group of people interested in that problem who may carry on for a number of years before there is community wide or municipal recognition of the problem.

So that always is a pioneering task for community groups of one sort or another. Al-o, some of them, you will find, are

equipped with program facilities. The Grange, 4-H Clubs, women's clubs, parent-teacher associations, the organization which I represent—all of them have different programs which may be carried on independently or correlatedly.

This program of education in farm safety just came to my attention the other day: It seems that there is a group of enthusiastic young chaps down in Lehigh County, Pennsylvania, who are interested in accident prevention, first aid work, and all that sort of thing, and they have been carrying on a magnificent program down there for a number of years. Here is an example of what they are doing:

They have gone out into a given farm community (you may be familiar with those good old Dutch farmers down that way) and have selected six farm homes as spots for carrying on instruction in farm accident prevention. The first farm selected was one that was well equipped with machinery. In the evening the farmers and their wives and their older children met together on that particular farm and an instructor took them through a course of accident prevention in connection with farm machinery.

The following week they met again at another neighborhood farm, which is well stocked with cattle and horses and other livestock; and on this occasion the subject under discussion was that pertaining to livestock and the various means of handling it as well as the ways of preventing accidents when dealing with livestock.

On another occasion they met at quite a model modern farm home where they could find practically all the hazards which can be found in a modern home either in the city or in the country, and at that time home accidents were the subject of study and discussion.

From this mode of procedure (and they have had enough experience so that they know what they are about), they expect that the entire community will become so interested in a group of efforts of this sort that they will be able to go right on through a first aid course, and then establish a first aid station as a sort of rallying point for their entire efforts.

That is a rather good example of what a community can do with developed leadership. Of course, our stumbling block is that of finding the proper leadership. How-

ever, I believe that we must keep certain steps in mind if we are to carry out this program satisfactorily. First of all, we must face honestly the problem that is before us, namely, that somehow or other we must develop in this country a more accurate and complete system of reporting farm accidents before we can really begin to approach the problem intelligently. We must know where it is; we must know how different the situation is in southern West Virginia, for instance, from that which exists in northern Illinois; and we must not generalize too much about our problem. You know, we have been surprised at the results of some of the surveys which have been made in connection with home accidents, namely: that accidents weren't happening in many cases where we thought they were happening, and we may find the same thing to be true as regards farm accidents.

Let us not overlook these community groups which may be the spearpoints, the agitators for this effort. Take advantage of all of them, whether they are organized very carefully, or whether they are very loose in their organization. All the way down from your service clubs in the town, let us say, from your Rotary clubs and Kiwanis clubs all the way down to even family reunions and family picnics, whenever a group of farm folks come together, have them reached somehow, in some fashion, with the message of accident prevention on the farm.

CHAIRMAN MINER: I shall now call upon Mr. T. H. Erickson, who will speak to us on State Safety Councils.

Minnesota 4-H Clubs

T. A. ERICKSON (State Club Leader, State of Minnesota Agricultural Extension Division, University Farm, St. Paul, Minn.): First, let me say that until recently it was my privilege to be the leader of the 4-H Clubs in Minnesota for a good many years.

About six years ago it was my privilege to attend the annual meeting of the State Safety Council and it struck me at that time that the Agricultural Extension Service was a pretty good source through which to teach farm people to become safety-minded. This, as you know, is the work that is being carried on by the agricultural colleges in each state that are cooperating with the U. S. Department of Agriculture, and

it is a sort of voluntary movement that gets in touch with practically every farm home in the country. So we added the safety work as an activity in our agricultural extension work in Minnesota, especially as a part of the 4-H Club program.

There was good reason why that proved to be a very effective way of putting across safety education. Those of you who have business relations and other contacts with farm people are no doubt aware that in our extension work we try to make contact with practically every group or force that is interested in rural life. So we not only have the agricultural extension service but we have contact with the public schools, with the farm bureaus, with the churches, with the Grange, with the Red Cross, with the county fairs, with the State Industrial Commission, with machinery companies, with the rural electrification association, with the farm insurance companies, with the public press and the farm press and other groups, all of whom are interested in farm activities.

Now this 4-H program is one in which we try to get rural boys and girls to do definite and specific things; and among these things we have asked each boy or girl who is a 4-H Club member to do something along the line of safety work. In Minnesota we have about 50,000 rural young people who are members of these 4-H Clubs, members of 3,000 locally organized groups. Last year in our state they held nearly 30 monthly meetings. We have amongst that group of young people a volunteer force which directly or indirectly reaches practically every farm home in the state.

I simply want to emphasize that as a wonderful source of putting across safety education. Judging from my experience with these young people the last six years in the State of Minnesota, I believe that the thing we need more than anything else in carrying on farm safety work is to help farm people, especially the young people, become safety-minded. We can make many rules and supply all the information and all the safety appliances on our farm machinery, but until we can get farm folks to learn how to use them and how to be careful about all sorts of little things, we will continue to have many farm accidents. While it is true that machinery and livestock are the main causes of accidents on the farm, there are many little things, such as the

pitchfork around the barn and things of that kind, which are the cause of numerous accidents.

Here is something which we did with the help of our 4-H Club members about six years ago: We asked them to make a survey of their own home and of their own premises and of their own farms, and we got together a wonderful report as a result of all their findings. Among some of the things which they found around the house were broken bottles and other pieces of broken glass which caused many accidents. They also discovered that there was a lot of machinery misplaced, that certain farm implements, by being where they ought not to be, caused a good many accidents.

You would be surprised at the number of hazards caused by all sorts of little things on a farm which resulted oftentimes in accidents. These surveys gave us a good insight into many of these matters. For instance, one chap said: "For years the only stairway to the hayloft was a few strips of wood nailed alongside the barn door, and I remember how I used to fall down and get hurt while trying to get up there that way." Hundreds of different little hazards were reported by these boys and girls, and it was all voluntary. No one forced them to look these things up. This past year we had more than 30,000 of our 4-H Club members who sent in reports to the effect that they had done something in the way of studying safety conditions on their farms and had done something to correct whatever hazards existed on the place.

It was my privilege to appear before the mutual farm insurance companies in the state. When the president began introducing our part of the program at that meeting, somebody said that he couldn't see what connection there was between farm insurance and 4-H Clubs and farm safety. In reply to that statement all I did was to bring out of my bag a bunch of these reports from 4-H Club boys and girls and then read what some of them had done. For example, here is what one of them said: "Before I took an interest in safety activity we used to keep the gasoline and kerosene in the same kind of a can side by side," and then he went on to tell what used to happen sometimes. "Now the gasoline is kept in a red painted can with the name GASOLINE painted on it. Before I took care of this hazard father used to start the fire in

the kitchen stove every morning by pouring kerosene over it. But father and I have talked that over and we don't do that any more." I gave them dozens of other illustrations and when I had finished speaking, they said, "Why, those are the very things that cause large losses in insurance on farm homes, these little things on the farm."

So we feel that it is a very fine thing, the cooperation which exists between all these farm organizations and farm people. There have been some very interesting and worthwhile exhibits by young people in Minnesota at our county fairs—and we have 99 of them in our state. There were over 300 demonstration teams made up of these boys and girls at our county fairs that showed some of the things that they had learned. For instance, a couple of girls showed how they poured kerosene into a lamp in a safe way; a boy showed how he handled a horse to avoid being kicked by the animal; they made these and a great many other demonstrations before the public. Thousands of farm folks listened to these youngsters and witnessed these demonstrations at the various county fairs. The best team was sent on to the State Fair, and at the Minnesota State Fair this year we had 42 county demonstration teams, every one of which made safety demonstrations for the benefit of the public during the entire period of the State Fair.

We asked each one of these three thousand 4-H Clubs throughout the state to bring up the subject of safety in their monthly meetings, so that the boys and girls might get up and talk on that topic, after which they would take back home with them the things about safety that they had learned. Reports have also been published in the local newspapers concerning the various things which these 4-H Clubs are doing in the field of safety on the farm.

I feel that one of the best and most effective ways of putting across the farm safety idea is to carry on our work through the young people. We may have to wait a year or two longer before we can notice any large results, but if we put on a program in which young people will take an active part because they like to do it, under voluntary leadership, then I feel certain that we are going to obtain some very fine results. That is the way we feel about it up in Minnesota. Every community in our state is talking safety. In a great many of the farm

homes it is not only father who says to his son when the latter goes out with the car, "John, be careful. Don't drive too fast"; but the son says to his dad, "Remember, dad, we are working on a safety program in the 4-H Club, so don't drive too fast. Be careful and obey the safety rules." If we can make this thing a family affair, we are going to accomplish a great many fine things.

CHAIRMAN MINER: I am now going to call upon Mr. Kenneth H. Anderson, Service Director of the National Committee on Boys and Girls Club Work, Chicago.

Rural Youth Organizations

KENNETH H. ANDERSON: We know that it takes a good team of horses to do this job of safety, that team consisting of education and engineering. Through the rural youth organizations of the United States a good job of education can be done, and I think it is highly important that that job of education be not something which just comes up at one meeting, intermittently through the year, but that it be part of the every-day programs of those organizations of boys and girls.

Some time ago, I heard an individual talk about campaigns being carried on for safety, and this person said: "We have been overdone and we are in danger of becoming overweak." I think that is very true. We can carry on fine campaigns for either a day or a week but they really must be carried on every day throughout the year if they are to become effective.

This work through rural youth organizations is being carried on by the Future Farmers of America, by the members of the 4-H Clubs, by the juvenile Granges, by means of rural schools, by various divisions of the farm bureaus, by Boy Scouts, Girl Scouts and Campfire Scouts, by educational and cooperative unions, and by means of a number of other organizations.

These people are beginning to realize that accidents can be prevented. I think we need to remember, when working with farm folks, that we are confronted with an entirely different situation than if we were dealing with a factory condition. You cannot legislate safety for the farmer; you can for the workers in a factory. For the latter

type of people you can have rules and regulations that will be followed. But in working with farm families, you need to make them enthusiastic about the idea of safety—I mean really enthusiastic about being able to prevent accidents, about being able to save lives through safety programs.

We know that through vaccination thousands of hogs are being saved; they no longer die because of hog cholera. We know that because of the work on Bang's disease, not many calves are now being lost in reproduction. And still we can't become enthusiastic about safety, it seems, when we are dealing with human lives in this farm safety program.

As has been mentioned here, I think a fine way to reach these farm families is through the boys and girls. They are still plastic, they are still receptive to ideas, they become enthusiastic about things, and they can talk to dad and mother and put these ideas across to them where a grown-up person wouldn't be able to do it. It's a fine thing to educate the old heads who are now at work on this problem; they need such education; but these boys and girls are going to be our future farmers, our future representatives in all fields of endeavor, and not only will they obtain this education for themselves but they will be able to pass it on to their parents.

Mr. Erickson told you something about the safety program which they have in the State of Minnesota. Mr. Mohler told you something about the safety program which they have in the State of Kansas. Now I would like to tell you just a little bit more about the work being carried on in Kansas, because they have really been doing a splendid job down there. In their case they do carry on safety work as a part of their regular everyday program. 4-H Club members are enrolled in projects. If a girl, for example, is enrolled in a canning project, she should know how to use a pressure cooker properly, because otherwise she is likely to have accidents. A boy should understand that, unless he knows how to handle the collar on a calf, he may get kicked, he may become involved in an accident otherwise. And so when some of these specialists come out of the colleges and go down there to address these young folks, they talk safety as a part of the regular 4-H Club projects, because there are ele-

ments of safety, naturally, in their programs.

In addition, safety may be carried on as an individual activity in their regular conservation program. In many of the states they have a state-wide conservation program of wild life in general, although it has become much broader than that in many respects; in fact, most of the youth safety programs are broader than the farm safety program itself: they deal with home safety, highway safety, etc.

As for the club activities, there is a fine opportunity for cooperation there. For instance, the members of the various clubs will get together and decide among themselves to put up stop signs at the entrance to their farms where accidents are likely to occur; or they will agree to mow the weeds down at the corners where accidents may occur; or they may even go so far as to go around to the different farms and help clean up the loose boards with nails in them and other accident hazards that may be found on a farm.

Also, these individual club members do something else that is of the utmost importance; that is, they make a farm and home survey of the accident hazards inside the house—the loose rugs, the chimneys which, because of their condition, may cause a fire out on the farm, the steps in the barn, the loose boards in the barn, the machinery that is not kept in proper repair—thereby bringing the whole situation right home to dad and mother, who are responsible for the condition of things around their place.

Mr. Möhler has told you something about the scope of this situation, and I think the states he mentioned as doing a good general safety job are doing a fine job of this through their youth organizations. There are a few others who are doing some work along this line, but in general a great deal of work still has to be done.

Kansas, Minnesota, Iowa, Nebraska, Illinois, South Dakota and Maryland, this year for the first time, started a safety program with the cooperation of their State Highway Education Boards, in which they are doing some rather novel things, I believe, in addition to the regular demonstrations, and these things adapt themselves very well to farm safety. For instance, in addition to having a professional driver

come out to their state club meetings and show the boys and girls how to drive a car properly, how to signal properly, what the various highway signs mean, and then conducting driver capability tests, they are having playlets so that they can dramatize this situation. They also have public speeches, which again provide a good opportunity for dramatizing their program. They are also having posters and pictures, and in many states film strips and movie films are now being made available in order to dramatize this situation.

Through the Future Farmers of America the boys down in the State of Arkansas have the cooperation of the State Safety Council, and they are asking the farmers to put a red reflector button on the back of horse-drawn vehicles and to put some sort of a light on the back of other types of vehicles as they drive on the highways. The local chapters of the Future Farmers of America have documents which they take around to the farmers, asking them to sign pledges and to read the literature which they are given. Those who get 20 pledges, or more, are awarded a certificate; those who receive 50 pledges, or more, are awarded a medal.

May I emphasize again that I think there is a real opportunity for a greater job of education to be done in educating both the farm boys and girls and the parents through these youth organizations. We need more organization of the program, more cooperation, we need more emphasis on safety within the programs, and we need much more literature which is adaptable to rural situations.

CHAIRMAN MINER: I shall now call upon Mr. E. W. Lehmann, Professor of Agricultural Engineering, University of Illinois, Urbana, Ill.

Agricultural Colleges

E. W. LEHMANN (Professor, Agricultural Engineering, University of Illinois, Urbana, Ill.): I think the first things we need in promoting farm safety are certain definite goals, and when we think of those particular goals in connection with a safety educational program, we need definite objectives.

Mr. Seagraves, I believe, is the only Farm Safety Engineer on this discussion panel;

he is directing the safety department of an organization in this state of some 70,000 farm members, and we are trying to cooperate with him. We are also setting up a program as a part of our own definite educational work.

A lot of emphasis is being put at present on all sorts of conservation programs. One of the things that we have uppermost in our minds is soil conservation, and it seems to me that during the last four to five years we have developed a more definite public consciousness along that line than ever before. We will continue to expand that consciousness into all sorts of conservation, including the conservation of human life through safety programs.

In the conservation of our wild life, as has been suggested (don't think that I am getting facetious), we need some legislation where education has not been effective (which is, of course, where we usually need legislation). I am referring to the "wild life" that frequents our roadways at night, the kind of "wild life" that is resulting in a great many accidents. Too frequently we read in the papers about a group of boys and girls who were killed in an automobile accident. It is evident that when we come to a serious consideration of the handling of a machine we must realize that the principal danger is dependent upon the operator of the particular machine, whether it is an automobile or a corn picker.

Let me then say at the outset that our goals are to save life and property and prevent suffering and our objectives are: first, to reduce hazards and risks; and second, to develop safer machines, safer buildings, and to engage in safer practices.

Now, when our friends in the implement industry tell us that they can't find any more ways to make further safety improvements on the farm machinery which is being manufactured, they are simply saying they can't do it because there are certain other factors involved; but whether they have analyzed the situation to a point where they have come to the right conclusion, that is another matter. I believe they are continually looking for means of making safer equipment.

Frankly, I believe that every machine we now have is much safer than it used to be; that is, it is safer because it is operated with less difficulty and less effort, and more

guards are provided to protect the operator. Fewer accidents occur because the machine itself doesn't require as much attention. One of the phases of our work at the University is to design safer farm buildings.

Another definite objective we should have is that of discipline as related to safety. There is, for instance, the type of discipline that is needed in relation to children, who have accidents while riding these dangerous machines, if you want to call them dangerous. Machines are made dangerous by the people who operate them because they are careless and because they permit their children to ride on them. You have seen children standing on a barrow or on the back end of a tractor while dad wasn't paying very much attention. We need a type of discipline whereby it would not be necessary to caution folks that this or that particular machine should not be ridden on by children—the sort of discipline which will make a child in the yard sense the fact that it is a dangerous thing to be in the way when dad goes into the garage to back out the car or into the shed to back out the tractor.

In other words, we need that sense of discipline which will make one stay out of the way under circumstances like that. A man might look around, see that nobody is behind him, and then begin backing his car out; but he cannot know that his child is about to run across his pathway from some other position. So we need that orderliness, and we need these disciplines in the home and in connection with the various things we do.

The fourth objective is to develop the safety consciousness which we have all been talking about. This consciousness is dependent on the needs that we recognize, on the facts that we gather together, on the techniques that we develop, on the decisions we make, and on the things we put into practice.

Now, as far as educational work and an educational program are concerned, I shall mention just a few things. The individual must recognize his responsibility for safety. We cannot save the individual from accidents, unless he himself does something to prevent them from taking place. I have seen things here this morning about which folks have been cautioned. I won't embarrass anybody by mentioning just what it was that I saw, but I have seen things right here in

this room which I'm sure everyone of you will agree would not be considered safe, things which you gentlemen have probably told your children not to do on numerous occasions but which you have gone right ahead and done yourselves. You can see what it is that I am driving at; namely, that there are individuals who haven't that consciousness in their minds which tells them that they must be ever on the alert, whether they are crossing the street, whether they are going down the road, whether they are going around the house, whether they are working on the farm, or whether they are doing something else or going somewhere.

It is indeed very difficult to measure the worth of some of the lives that are destroyed as the result of accidents. Take a man like Glenn Frank, who died recently as the result of a fatal automobile accident; when a life like that is lost, from a national point of view, how can it be valued? What is the potential life of a child worth? It seems to me that we have to get the feeling in the minds of people that here is something that is worth conserving.

Someone has said that "the measure of civilization is our concern for human life." Certainly if that is a true measure, then the concern for human life in Europe today isn't very great. Probably it is an indication of the fact that our civilization is beginning to break down. Maybe it would be better to say that "the measure of Christianity is our concern for human life," because, after all, we think of Christianity as a way of life—the safe way.

Now, in trying to analyze this problem, we know that we need a lot of idealism in preaching any sort of program that is educational, and you must have goals and objectives that people are willing to accept. I think that there are four steps in such a program.

First of all, you must recognize the fact that you must have something which will motivate people's thinking and make them feel that it is important. When I have a class of students to instruct, for example, I want every person in that class to feel that the thing we are going to study and talk about is of importance to him. In other words, you have to motivate each person's thinking apparatus and make him feel that the thing you are telling him is of importance and significance to him personally.

The second step has to do with the collection of the necessary facts, but here, again, the mere collection of these facts is not the important thing; what is significant is the individual who is collecting those facts.

The third step has to do with the question of techniques. In any educational program where action is involved we have to develop techniques. What are the techniques of all these various things that the farmers do in connection with their various operations? Why are some practices more hazardous than others?

Finally, you must do something about it. This involves both decisions and action. In other words, unless the farmers and the people who are going to carry on a safety program and gather all the facts together do something to make safety effective, you will not be doing a very good job of education. The end result of safety education is to have safety, and it seems to me that we should keep these four points in mind if we are to successfully carry out our plan.

As far as our particular activity at the University of Illinois is concerned, I do want to mention one or two things. In the first place, we have a new course at our University, a course in safety education. It was organized a year or two ago. I should like to read a statement by President Willard from the Safety Bulletin of the Division of Highways of Illinois, issued on February 13, 1939, in regard to this safety education course. The statement is this:

"The tremendous loss of life and the truly appalling number of injuries resulting from automobile accidents is so startling in itself that no further comment is necessary in support of new and aggressive traffic safety programs." He then goes on to mention other facts about traffic safety work in connection with this particular course, and stated: "Manifestly, the University can reach directly only a very small fraction of our people, but it is offering a special course for prospective high school teachers so that they will be prepared to teach certain principles of safety to many people who are potential drivers of automobiles."

Not only will the safety problem as applied to automobiles be considered, but other interests in safety will come up in connection with this course.

We also have a fire college at the University each year. This fire college is a one-week affair where the firemen from all over the state come together and are given a certain type of instruction. This is in charge of the Department of Architecture. A further phase of our educational program is that practically every extension man and woman in the College of Agriculture of the University, in one way or another, pays some attention to the question of safety.

We also have an extension project that was organized about two or three years ago, and on the basis of this extension project there are a few of the farm advisors and their organizations in the counties that are now setting up a rather definite program in which they are attempting to carry out a lot of the ideas which have been expressed here today. These farm advisors in our state have a County Planning Committee, and this committee selects certain things on which emphasis is to be placed. Among other things they are emphasizing the importance of conservation, and when speaking of the conservation program they invariably mention natural and human resources. In other words, they do not merely take into consideration the natural resources but also the human resources of the state and the question of using those resources properly.

Now, I realize that, after all, the leadership in the county, which must be developed to make it possible to carry out these programs, must take the initiative of getting the program into their own county. I wish to call your attention to the work on safety being done by the farm advisor in Macon County, Illinois. Timely suggestions on safety are sent out monthly in the form of letters. I realize that we may be late in getting this sort of thing started. Maybe it should have been started 25 years ago. Some of us who have been in agricultural education work realize that years ago we were talking about terraces and contour farming. It was only after we had the "big pushover" of a national program that people developed a soil conservation consciousness and came to know about such a program.

Now, those of us who are interested in safety must obtain the interest of all those agencies and people who in some way or another are contacting farmers and are interested in their welfare. Certainly the dealers who sell farm equipment are interested

in seeing to it that their machines are not a hazard and are safe to operate. Certainly the lumbermen and those who sell the equipment that goes into the making of these farmers' homes and buildings are interested in their being safe. Certainly the rural service engineers who are instrumental in getting electricity into farm homes want the use of electricity made safe. Therefore, I believe that all of these agencies have a part in the "pushover" of an educational safety program, and it is certainly gratifying that we have so many of these representatives here today.

Accelerate the Program

CHAIRMAN MINER: Professor Lehmann, you have summarized the discussion and established the goals for all who are interested in farm safety programs in a splendid manner.

One of the finest things which has come out of this meeting is the realization that there are many different approaches to this problem. I am sure that as a result a plan will probably be established, with the help of the panel participants, to bring about the program that we have in mind.

Are there any questions?

E. J. BATH (Ohio Farm Bureau Federation, Columbus, Ohio): I just want to say that if, after hearing the splendid presentations from these men on the panel, those of us who are in a position of leadership and responsibility can't go back home and do a constructive piece of farm safety work, then we are just a bunch of chumps.

I want to express my personal gratitude to these men for what they have given us here. They have enabled me to go back to Ohio, not only with mobilized and crystallized methods of procedure, but with a high degree of determination to do something about this problem. If we return to our homes with such determination, then I can see no excuse under the sun why we can't start a program that will help to greatly reduce the number of farm accidents.

CHAIRMAN MINER: I am glad that you received some help this morning. But we need your help in working out this program, we need the assistance of every one of you in order to build up this program.

MR. SEAGRAVES: I would like to suggest that this group offer a resolution to the National Safety Council, to the effect that those of us who are interested in farm welfare appreciate the time and effort which have been devoted to the upbuilding of this

Agricultural Safety Session and that the National Safety Council be urged to accelerate the program which has already been put into motion.

... The motion was regularly seconded and carried.

ADJOURNMENT

Building Maintenance

FRIDAY MORNING SESSION

October 11, 1940

The session devoted to a discussion of problems in building maintenance convened with Chairman Frank M. Whiston, Manager, Pittsfield Building, Marshall Field Estate, Chicago, and Vice-President, National Association of Building Owners and Managers, presiding. Assisting him as Co-Chairman was W. Dean Keefer, Assistant Manager, Safety Engineering Department, Lumbermens Mutual Casualty Company, Chicago.

The session was planned as a Panel Discussion, the Problem specifically being as follows: "What are the Common Causes of Accidents in Public Buildings and How Can They Be Corrected?" Chairman Whiston opened the session by presenting to the audience the members of the Panel, as follows:

Frank Morris, Assistant Vice-President, Liberty Mutual Insurance Company, Boston, Mass., who was selected to make a formal presentation of the problem.

Will Cooper, Consulting Engineer, Glenview, Illinois.

E. R. Granniss, Director, Industrial Engineering Division, National Conservation Bureau, New York City.

Rex E. Hieronymus, General Superintendent, Aldis & Company, Chicago.

Roy L. Hunt, Safety Engineer, Public Works Administration, Federal Works Agency, Washington, D. C.

K. A. Lane, Personnel Manager, Hotel New Yorker, New York Municipal Airport Restaurants, New York City.

George Peck, Personnel Manager, Michael Reese Hospital, Chicago.

F. W. Rodenheber, Manager, Louisville Safety Council, Louisville, Ky.

The Chairman then called upon Mr. Morris to present the Problem.

Why Should We Prevent Accidents in Public Buildings?

By FRANK MORRIS

Assistant Vice-President, Liberty Mutual Insurance Company, Boston, Mass.

It's an easy thing to present a problem, but it takes a crew of experts to solve it. Why should we prevent accidents in Public Buildings? Because people get hurt?—not primarily. That might motivate us in a plant where we feel a responsibility to our neighbors, our fellow-workers, but that motive would hardly stir us to action with the public because we don't have any special feeling toward the public as people.

We read over the coffee cup that John Smith got hit by a truck, but we are only mildly interested because we don't know John, so we say, "Too bad," and start for the sports page, but our eye catches another line—"The truck is owned by the Blanket Laundry Company," and right there we become intensely interested, for we happen to

be working for the company that insures this Blanket Laundry outfit. We wonder if it was a new driver; had our safety program been effective; what were the road conditions; and so on, including a thought perhaps that this would hurt the Blanket Laundry trade and that it would also increase their insurance rate.

If you fall down stairs in the Hotel Stevens, I'll be interested in the cause and the cure because that will help us to prevent falls on hotel stairs everywhere. However, if you should fall down stairs in the Palmer House, I'll admit that I'd be much more interested because my company insures the Palmer House.

So in back of any humanitarian desire that we may have to make a terrazzo lobby

skidproof on a rainy night for the inebriated convention delegate who slides in at 3:00 A.M., we have the concrete fact that accidents cost money, and although we have no neighborly or fellow-worker feeling for this "stew" at 3:00 A.M. because we don't know him, but we do know the hotel owner, in fact we insure him, and we know that if that man or that woman slips and breaks a leg, our policyholder's rates will increase—needless expense will be incurred.

The same goes for a store or office building—any public liability hazard. So there is one slant on this proposition—if we can solve the problem we can save money.

Although the insurance rates for Public Liability can be jockeyed around considerable, in general it can be said that if a building's P. L. experience is bad, its P. L. rate is high. In short, it pays dividends to make the building safe. Aside from the direct insurance costs, you have the loss of good will and often the loss of patronage that follow an accident in a public building. The man who trips over a rug in a hotel hallway is generally a man past middle life, wearing bifocals and without too much to do, which gives him a lot of time to raise trouble about the rug. If a young fellow had fallen there, he wouldn't have been hurt and he'd probably be too busy to mention it.

In a department store if an elevator slides from the first floor to the basement and touches the bumpers, the ten occupants of the elevator have ten stories to tell by the time they get home, and some of them have the elevator dropping from the tenth floor. Among the ten you will be certain to find the matron past 50 who admits she's passed 30. She has three chins, weighs 75 pounds more than she should, she wears earrings, and invariably—if the elevator slips the least bit—she has water on the knee. On the other hand we have people who really do get hurt and suffer and people who honestly think they get hurt but don't and really suffer nevertheless, and people who get hurt and dishonestly think they suffer, not to mention the people who dishonestly get hurt. Those are problems for the claim adjusters, however—and the psychiatrists and courts.

Our problem is how to remove the P. L. hazards in Public Buildings.

Approach Must Be Different

In a plant dealing with people in whom the employer has a direct interest—and we

can enlist his interest on two counts: in the well-being of the people who make his business and the saving of insurance overhead—we can do a bit of enforcement, some engineering and much education, probably 5-10-85.

In maintaining safety—removing hazards from a public building—our approach must be different. True our analysis of accidents and the discovery of the remedies is the same procedure, but when it comes to applying the remedies we find at once that we have quite a different problem than in a plant or with a fleet of trucks.

Let's talk for a minute about the three E's of Safety! Enforcement—Education—Engineering.

Enforcement

Enforcing—can we do any enforcing?

We all know the difference between controlling accidents among a group of commercial-vehicle operators and among a like number of pleasure-car drivers. In the one we have organization with supervision, and a community of interests—in the other it is much a case of every man for himself; if everyone else drove as we drive we wouldn't have any traffic problem—that's what we think. The only other drivers we watch out for are the women drivers, and that is not because chivalry is still alive, but because in spite of her hand signals, if any, God alone knows what she will do.

We are confronted with a somewhat similar problem with regard to the control of movement of the public in our office buildings, hotels, and stores. We can advise them by signs or by word of mouth—WATCH YOUR STEP—but we can't do anything about it if they don't. From some of the accident reports that you and I have seen, we marvel that human nature is so perverse. We put up a sign—NO TRESPASSING—and it seems to invite people to trespass: their curiosity is aroused and they must see what there is about the place that caused someone to put up the sign. And then they get hurt. In my state—because of some court decision, I presume—all such signs must read—NO TRESPASSING—POLICE TAKE NOTICE. We don't have signs reading—30 MILES SPEED LIMIT—POLICE TAKE NOTICE—or—NO PARKING—POLICE TAKE NOTICE—and the degree of our problem of enforcement is indicated—POLICE TAKE NOTICE.

So we can toss the "enforcement" leg of our three-legged "E" safety stool out of the window. A stool with two good legs isn't too bad, but you can fall in two directions even with two legs left—Education and Engineering.

Education

Do you see that sign over there on the fence reading—WET PAINT? Now don't yield to that impulse to go over and put your finger on it to prove that the sign is wrong, but just stand here and watch the men, women, and children who step up and get paint on their fingers. The public doesn't believe in signs. So we can't depend on "education" and we can toss that leg out the window also—because people as the public aren't interested in your opinion of their ability to take care of themselves. Your wife tells you to wear a topcoat today as you are going down the front walk, but I guess you know that a little chill in the air isn't going to bother. I guess you can take care of yourself.

Engineering

So we have one leg left—Engineering—and we can do fairly well with this one-legged stool if we make certain that it is as good a leg as it should be. You can fall in any direction, but strange as it may seem we realize that fact and—we just don't fall. Depending on two-legged stools is quite different—we can fall only in two directions, but we think those are the safe directions and over we go.

In short, we must make our public buildings as safe as can be so that any reasonable person using due care will not be injured. As I see the problem, we cannot depend on supervision or on educational means—they can be helpful in a measure, but we cannot put too much reliance on them.

Make the building safe and by constant

inspection and good maintenance keep it safe in spite of a public which, collectively, is not interested.

A year or so ago I was downtown in Cincinnati waiting for transportation out to the airport, for I had to fly to Washington to get to a certain city in West Virginia that night where I was to give a safety talk to the employees of the one large industry in the town. They had made a fine safety record and I had to go there to tell them how good they were. While I waited in front of this hotel, there was a great commotion in the next block, a sudden crowd, a clanging ambulance, motorcycle officers and so on. When the crowd began to thin out, I went up to discover the cause of the excitement and I found a broken store window and considerable blood on the sidewalk. A young mother had stopped to look at a dress in the window, and at that very second a stone loosened from the coping five stories above and crushed her skull, killing her instantly.

I thought that my audience that evening would be interested in the contrast between the dangers of a large city and their safety in an isolated town, but they were not. Cincinnati was too far away—it was in another state and even if they had known where it was they would have doubted if anyone could come that far in a day. Besides, there were no five-story buildings in their town.

In traffic safety we're drivers a part of the time, wishing the pedestrians would keep out of our way; and then as pedestrians we expect the autos to wait till we get across the street. As safety engineers dealing with this problem in hand we can see where the public should do thus and so, but as individuals of the general public, you and I are like everybody else; we are introverts—"it can't happen to me." And so our plans for safety in public buildings must be predicated on little or no help from the public.

Panel Discussion

CHAIRMAN WHISTON: Mr. Morris, I wonder if you have some suggestion as to where we should start with the public in our safety program?

MR. MORRIS: I have no definite idea of where to start with the public. The problem is a tough one. I hope that we can

get from this audience a lot of suggestions. You safety men are on the firing line, and you probably know a whole lot more about the subject than I do.

ARTHUR BROWN (Palm Olive Building, Chicago): It occurs to me that probably the greatest problem we have has to do with

two things. First, our elevators; and second, our swinging doors. Has anyone had any experience with swinging doors—for example, has a device been discovered to minimize catching one's fingers between the doors?

CHAIRMAN WHISTON: I understand there are some double-acting doors which have a sort of rubber bumper inserted on each side of the door where it hits, and as a result, the softness of the rubber minimizes the hazard. Other people have put a bronze raised edge on a bronze door and a piece of wood on a wooden door, so your fingers don't get over the edge.

Mr. Peck, you represent a hospital organization. I assume you are very interested in seeing that doors are properly taken care of.

Start Safety at the Door

GEORGE PECK: We are, but doors are not our primary problem. With reference to Mr. Morris' statement that you should begin with the public, I would like to flip a lateral pass to Mrs. LaBelle, on my right, who is our Executive Housekeeper at Michael Reese Hospital. She is convinced that you can start safety for the public just inside the door, that is, regarding slipping on floors and so on. Will you take on from there?

CHAIRMAN WHISTON: Go right ahead, Mrs. LaBelle.

MRS. ALTA LABELLE: Mr. Peck asked me to sit in here this morning to talk about slippery floors. I am a little dubious as to where I should start, because I have never, to my knowledge, had what I could call a really slippery floor. During the six years I have been at Michael Reese Hospital, we have had only four slipping accidents, and they have all concerned our personnel. No serious damage occurred, nothing more serious than a soiled uniform.

Some of my boys say it is just the sub-debs who fall on these wet floors because they do not observe that they are wet.

Mr. Peck says I should start just inside the door. I believe if everyone would have ample and correct mats just within each doorway, we wouldn't have any slipping problems, because most of our problems are from wet feet and not slippery floors. I find that by having a double mat system—one in the vestibule and one just inside—

by the time John Q. Public or Mr. Accident gets inside, his feet are dry and there is no danger of slipping. As far as slipping within the house, it is all a matter of putting up barriers and that sort of thing.

A. F. FLANIGAN (Pure Oil Building, Chicago, Ill.): We have asphalt tile in quite a few places throughout our building, and we have done an untold amount of experimenting with different waxes on the market. If anybody has any helpful suggestions as to maintaining the proper appearance of asphalt tile floor, I would certainly be interested in hearing them. I have had a lot of experience, some good and some bad.

CHAIRMAN WHISTON: Have you had any slipping accidents?

MR. FLANIGAN: Yes. I have always contended that the wax people are barking up the wrong tree when they talk about waxes for tile floors. I believe they should get something that does not have wax in it; then half their troubles would be over. I don't have any trouble with our terrazzo floors or the granite. Most of our trouble is with asphalt tile.

MRS. LABELLE: Mr. Flanigan, I have quite a number of divisions with asphalt tile in them. We use wax very sparingly on them—just a very thin film, with a good buffing—and we have never had a slip case. We do that in the patients' rooms in the children's hospital, where we have children on crutches, wheelchair cases, etc., and never had a slip case.

K. R. JENSEN (Baird & Warner, Chicago, Ill.): We have found that putting on wax sparingly is sometimes quite difficult. The building staff seemingly thinks that more wax makes for easier work. We worked around that by diluting our wax. They don't seem to know it is diluted, and they can put it down in any quantity and the amount of wax put down is very slight. We cut down our slipperiness about 80 per cent.

CHAIRMAN WHISTON: That is interesting.

Mr. Legge, an exhibitor, is here, and he is an expert on floors. I wonder if he would tell us what he might do in a case of that kind.

WALTER G. LEGGE (Walter G. Legge Company, New York City): I don't know of any wax that can be successfully used on

a tile floor. Some waxes may be non-slip over a short period of time, but after they are down for about two weeks, they become slippery, whether applied thinly or heavily. That has been my experience.

CHAIRMAN WHISTON: Mr. Legge, have you a wax substitute?

MR. LEGGE: Well, we have been rather successful in producing a compound that is used on asphalt tile floors in hospitals and office buildings. It is a matter of application there, but first we must get the floors in condition by eliminating all previous wax from the floors in order to apply this correctly. After that is done, you will get good results from it.

Then, of course, after the material is down, there is a method of maintenance which is giving good results.

MRS. LABELLE: What is this material?

MR. LEGGE: It is a composition of gums.

F. W. RODENHEBER: We have to start with the public. I know, for instance, that we have fallen over the rugs in this hotel not once but several times during the past week. I notice that some of the rugs are still lapped. There should be some discussion this morning on why the supervision or inspection of properties is delegated to people who won't take care of them, and why someone higher up won't go to the trouble of making these inspections and having these corrections made.

Start with Ourselves

W. W. FLYNN (Aetna Casualty & Surety Co., Des Moines, Iowa): I think our problem, instead of starting with the public, is to start with ourselves, and with building maintenance. I think that more rigid supervision of building maintenance is going to cut down on accidents as far as the public is concerned.

CHAIRMAN WHISTON: We have a specific instance here this morning regarding the carpets in this hotel. Does anyone have anything to suggest with reference to carpets and rugs that curl and roll on the end?

K. A. LANE: In the Hotel New Yorker we have had considerable difficulty with problems, such as are faced in the Stevens here today, with large groups in the house.

We have attacked the problem in this manner: We have instructed all the bellmen in the lobby, all the assistant managers on the floor, or any other employee who has occasion to be using the lobby or the public rooms, hallways or banquet rooms, to be particularly vigilant in watching for curled rugs and mats. I mean mats that we lay down on rainy days.

I believe the solution of that problem is to attack it from that viewpoint. We have had considerably better experience since we have made those employees accident-conscious. That does not entirely solve the problem, because after all, the human element is there, but I believe if you impress safety upon the people who are working in your public place, especially in a hotel, you will go a long way toward solving the problem. For instance, in our hotel, if a bellman is walking down the lobby and sees something lying around, he is instructed to pick it up. If he walks by it and the bell captain notices it, the bellman is reprimanded for not reporting it.

E. R. GRANNISS: Mr. Lane, is there any advantage, each time you put down a mat, in reversing it so the curled edge will curl down the next time the mat is laid? I think there is an advantage there with rubber mats. As far as textiles are concerned, I don't know.

MR. LANE: There is an advantage in that, but if you lay a mat down in a hotel lobby, especially if it is a busy hotel, it will be bound to curl after some constant use.

Another solution is to have your carpets constructed so you can pick up that center piece and lay the rubber mat in its place. Of course, it will cost you money, but that is one solution—to have the mat laid to fit right in, so you can take the carpet up on a rainy day.

W. DEAN KEEFER: I would like to ask Mr. Lane a question. He says he trains his employees to be on the constant lookout for bad conditions. In addition to that, do you have any inspection committee that goes around at regular intervals, checking up on your employees and conditions, making sure that no one has missed the thing that might cause an accident?

MR. LANE: Yes, we do.

MR. KEEFER: Who is on that committee?

MR. LANE: That committee consists of eight department heads, who meet regularly once a month. Regular inspection trips are made weekly by the medical department and myself, and about once a month we are accompanied by an insurance company engineer.

MR. RODENHEBER: You say you delegate this to someone. Evidently that problem is delegated here, but still hasn't been corrected. Now why don't we—who are interested in accident prevention in buildings—see that those things are taken care of correctly?

MR. LANE: Let's get down to cold facts: Somebody in authority is not on the job; they are not watching. When we report things to the management, they are followed through, and are taken care of, because we know that is the only way you can have accidents prevented. The human element is a big factor. You can lay down all the rules and regulations you want, and have all the committees you want, but if someone in authority doesn't follow up it isn't going to be done.

CHAIRMAN WHISTON: Mr. Pendleton, of the Massachusetts Safety Council, is in the audience. I wonder if he might tell us how they are educating the public.

RALPH W. PENDLETON (Assistant General Manager, Massachusetts Safety Council, Boston, Mass.): Well, on this question of mats, I think there are some mats with metal ends tapered and fastened to the mats, which prevent the mat from curling.

In answer to your question, "What are we doing to educate the public?" I think sometimes we are educating the public by making them more claim-conscious by not doing enough of this supervising and taking care of the engineering aspects before they become claims. We put up signs warning the public to watch out for this and that, and the public thinks, "Well, here's a possible way of getting hurt." I think I see a growing consciousness of the possibility of a little easy money, and I think that we should watch ourselves very carefully about spreading that sort of education. I think it should be done behind closed doors, in our own management meetings, etc., such as you have done in New York with your hotel group.

MR. MORRIS: I had in mind that Mr. Pendleton might tell the audience about all

the newspaper releases and the thousands of bulletins they scatter all over the state of Massachusetts. Probably they are doing the best job on educating the public of any organization that I know.

That is one good way of getting our message across to the public, because a local safety council cannot be accused of having any selfish interests, like an insurance group, for instance, or a manufacturers' association. A local safety council is supposed to be non-partisan, and they can do a wonderful lot to educate the public, and the Massachusetts Safety Council is doing a whale of a good job in that direction.

CHAIRMAN WHISTON: Many times, in educating the public, you do it indirectly by educating your employees. For example, take your elevator men. If they are properly educated, you will be surprised how the numbers of accidents diminish as a result of constantly bringing safety factors to the attention of employees.

MR. GRANNISS: I think it is time somebody said a good word for hotel employees. I have seen employees in this hotel standing over loose rugs and warning people to walk around the particular spot where they might trip. Somebody has done some work with the employees here. While that doesn't correct the rug condition, certainly there is a possibility of good will on the part of the employees toward the public.

CHAIRMAN WHISTON: We adopted the thought of giving a cash award each month for the best suggestion made. Employees ran out of suggestions after five or six months.

JOHN S. SHAW (Hercules Powder Company, Wilmington, Delaware): Has anyone had any experience with carpets on an asphalt tile step-up?

Male Vs. Female Accidents

DELEGATE SHROONER: We had a case in the Edison Building hall in Chicago. One-half is rubber tile and the other half is marble. When we first put the rubber down, there was a little trouble for about ten days, due to the newness of it, but we gave close attention to the waxing. Thousands of people have gone over that little joint and so far we haven't had an accident.

I might ask a question. What is the percentage of women having accidents, compared to men; and what kind of shoes do they wear; and how do they walk when these accidents happen?

CHAIRMAN WHISTON: In Philadelphia, one large building, during a period of seven years—1933 to 1940—had 62 accidents, 26 men and 36 women. The largest discrepancy occurred in slipping on dry marble floors, with one male to ten females. On the other hand, considering those pinched in elevator car doors, there were 14 men to 2 ladies. In total, the ladies had a ratio of 2 to 1 over the men.

MR. SHROONER: Concerning this asphalt tile, the wax people themselves have admitted to us that they have their biggest headache over educating people, including the superintendents and managers, but particularly the people who actually do the work, to use the proper method of applying the wax. The wax people have told me without hesitation that they are far from curing slippage. Of course the girls who have these high leather heels with brass nails in them will slip on anything. Most of our accidents were caused by people being in a hurry, and through some slight unevenness in the floor.

Concerning revolving doors, I would like to know if somebody has a governor that will prevent a revolving door from being pushed very quickly, so you don't push the person ahead of you out on the street or sidewalk.

MR. GRANNISS: The speed of revolving doors is conditioned very largely by the adjustment of the rubbers on the bottom—that is, the frictional element determines the speed of the door. It is a matter of constant adjustment to keep the door so it will push at the proper speed.

You asked for information on the amount of slippage by women, especially those with high heels, and those with high heels who were hurrying. Suppose we did find that out. What can we do about it? We can't keep the women out of hotels, or stop them from wearing high heels, or stop them from hurrying.

MISS MARIAN TELFORD (Director, Education Division, National Safety Council, Chicago): What about the so-called "wedgies" solving the problem? I understand "wedgies" are in danger of going out

of business because the men don't like them.

But I want to ask a question that comes to us rather frequently. What is the proper treatment of a floor in a school gym, that is used as a gymnasium all week long, and then used as a place to dance on Friday nights; but on Monday morning must be used as a gym again?

Floors in the Gymnasium

CHAIRMAN WHISTON: I presume your problem is the slipperiness of the floor on Monday morning, is that it? Can anyone answer that question?

MR. GRANNISS: I don't know whether it is a good thought or not. I would suggest that you put suction shoes on all the children in the gym.

K. R. JENSEN: I believe borax is used on dance floors.

MRS. LABELLE: Couldn't it be cut with steel wool and a rotary machine?

R. L. HITE (Franklin Research Co., Philadelphia): Where you get into a penetrating seal-type of finish on a gymnasium floor, quite a number of rubber burns occur. We found it best to use the bakelite type of seal, which gives you surface covering; and then use borax for dancing, because it is too much of a problem to wax it just for dancing on Saturday evenings and then have to take it off again so that boys won't fall down the next Monday.

MR. RODENHEBER: I can appreciate Miss Telford's question. As a general rule these floors are ordered, not with the idea of getting the best, but buying from someone who expects to be favored with an order. We don't always get the approved type of flooring.

It isn't just the waxing that gives us trouble. It is the fact that someone buys a fancy floor for a school gymnasium because they have a certain amount of money to spend. Possibly the approved type of floor would be a great deal cheaper for a gymnasium.

We have recently built seven new junior high schools, and all seven have wonderful gymnasiums. They are best suited for balls rather than to be used as gymnasiums five days out of the week. I think that is what Miss Telford is talking about. She knows if she stayed there and scrubbed that floor

Saturday and Sunday, it wouldn't be corrected by Monday morning. I think she would like to have an expression from this group that we don't have hardwood floors in gymnasiums.

MISS TELFORD: That's right.

CHAIRMAN WHISTON: Based on your experience, does anyone have any idea of the kind of floor you think appropriate?

ROY L. HUNT: I don't have any experience, except that we had somewhat the same trouble with the Interior Building in Washington. They made a recreational area there to be used for games. They had some dances, and had trouble with slippery floors. They went back to the primary principle that it was a recreational area, and danced the best they could on it without any permanent waxing or anything of that nature, because we had too many accidents in the gym work. I think that if a floor is designed for gym work and has to be used for dancing, they should probably make the best of it under the conditions of the floor which are suitable for the basic use. If you can't afford to wax it for dancing and then take off the wax, I think the safety of your pupils is the primary thing to consider. The inconvenience in dancing should be a minor consideration.

ARTHUR EDWARDS (Chicago Park District, Chicago, Ill.): We have different types of floors in our gyms throughout the Park system. We refinish them differently, according to the use they are going to get. In many cases, if they would just put on borax sparingly, it would solve the problem, as it comes off very easily. That is what we do in all our gyms which are also used for dancing.

Accident Prevention Set-up

CHAIRMAN WHISTON: Getting back to the hotel safety setup, Mr. Cooper, would you care to indicate what sort of setup you would recommend for accident prevention in a hotel?

WILL COOPER: Well, I have kept quiet while this discussion was going on about slipping. It seemed to me that we were getting away from the subject of this meeting, in trying to give prescriptions for particular conditions. We could go on endlessly, because there are endless conditions to meet.

Back in 1926, when this hotel was finished, we joined the National Safety Council, and we were the first hotel to go into organized safety work. The job was turned over to me, and none of us knew anything about it. The safety convention that year was the first large convention at the hotel, and I believe Mr. Stevens just wanted to make a gesture of good will toward the Council by joining it.

However, when we looked into it, we found that the accident rate in hotels was worse than it was in the big steel mills in South Chicago. It was a good deal worse than it was on some railroads, and, next to department stores, I think we were classed as one of the most hazardous risks that the insurance companies had.

We had no precedent to go on, so we started out along original lines. To sum it all up and make a brief story of it, we held each department head responsible for the accidents that they had, which included not only the public but the employees. It was very simple. The whole job was done by myself and our head nurse in the medical department, who is still here with the hotel. I wish I had her down here today, because she has had as much to do with it as anybody.

Whenever we had an accident, we simply made a brief record of who it was, where it happened, and how much it cost. In a few months we were able to classify where the most accidents occurred, by departments. We got those department heads together and showed them the records. At first we would get an answer like this: "I know, I'm very sorry about it, but that was an accident; you can't help it; nobody is to blame. It just happened." Well, after we had heard that two or three times, we said, "No more about that. You must find out the right way to do these things—that's all there is to it. We will be glad to help you, but you must stop these accidents."

"It is simply a way of operating," we said, "a detail of operation as to whether you operate right or wrong. It stands to reason that if you are doing things so people get hurt, you aren't operating the right way. If your head housekeeper and you know your jobs, you ought to know the right way to operate."

Well, it was pretty straight talk, and some of them were very much crestfallen about

it. But at the time we started this program we were paying the insurance company 65 cents per \$100 of payroll. We were paying a public liability rate in just about the same proportion. In about two years, however, we reduced the employers' liability rate to 15 cents per \$100 of payroll, and the public liability rate went down accordingly.

We had no safety department. We had no safety committee. We had no safety meetings. We never told the employees that we were having safety meetings, and never got them together or talked to them. We put it absolutely up to the individual supervisor, and we got such good results that I think nearly all of the large hotels joined the Council as a consequence of that. We got the Waldorf, the Statler chain, Mr. Hitz' hotels, and I don't know what others since I left. Did you ever get a regular hotel section started, Mr. Keefer?

MR. KEEFER: No. We did in New York City, but not on a national basis.

MR. COOPER: Anyway, how many hotel members does the National Safety Council have?

MR. KEEFER: About a hundred.

MR. COOPER: Now it was all done simply by holding individual supervisors down, as I have said, to the argument that if they were operating right, they wouldn't hurt anybody.

While I am on my feet, there is another thing that I would like to bring up here. It will probably hit a lot of you people like a bombshell. You insurance men are mainly responsible for the public accidents. How do you like that?

MR. KEEFER: I don't like it.

MR. COOPER: Back in 1927 or 1928, we had a convention in New York, you will recall, and we had a meeting on elevator shafts. How many insurance men were there? They just about took charge of the meeting. How many here are representatives of casualty companies? (About 20 raised their hands.)

I'll tell you why I make that statement. I have observed—not only in this hotel but with another large corporation with which I was connected for five years—that the public and "snitch" lawyers are encouraged to bring malingering and fraudulent claims because you people insist on paying nuisance values to them. Now of course a large num-

ber of your policyholders encourage that, as they don't want notoriety.

I can give you one concrete example of it right here. We had a snowy day, with a big convention on here, and a lot of snow was tracked into the vestibule. The secretary of the association holding the convention came in, she had snowballs on the bottom of her feet, and she slipped and fell in the lobby and sprained her ankle. Mr. Stevens told me to see that she received every care. We took her upstairs and gave her a room and fed her, and did everything in the world for her. I don't know how much it cost us, but the insurance company said we would have to stand the food and the room, and they settled with her for something because of the accident, although we came to the conclusion afterwards that there were natural conditions which we could not guard against. I didn't think then, and I don't think now, that the woman had any just claim against us at all. We paid as a matter of policy.

A great many of these "snitch" lawyers—to use the vulgar expression—are not competent to go into court and fight a case. If they know, when they get one of these cases, that they are up against something that they'll have to fight for, they'll drop it. One of the best things that any insurance carrier or any insured individual or corporation can get, I think, is the reputation of being tough on those cases. Of course there are cases where the injured person is entitled to some kind of settlement, and in those cases it is proper to go around and offer them what is right, but pay no nuisance claims.

Accident Claims Experience

CHAIRMAN WHISTON: Mr. Grannis, have you anything to say regarding the remarks of Mr. Cooper?

MR. GRANNISS: Undoubtedly insurance companies have been somewhat to blame for payment of claims which should not have been paid, or at least should not have been added into the actual experience of the hotel. In New York we recently had an increase in public liability rates. They have gone from 35 up to 55 cents per \$100 of payroll. That is quite an important increase in five years. I think they have gone

up even farther since Frank Morris got those figures.

One important reason for the increase is the payment of claims that have not resulted from accidental injuries, or at least from conditions for which the hotel was responsible. We know of many such cases; yet the insurance company is not altogether responsible or even half responsible for the payment of those claims. For instance, when a customer comes into a hotel and suffers some injury while attending a banquet, the hotel will usually insist on payment of a claim of that kind.

For example, there was a banquet in one of the main banquet halls of a leading New York hotel. One of the ladies, a very large woman—imbibed much too frequently, and two of her male companions decided they would put her in a cab and send her home. With a man on each side, she was walking through the lobby, talking rather wildly and gesturing, and as a result, she slipped from their hands and sat down heavily in the middle of the lobby floor. I don't think she was hurt very much, but certainly her dignity and clothes were hurt considerably. It happened that she was the wife of the man responsible for bringing this large banquet to the hotel. As a result, the hotel wanted to do everything they could to pacify the lady. Believe it or not, \$9,000 was paid for that claim, because the hotel was afraid of losing that banquet business.

It has been said that the payment of these claims is a matter of claim settlement by the courts. They are, but only to a certain extent. They are largely the responsibility of the hotel management in the making out of the preliminary report on an accident. I would like to read you something very quickly, if I may. This is from a pamphlet put out by the American Hotel Association with the cooperation of the insurance companies down in New York. Here is what they suggest be done by the hotel employee when he investigates an accident:

"Be courteous.

"Don't argue.

"Don't discuss defective building or equipment conditions.

"Don't talk about insurance or claim settlements.

"Don't attempt any first aid yourself. If need for medical attention is apparent, call the house physician. If injury is slight or

non-existent, don't ask for name or address, but fill out accident report form as far as possible.

"Attempt to learn if personnel involved in accident committed any unsafe act or had any physical infirmity. Note bifocal glasses, run-down heels, alcoholic conditions, etc., and put in report.

"See that house manager or assistant is notified immediately."

We have done far too much in our public buildings and hotels in encouraging claim payments. If a hotel wants to settle for somebody's dignity, that certainly is their business and they should be allowed to do it, but it is unfair to all hotels to put that in as a part of their accident experience account. It only boosts up the rate for the whole hotel industry, and really something should be done about it. The matter is more in the hands of the hotel management than in the hands of the insurance people.

MR. COOPER: I think I stated that the insured were not altogether blameless in that matter. But I think it is the duty of the casualty companies to educate the insured on those things.

MR. GRANNISS: I think so, too. There have been flaws on both sides, but that has been the major reason, in my opinion, for the increase in public liability rates for hotels.

Door Problems Again

DELEGATE: I wonder if I might go back to the question of revolving doors. One gentleman asked a specific question to which I think our company has found the answer.

We had quite a few accidents with revolving doors. There is a definitely safe governor on the market that can be put on revolving doors. We have had them on our doors for two years, and we haven't had an accident during that time. Prior to that, over a period of ten years, we averaged from 10 to 15 accidents a year.

It isn't a question of setting the wipers up tight, because if you do that, you get some slight frail person—when you have two of your leaves turning—who just isn't able to push the door around. If you loosen the wipers without some other mechanism, the door will spin.

We made some tests in conjunction with

our insurance engineers, and we determined that the absolute safe maximum for a revolving door was about 15 revolutions per minute. A better figure, we found, was around 10. This governor is so designed that you can set it for whatever number of revolutions you want. You can push it with your little finger until you get it up to that 10-revolution speed, and then it will slow down and you can't push it any faster. It can't be shoved in a hurry, because if you do, it sets. It definitely has solved our revolving door problem.

CHAIRMAN WHISTON: Does it collapse under pressure?

DELEGATE: Yes, it will collapse if you try to push it too hard. It has the safety chains on it, but it takes considerable more pressure than is sufficient to push it around with ease in order to do so. In other words, they are panic-proof.

MR. HUNT: You have to push two at once to have it collapse, don't you?

DELEGATE: Yes. You have to have two people trying to go different ways at the same time to really make it collapse.

CHAIRMAN WHISTON: What type of building?

DELEGATE: It is a public utility building, and we have possibly four or five thousand people in or out of these revolving doors every day.

CHAIRMAN WHISTON: That is very interesting. How long have you had the device?

DELEGATE: Two years, and we haven't had a reported accident.

With this device, we can set the wipers so they just barely touch, and there is less chance for children to get their fingers pinched because there is not much pressure and the felt part will bend over.

CHAIRMAN WHISTON: In winter time, of course, you must have the wipers tight.

DELEGATE: Just enough to prevent the seepage of cold air into the building. We also found we saved money on the cost of wipers because, not being set so tight, there is not much friction.

Elevator Problems

CHAIRMAN WHISTON: Does anyone care to discuss the question of elevators?

J. P. O'HARA (E. I. du Pont de Nemours & Co., Richmond, Va.): I don't know whether anyone has considered the problem of elevators in the same way I have; that is one of the things I came here to find out. We have several 2,000-pound elevators in an industrial plant. We have recently set up a system of inspection and maintenance, with one inspection every month by our own men, and one inspection every year by the elevator people. I wonder if anyone could tell me if that frequency is too great or if it is not enough?

Also, on the inspection of load cables, what has been the practice in the past, or does anyone know about the replacement frequency of cables on a 2,000-pound job? We have one elevator on which we are replacing the cables every ten years, and another elevator about every six years. I would like to know what a good figure would be on replacement of cables.

CHAIRMAN WHISTON: Mr. Hieronymus, you should be able to tell us something about that.

REN E. HIERONYMOUS: It depends upon the miles traveled, I think.

ARTHUR BROWN (Palmolive Building, Chicago, Ill.): How fast do your cars run?

MR. O'HARA: I can't tell you. We have a report that is about two pages long which gives the speed and feet per minute. I can't tell you the size of the cables, but they are 2,000-pound industrial elevators.

MR. BROWN: If the cars are alike and your sheave wheels are alike, the cable life should be alike. We very definitely base the life of our cables on our low-rise cars at about 20,000 or 25,000 miles per car, and if we don't get that, the cable companies are going to make an adjustment. On our high-rise cars, we should run 30,000 or 35,000 miles, and I have never had any difficulty in getting adjustments if they do not.

If your cars are in the same physical condition and they have the same loads and same speed, your cable mileage should run close to the same mileage per car. I can't see any difference, unless there is a physical condition on the sheave wheels.

MR. O'HARA: Do you have any thoughts, sir, on the frequency of the inspections we are making?

MR. BROWN: I can't say on yours. Our

inspection just never stops. I don't want to advertise anyone, but we have constant elevator service, and at least every three months the elevator mechanics must come to me with a report on the condition of the elevator cables. How often did you say you had them inspected?

MR. O'HARA: By our own man, once a month; by the outside vendor, once a year.

MR. BROWN: How many elevators have you?

MR. O'HARA: We have four 5-4 jobs and three 2-4 jobs. They are all 2,000-pound jobs.

MR. BROWN: I would say it was deplorably low.

MR. O'HARA: Do you mean it is not enough or too much?

MR. BROWN: It is not enough. Ours is a public building, and in our case the elevators are gone over every day. I have two mechanics on 12 elevators, and they go over these elevators every day. It is true we have a terrific traffic in our elevators, but I would say that once a month is not enough for any elevator. If I were there, I would insist they be gone over at least once a week.

MR. COOPER: I can't understand how anybody operating elevators at all would limit an inspection to any definite time. Elevators should be looked after constantly. If you only have one or two elevators, so that you don't have enough to keep a regular elevator man on your payroll, you had better make a contract with some outside company to look after them. But if you are operating any number at all, you should have a competent elevator mechanic on your payroll to go over those things continually, oiling them and looking after them, so he can spot anything defective as soon as it turns up.

MR. O'HARA: Don't misunderstand me. We have three elevator mechanics on service 24 hours a day. They make periodic checks of those elevators. What I am referring to is an inspection report, a 2 or 3-page affair which covers the whole works, set up by the American Institute of Architects.

MR. COOPER: I don't think that is worth very much to you. An insurance company will do that much.

MR. BROWN: We have our elevator mechanics check the elevators every day.

They check the cables definitely every three months, and the insurance company also checks the elevators every three months. I advise our mechanics that if they do not give me a report ahead of the insurance inspectors, God help them. So I would say that a never-ending supervision of elevators is absolutely necessary.

CHAIRMAN WHISTON: Mr. Hieronymus is associated with a large organization in this city, and has a large number of elevators under his jurisdiction. Rex, will you say something on this subject?

Replacing Elevator Cables

REN E. HIERONYMOUS: I will only attempt to cover one point, and that relates to the frequency of replacing the elevator cables. In the first place, it is extremely laborious, and it takes a long time to collect adequate information on the life of a cable. Cables last a number of years. The main factor in their length of life is not the miles traveled but the number of times over the shiv.

I had access to complete cable records made on a group of buildings in Cincinnati, covering some 23 or 24 years of service, both high-rise and low-rise cars, and including main hoist cables and governor cables. Captain McIntyre, who operates that group of buildings, found a variation of 300 per cent in the life of cables which operate under apparently the same conditions, where approximately the same life might be expected.

We have records of cable life in our own organization, covering some 12 or 15 buildings, and we find the same variation in our experience. The variation is not explainable in any terms that we can think of. It seems unquestionable, however, that the variation certainly will run from 100 to 300 per cent in the expected cable life. We conclude, therefore, that to base the replacements of cables on any kind of a time interval is either unsafe or extravagant. If the time interval is too short, it is extravagant; if it is too long, it is unsafe.

Therefore we base our cable replacement on the condition of the cable. That relates primarily to the number of breaks in one layer of the cable, and also the character of the breaks—whether the broken wire sticks out or not. Of course we follow the prac-

tice of replacing a cable before it is considered at all possible that it might be dangerous, but I think it is quite impossible to replace cables on a calendar basis. It should be done whenever the condition warrants it.

We regard the inspection by city agencies as not of great importance. We rely a great deal on the judgment of the insurance companies. In some cases we find it best to maintain contracts with the elevator companies, but we still make our own inspections.

Your own inspections of elevator equipment can't be too frequent. They should be made daily. The more formal inspections, where a report is written, may be suited to the conditions you have, but certainly in 24 hours something could go wrong on any piece of mechanical equipment, and elevator equipment is inherently the most dangerous equipment in the building. It is potentially the greatest and most disastrous hazard to which the public is exposed, and unceasing watchfulness is the keynote for an accident-free experience.

MR. ATCHLEY: There is too much stress placed on cables. The majority of accidents on elevators are caused at the hoistway entrance. People are always worried about the life of a cable.

I have been in the elevator business all my life, as a mechanic. I am now inspecting. There are no two elevators alike; no two operate alike. You can buy a bank of 16 or 20 elevators, and no two cars will run at exactly the same speed.

What we have to eliminate are the accidents at the hoistway entrance. It is very seldom that there is an accident due to breaking of cables. Occasionally, yes, but when you get down to the accident record, you find most accidents are at the hoistway entrance.

DELEGATE McLAUGHLIN: I wonder if Rex couldn't tell us something about training the employees.

Educate the Employees

MR. HIERONYMOUS: Something has been said here this morning about educating the public. At the risk of sounding a discordant note here, I want to say that personally I am not at all hopeful of getting any place on educating the public. With respect to office buildings, your public is

too variable and too independent, for one thing. The tenants in your building are not so variable; you have an opportunity to educate them to some degree. However, the public mostly has an independent attitude; they think they already know how to take care of themselves.

I think the problem has to be approached entirely by educating the employees of the building, in whose hands rests the safety of the public. When you have educated your employees, even with respect only to their own safety, you have accomplished something in the direction of educating them toward the safety of the public.

The gentleman mentioned the frequency of accidents at elevator hatch entrances. This is the chief hazard of the elevator plant's operation. If you can train your maintenance employees and keep the equipment in good shape, all right, but you can't prevent a member of the public from trying to duck in the door when he is really too late. You have to train your operators to be prepared to prevent the public from getting hurt. I think it has to be done by formal methods, by verbal instructions to your men, by following up every accident and talking to the employee about it afterward, by watching for signs of weakness in your operations. You can have your starter or building superintendent talk to the operators as a group when you want to bring up the question of a certain accident.

I think we have to educate the public or safeguard the public by educating our employees.

One factor that comes into this question constantly is the matter of acceptability. Certainly it is possible to install office floors on which no one could ever slip, but you couldn't rent such a building to the public. That question came up a year or so ago.

The stenographer of one of our tenants slipped in the lobby of the building on a wet day. Her employer had an idea on the subject, and said there should be a floor there that wouldn't allow people to slip. I talked to him about the matter and asked him what kind of floor he thought it should be. He thought it should be something like brick. I said, "You wouldn't rent an office in a public building that had a brick floor in the lobby." He agreed with me, but thought there must be some way of getting around the problem. This question of acceptability is really quite a problem.

MR. LANE: When we employ a new elevator operator, he goes on the car for at least one full day, and in many cases two days, with an experienced operator; and then after he is given that instruction, he is turned over to a member of the engineering mechanical department, who further instructs and questions the man to determine if he is good material for an elevator operator. In other words, he is instructed both from the service and the mechanical angles.

CHAIRMAN WHISTON: Is there any follow-up to see if a man continues to be a good operator?

MR. LANE: Definitely. That is followed up by the superintendent of service.

B. A. SCHULZ (Tribune Tower, Chicago, Ill.): What do you do when you hire an extra man for a day or two? How do you educate him so he doesn't slam the gate?

MR. LANE: If he is only going to be hired for a day or two, he is put to work one or two days previously to the time the car is turned over to him.

MR. SCHULZ: What if you are short one man?

MR. LANE: We have reserve men on call for that—what we call extras, and are called in on the extra jobs. Then when there is a permanent job, they are given the permanent job, and a new man is trained for extra work.

CHAIRMAN WHISTON: So far as our elevators are concerned, we have a book called "Standard Practice." Each man is supposed to know all the rules and regulations contained in that book, and we have frequent examinations to see whether or not the men are reading the book and actually complying with the instructions. It is only by constant attention that you can get them to do what you want done.

Are there any other questions with reference to public or employees' safety that you care to bring up this morning?

E. C. PAINE (Railway Exchange Building, Chicago, Ill.): I have a thought on educating operators. I turn them over to the starters, and let the starters put them through the ropes until the starters are satisfied they know the business. Then I take the operator up to the penthouse and educate him on what he is doing when he is improperly operating the machinery. In other words, we overcome repair bills by

thoroughly educating that man as to what stunts he is putting that equipment through by just moving the lever.

Training Washington Workers

MR. HUNT: In connection with training, our problem is, I suppose, different from most of you men. We have between 400 and 500 elevators in Washington. Of course we have to keep a force going all the time, and we do train and put them through a training school. This training course includes courtesy, methods of handling the public, and preventing the public from getting hurt at entrances, as far as possible. It also covers a knowledge of the equipment. We describe the equipment to them, take them to the penthouses on some of the buildings, and then we give them a test with a car on safety, as they may have emergency conditions sometimes. Unless they can keep their heads under those conditions, they may cause trouble.

Practically all the class get on a car which is allowed to go on safety. Of course they are thoroughly instructed that when the car goes on safety, they are not to release it, but instead should communicate with the elevator mechanic right away. They are trained in taking care of people in emergencies.

We had an emergency not long ago, and the Washington papers made a lot of it. All the power in one of our big buildings—the Commerce Building—went off at about 11 o'clock in the morning. We had people in cars when that happened. Most of the cars were emptied very quickly, as the side emergency exits were available in most cases. However, we had people in one car for over an hour. They were between floors, and the bottom of the car showed just about six inches at the hoistway door at one floor.

We were able to pass water up to the ladies in the car, but were not able to get them out. All the power was off, and the load was such that the car could not be allowed to drift. Generally you can release the brakes by hand and drift a car to a landing.

Our operator deserves credit. She kept the people from having a panic for somewhat over an hour, in a car totally dark. There was just a little natural ventilation, because the fan had stopped. Thirteen peo-

ple were in the car, and the operator did a good job—they didn't get frightened, and came out without anybody being hurt. But if she hadn't had some emergency training, she might not have done as good a job as she did.

We try to prepare them for those emergencies. We think our training is of great value. Also, it convinces us of one thing—that we don't want to use our elevator cars for fire exit purposes. We have decided that pretty definitely. If we have a fire emergency, we want people to walk down the stairs. Of course, that is all right in our buildings, but not in the very large buildings. Washington buildings are restricted to seven or eight stories.

Sponsor Safety Programs

CHAIRMAN WHISTON: One other thing regarding the work that has been done with reference to safety. Booklets have been published, and endeavors have been made to acquaint the public and various lines of business with what they may do in a safety way. There are four booklets. One is "Automobile Service Station Safety Instructions," and we also have "Restaurant Safety," "Safety in Hotels" and "Apartment Houses." Unfortunately we do not have copies here, but if any of you are interested in receiving copies, they can be had for the asking, from the National Conservation Bureau, 60 John Street, New York City. That is the National Conservation Bureau division of the Association of Casualty and Surety Executives. You may be interested in some other particular branches of safety, and no doubt by writing to this organization they will have what you are looking for.

I assume that we should wind up this meeting with some sort of recommendation or resolution. I offer one for your comments:

It is suggested that the National Association of Building Owners and Managers and all other groups operating public buildings such as our government, insurance companies, hospitals, etc., sponsor safety programs at all their local, regional and national conventions, and cooperate with their community safety committees, with public officials, (and that is very important—too frequently we forget about the public offi-

cials) labor organizations, (there again we may solve the question of the elevator man who comes to you unprepared, not knowing about safety) and others in the promotion of safety in all of our buildings.

If someone would care to make a motion to adopt that as a resolution, the Chair is open to such a suggestion.

MR. COOPER: What do you mean by safety programs?

CHAIRMAN WHISTON: Let me use one illustration. Take office buildings in downtown Chicago. So far as I know, there has been no unified method nor has there ever been an attempt to promote any kind of safety at any of the office buildings. Yes, we talk to our elevator men and engineers and put large placards near the time clocks, etc. Frankly, the majority of people working in our office building maintenance are illiterate and can't read the signs. I think if the operators of those properties adopted a program and set it forth some way in book form and distributed these books to the members of their organization, it would help very materially in educating the employees and in time the public to safety consciousness.

Safety Part of Operation

MR. COOPER: Safety is a detail of operation. You don't get the elevator men all together and discuss how we are going to operate these elevators and schedules, etc.; you don't get your janitors all together and ask them about how often you are going to mop the floors or vacuum an office. The point is that they take orders on how to do those things from the man in charge, and I think that this socializing of a safety program, such as holding safety meetings and pep talks, tends to shift the responsibility, and you get to the point where, to use the old proverb, "What is everybody's business is nobody's business." I think a meeting like this is a very good thing, but if it is the plan to get the employees together to talk about it, I don't believe in it.

CHAIRMAN WHISTON: Do you have a suggestion to offer in lieu of that?

MR. COOPER: Well, if you plan to hold a meeting of this kind, I think it is all right—a meeting of supervisors to take up problems, just as you would other operating problems.

MR. HIERONYMOUS: I don't think Mr. Cooper's remarks are all incompatible with what you had in mind, Mr. Chairman. I therefore would like to make a motion that this group assembled here this morning adopt the suggestion you made, and that you, as Chairman of this meeting, communicate our action to these various groups you mention. In other words, the motion would be that the associations and

various groups that operate public buildings cooperate with the National Safety Council and take some actual steps to further safety work in the buildings they represent. I make that a motion.

CHAIRMAN WHISTON: Is there a second?

(The motion was regularly seconded, put to a vote, and carried.)

ADJOURNMENT

Eye Protection

FRIDAY MORNING SESSION

October 11, 1940

The meeting for the discussion of problems of eye protection, which was sponsored by the National Society for the Prevention of Blindness in cooperation with the National Safety Council, was called to order by the Chairman, Dr. Leonard Greenburg, Executive Director, Division of Industrial Hygiene, New York State Department of Labor, New York City, who presided.

CHAIRMAN GREENBURG: The meeting this morning is intended to be a very informal one. We have a chief speaker, but in addition we have a panel discussion which is completely and totally unprepared, the idea being that many of you gentlemen in the audience have had a great deal of experience with eye protection in industry. Some of our experts who have been invited here will discuss various aspects and phases of this problem, based chiefly on questions which have come in to us from

time to time, but it must be clearly understood that anybody in the audience can participate in the discussions as he may wish.

Finally, I want to say that the problem of eye protection in industry does not consist of the gathering of data and doing nothing about it. I am very much reminded of the remark of our dear departed friend, Will Rogers, when he said that data are like garbage: after you collect them you have to find something to do with them, and that is our problem this morning, to find just what we are going to do with these interesting figures.

The first speaker of the morning is Dr. M. Davidson, who happens to be a confrere of mine in New York State and who for many years has been in charge of the eye work for the State of New York Department of Labor.

Industry's Obligation to More Adequately Protect the Worker's Eyesight

By M. DAVIDSON, M.D.

Ophthalmologist, New York State Department of Labor, New York City

There are two aspects to this obligation of industry to safeguard its workers' eyes. One is to make the environment safe for the worker by eliminating hazards causing accidents, and the dusts, fumes, intoxications and poor illumination, responsible for occupational diseases. Safety measures have accomplished much since the turn of the century.

The other aspect, that of making the worker safe for himself, his co-worker and industry, has as yet not received the recognition it deserves. It involves proper vocational guidance and advice for the applicant for employment with irremediable defective eyesight and for the worker who has ac-

quired it in the course of his employment. To reject him as an applicant when found with such a defect or to discharge him after employment, is obviously an inadequate social solution of the problem.

It should be emphasized that errors of refraction are not considered here as constituting true defective eyesight, as long as normal visual acuity can be secured by correcting the errors with glasses. Such errors prevail in more than one-half of the population. When uncorrected, they are of course a handicap and a source of eye strain, particularly under poor illumination.

The true defectives are those with irremediable defective eyesight, either in vis-

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The true defectives are those with irremediable defective eyesight, either in vis-

ual acuity or otherwise, who constitute the "human" as distinguished from the "environmental" factor in accident prevention and industrial efficiency and who need appropriate attention.

Their handicap may be merely a low visual acuity incompatible with their tasks. It may be, however, a lack of depth perception; defective color vision, congenital or acquired; defective light sense, or defective indirect vision, and accompanied perhaps by a normal visual acuity. They are unable to perform certain tasks effectively and become unsafe in those operations particularly which require speed. Thus, lack of depth perception makes flying and driving any motor vehicle extremely hazardous, and the finer mechanical work and artistic and drafting work difficult. Defective color vision is also a hazard in flyers and drivers and a handicap for signalmen, embroiderers, and in the chemical industry. Flyers, drivers of motor vehicles, sailors, miners and night watchmen need especially good light sense and indirect vision, and photographers and x-ray technicians find their absence crippling.

This group also offers a problem in Workmen's Compensation administration. When they meet with an accident damaging their eyes, they are, in the absence of knowledge of their antedating condition, perforce given the benefit of doubt. We must not, however, exaggerate the extent of their overcompensation. It is balanced moreover by the undercompensation of a considerable element endowed originally with a visual acuity of 20/15 or even of 20/10 for whose loss, when they meet with an accident reducing their vision to 20/20, there is rarely provision under the law. This is obviously not the best kind of justice.

It is clearly the duty of Labor, Industry, State Departments of Labor and other State Agencies to take cognizance of this group of defectives and, for medicolegal justice, of the supernormals, and to come to their relief. Our knowledge of the real size of the two groups, and of the frequency distribution of the causes of defective eyesight in the industrial population, is incomplete. The National Safety Council is at present "unwilling to estimate eye injuries in occupational accidents without further study." Such knowledge, necessary for proper vocational guidance and advice, can be secured, without great expense, by the routine examination of the industrial population by ophthalmologists to screen out the defectives and classify them as to cause. Merely determining the visual acuity and the mechanical application of eyesight testing methods by non-ophthalmologists are not adequate for the purpose.

A survey of the examinations of eyes for compensation in New York City in 1939, from the vantage point of a rather large material and a uniform method of examination, is presented here. As an introduction to it, let us examine the available data as to the eye capital which the worker brings into industry and the inroads which industry makes on it. Both differ widely between countries and regions, as to whether they are industrial or agricultural, from the presence of endemic diseases such as trachoma. The data also vary with age, due to progress in the art of refraction and correction of its errors, in diagnostic methods, and to better nutrition, all unequal in different localities. It is to be noted that the data are in terms of visual acuity only.

Eye Capital of the Worker

In 1925 Collins' figures for New York, Delaware, North Carolina and Maryland, when analyzed, show among male school children of 16 (less defective than younger boys and girls), with only 10 per cent fully corrected for errors, as follows:

20/20 in either eye, 70.8 per cent.

Less than 20/20 in one eye, 10.7 per cent.

Less than 20/20 in either eye, 18.5 per cent.

Serious defects in the last two groups combined, 8 per cent.

In 1939 an analysis by Blankstein of 920 visual acuity determinations of school children in Chicago, 7-19, to screen out defectives, shows the following:

20/20 in either eye, 68 per cent.

Less than 20/20 in one eye, 22 per cent.

Less than 20/20 in either eye, 10 per cent.

Allowing for a large proportion of defective eyesight correctible to normal by glasses; of other defectives not entering industry of their own choice; and of still others rejected by industry, the eye capital which the worker brings into industry must be considerably better than 70 per cent good eyesight.

New York State Figures

Averages For	Blind	Permanent Partial*	Temporary Disability	Permanent Eye Disabilities % of All Permanent Disability
1925-30.....	8	766	2189	3%
1930-34.....	9	574	1930	2.56%
1934-39.....	8	520	1265	2.74%
In 1939.....	11	467	1190	2.24%

The Present Situation

	Blind	Permanent Partial*	Temporary Disability	Total in Round Figures
Past Annual.....	240	15,600	37,950	54,000
Present.....	80	5,200	12,650	18,000
Annual or on Basis of 20,000,000 workers.....	4	260	632	900
	Per Million	Per Million	Per Million	Per Million

* Includes unilateral industrial blindness.

In 1928 McAuliffe reports defects, some correctible, among 5000, 20.5 per cent.

In 1929 a New York Central Lines survey finds defective, 20 per cent.

In 1933 Murray among miners finds defects, some correctible, 28.3 per cent.

In 1937 Rainey among 15,000, in Chicago found defects, 14 per cent.

Illiteracy among the miners is stated to account for the higher figure, and a rigorous selection by industry since the depression probably accounts for the lower figure. Rainey moreover succeeded in correcting to normal more than half of the defectives and in improving some of the others. True defective eyesight for Chicago today among workers should be accordingly not over 6 per cent.

With due allowance for both the depression and increase of population, the eye toll has been reduced to $\frac{1}{2}$ in 15 years. Available fragmentary figures for the rest of the country indicate a reduction to about one-third for the past three decades. Multiplying the New York State Figures by 10, one can visualize the past and present situation. See table, "The Present Situation."

The following summary of New York City Eye Examinations for 1939 includes

examinations for accidents occurring in 1938 as well as in earlier part of 1939, hence does not cover the same material necessarily shown in the New York State table.

Number of examinations (1 and $\frac{1}{2}$ per person).....3414

Number of persons (7% females; 495 old cases reexamined).....2663

Persons examined for first time (509 subject to reexamination).....2168

A. Persons with normal visual acuity in either eye.....1340

B. Persons with subnormal visual acuity in one or either.....828

C. Persons with permanent partial or total compensable defects.....440

(Non-compensable defectives among uninjured eyes17 per cent

D. Persons with non-compensable pre-existing defects388

(Constitutes in relation to group "A," defective group of.....22 $\frac{1}{2}$ per cent

The distribution in Rainey's study is upon analysis somewhat as follows: Development, 49%; Injuries, 8%; and Systemic, 43%.

From the data available for the country as a whole it appears that the potential in-

Analysis of New York State Closed Cases for 1939

(On basis of unpublished survey by Dr. Patton, Director of New York State Dept. of Labor Division of Statistics.)

	Number	Total Cost	Average Per Case
Total Cases.....	1,669	\$ 1,074,705	\$ 644 (One death included)
Temporary Disability.....	1,190	49,287	41
All Permanent Eye Disability.....	437	851,613	1,824 (Head injuries included)
Permanent Total Blind.....	11	164,680	14,971
All Other Permanent Disability Cases for Comparison.....	21,381	14,280,252	688

Summary of Distribution of Defects of Group "C"

Less than 20/40 in one or either eye	20/40 to 20/100 in one or either eye	20/100 and less in one eye	Blind
41.6%	23.5%	33.5%	1.4%

ustrial worker may bring with him into industry an eye capital about 30 per cent defective. A large proportion of these defectives are remediable by glasses. Among the industrial population the incidence of true defectives is somewhere between 14 per cent and 22.5 per cent, or approximately 18 per cent. About 1/12 of this group is defective because of industrial injuries in the past.

On the basis of a vision of 20/100 or less, and of lack of binocular depth perception as constituting the group of serious defectives, there are 6 per cent of serious defectives in the industrial population requiring special attention in view of the National Industrial Defense Program, for the sake of efficiency and of accident prevention. Over one-third of this serious defective group is a hazard because of lack of binocular depth perception, and possibly a hazard out of proportion to the numerical strength of the group. In any survey of the industrial population it is therefore extremely desirable to make a complete eye examination, to include the other elements of normal eyesight and not merely to measure visual acuity, as is commonly done.

Eye Examination Program

A survey of the incidence of true defective eyesight among the industrial population in terms of its most important element,

visual acuity, indicates about 14 per cent to 18 per cent, with most probably less than one half serious, defectives. The problem appears therefore smaller than it is usually envisaged, but it nevertheless calls for better knowledge of it, and, above all, for attention.

As part of the Defense Program, now acute, and for the sake of a more just administration of Workmen's Compensation, a complete study of the problem with a view to meeting it is in order. Neither industry nor labor can be expected to carry it out with satisfaction to all concerned.

Considering that some 10 per cent of workers of New York, and presumably elsewhere, are annually examined or have a hearing at a Department of Labor for compensation for all kinds of accidents, entailing loss of time by the worker and expenses by the State, utilization of the occasion and the facilities of the Department for the examination of the eyes of these 10 per cent, already there for other purposes, suggests itself as practicable and economical.

These eye examinations, not for glasses, but to screen out the defectives for vocational guidance and advice, would entail for the country no more than adding or attaching to State Departments of Labor some 150 ophthalmologists to perform the service, and a certain number of medical social workers

Summary of Causes and Distribution of Defects of Group "D"
(An Attempt at a Classification of a Sample of 55%)

	Better than 20/100	20/100-20/200	Stereopsis Loss	Blind
Developmental—47%				
Errors of Refraction.....	28.2%	7.5%	3.2%	0.5%
Strabismus.....	2%	1%	3.1%	
Miscellaneous.....	1%		0.5%	
Injuries—21%				
Old Industrial.....	4%	2.5%	1%	0.3%
Non-Industrial.....	6%	3.5%	2%	1.5%
Systemic and Unknown—32% (includes senility, infections, glaucoma and simulation).....	25%	4%	3%	
Total 100%.....	66.2%	18.5%	12.8%	2.5%

to be furnished by cooperating State agencies, such as the State Departments of Health, of Social Welfare, and of Education. The execution of the program could be lodged either with a Workmen's Compensation Division or with an Industrial Hygiene Division.

The program could be expanded, should the need arise, to examine a larger sector of the population by increasing the staff. It

can also be adapted for the general physical examination of workers. It should be borne in mind that the mere determination of visual acuity, forming part of physical examinations in general, is of no use, since low acuity may be due to errors of refraction only, and normal acuity accompanied by defects or disease.

The cost involved might be one-tenth of what it would otherwise be.

The Panel Discussion

CHAIRMAN GREENBURG: It is interesting that in a state such as the State of New York—and I use that just by way of example—we have a total of approximately 3,000 eye accidents a year, that at least one or two of these each year result in death, that about ten or fifteen result in permanent total blindness, permanent total industrial blindness, that about 500 result in permanent partial disability, and that there are a large number of temporary disability cases. This must be characteristic of practically all manufacturing states in the union, and a very recent, most interesting and valuable report which has come in from the state of Wisconsin, proves this to be essentially the fact.

These cases in New York cost about \$1,200,000 a year in round numbers, a fairly sizeable sum, and the average per case is approximately \$650. When we looked into the cost of some of these accidents we found

that in general handtools were associated with higher costs than some of the flying objects. In other words, in many cases of small flying objects the disability is not great and not serious, but as soon as a tool begins to come into the picture, usually the flying object presents a more serious hazard. The average cost per case is just about as Dr. Davidson presented to you, about \$650 for an eye accident and about \$350 for other types of accidents.

The Problem

The problem then boils itself down to a real economic and social problem because of the economic factors involved—to industry and the workman in the case of the injury, and to society in general in the case of those persons who are permanently and totally disabled or who are partially disabled on a total basis.

That means that a broad-gage plan must be set up, both with reference to protection of workers and compensation for eye injuries and more particularly for standards of employment rejection. Now some companies have a very broad-gage policy along these lines and they do not refuse employment to a man because he has no vision in one eye, but unfortunately some companies do refuse employment to such a man and it brings about therefore a most serious problem.

These and other problems which you may have in mind, and which some of our friends have had in mind, can be discussed very freely and frankly before this panel. I will now present to you Mr. W. T. Cameron, Chief Safety Advisor, Division of Labor Standards, U. S. Department of Labor, Washington, D. C., who will be the leader in our panel discussion of eye protection problems.

(Mr. W. T. Cameron assumed the chair.)

The Panel Members

Chairman Cameron introduced the members of the panel as follows:

Mrs. Eleanor Brown Merrill, Executive Director, National Society for the Prevention of Blindness, New York City.

Harry Guilbert, Director, Bureau of Safety and Compensation, The Pullman Company, Chicago.

Dr. T. Lyle Hazlett, Medical Director, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

R. McA. Keown, Engineer, Industrial Commission of Wisconsin, Madison, Wis.

M. A. Kroger, Director of Safety, Chevrolet-Gear, Axle and Forge Division, General Motors Corporation, Detroit.

H. S. Simpson, Safety Director, Caterpillar Tractor Company, Peoria, Ill.

CHAIRMAN CAMERON: As I see it, we have before us two problems. One is protecting the good eyes of industry, and there are a lot of them still left despite some of the figures that do turn up on lack of depth perception and lack of visual acuity

and color blindness and so on. We have the job of keeping the eyes for our great defense program, and so on. The second problem is: How are we going to make the best use of these workers who now have some uncorrectible defect? Where can they be placed? Where can they be used? How shall we provide them with opportunities to earn a livelihood?

I think Mr. Knudsen said the other day that our first bottleneck in national defense is going to be the lack of skilled and trained workers, so we are going to have fewer of the labor supply waiting outside the gates, clamoring to get in, and we are going to have to use some of these people who have previously been screened out of industry or neglected because of some defect, in many cases a visual defect.

We are going to follow the questions as listed in the program, although we probably will do some skipping around.

First, in what operations and occupations do eye injuries occur most frequently? I shall call first on Mr. Keown to give us some information on that subject.

Where Eye Injuries Occur

R. McA. KEOWN: Mr. Chairman, I have a few figures. I am not going to give very many of them because they have been covered pretty well already, but some of the most important.

In our Wisconsin eye injury cases we find that the industries that cause the greatest number of injuries are the clay, glass and stone industries, and another important group is the metal and metal products. The paper and paper products contribute only about 2.4 per cent of all the eye injuries. Another group, a rather serious one, is the commercial and mechanical services like garage work, which account for 4 per cent of all of the eye injuries. As to mechanics, carpenters suffer more eye injuries perhaps than any other group, and hammers contribute the greatest number of injuries as a tool. Dr. Greenburg mentioned the fact that in Wisconsin 23 per cent of all of the eye injuries are caused by handtools; yet only about 4 per cent of the benefits are paid on account of handtool injuries.

Eighty per cent of all of our injuries are of a temporary nature, and manufacturing contributes only about 50 to 55 per cent of

the eye injuries. Eighty-three out of every 100 compensable eye injuries are temporary. As stated by the New York figures, our number of eye injuries as compared with all injuries runs from 2.9 per cent to nearly 4 per cent. That figure has varied between those two limits for quite a number of years, and the amount of benefits paid, however, runs from 8 to 10 per cent and that checks very closely. The cost of eye injuries in total benefits is about two and one-half times as serious as for all injury cases.

CHAIRMAN CAMERON: I think we might have an actual example or two. I know that the usual procedure in industry is to go through the shop and make a list of all the jobs where eye protection of one kind or another should be furnished. I should like to call on Mr. Simpson, of the Caterpillar Tractor Company, to give us some examples of where eye cases turn up in heavy manufacturing.

H. S. SIMPSON: It is our experience, and that of all industry, that accidents happen where you do not expect them. If you do not expect to have an eye injury, you do not wear goggles, and you end up in the hospital with an injury and then the compensation. We have considered adopting the compulsory goggles rule but we get up there and then we back away. We have tried to evaluate hazards. We say that the operator on this machine must wear goggles, but what are we going to do about the timekeeper who stops by for an instant to get the man's time and also one of his chips?

Our serious eye accidents have been cases, for instance, where a lock-washer exploded when the nut was being backed off with an air wrench. A piece of the lock-washer tore a hole in a man's eyeball. Normally, you have a devil of a hard time selling the man in the shop that there is any particular hazard there, but he believes it now. Incidentally, he is in our employ and we do not feel that we should discriminate against his lack of binocular vision. The intelligence level there takes care of many things. He has learned an awfully good lesson and he sees twice as fast with one eye.

FRANK K. BOYLE (Brown-Lipe-Chapin Division, General Motors Corp., Syracuse, New York): In the doctor's statistics, how many cases involved syphilis and do accidents aggravate the condition?

CHAIRMAN CAMERON: Dr. Davidson, will you take that question?

DR. DAVIDSON: A very insignificant proportion. I haven't the exact figure.

MR. BOYLE: Is it true, doctor, in the state of New York that if a person has syphilis and an accident aggravates the condition he gets compensation for total blindness?

DR. DAVIDSON: According to our laws, if syphilis preexists an accident, he gets paid for the loss regardless of the pre-existing condition. Aggravation is a ground for compensation.

Getting Employee Cooperation

CHAIRMAN CAMERON: I think this very logically leads us up to "The pro and con of the compulsory goggle rule." We have had several questions turned in. The first one is, "Any eye protection campaign depends on the worker. How do you gain his cooperation? What is the supervisor's place in the program?"

Dr. Hazlett, I should like to have you tell us a little about how you gain the worker's cooperation in wearing goggles. Now we have two things here. We have one the matter of making the wearing of goggles a condition of employment, just like punching a time clock or anything else. We have the other problem of a selling campaign to get the workers to wear goggles voluntarily with perhaps a little pressure now and then from the supervisor. Will you take that first, Dr. Hazlett?

DR. T. LYLE HAZLETT: In regard to the employee, I think that we can educate him by means of example. It has a very telling effect. We all feel that a great majority of the eye accidents can be eliminated if we do have proper protection. We still, of course, have the timekeeper or the engineer who may have an accident when walking down an aisle, but eye accidents can be eliminated by making the employees more conscious of the effects of simple eye injuries.

Often if the employees are shown a break-down of minor accidents occurring in different divisions, it will make them realize the size of this whole problem. I think we can sell this to employees by gradual education, making them more conscious of the number of cases occurring during a

period of time. This must be continuous. By keeping after it all the time we feel that we can create a great deal of additional interest in the conservation of eyes in industry.

Goggle Difficulties

S. WARZALA (Calco Chemical Division, American Cyanide Co., Bound Brook, N. J.): In our experience, there is no difficulty with the worker about the wearing of goggles. The worker will wear goggles whenever we can furnish him a satisfactory goggle, but I do not know of any goggle manufactured today that you can call a satisfactory goggle for our purpose.

Where you can wear a spectacle type of goggle and where you can wear a cup type goggle, perforated to provide ventilation, you may use that goggle very well; but where you must have a goggle that covers your eyes completely and have it practically hermetically tight, then we do not have a goggle on the market that will satisfy that condition.

We have eye accidents in industry largely because men cannot wear goggles all the time, and they cannot see in connection with their work the different places where they are required to wear goggles; therefore, they get into trouble.

In one case we had a drum standing on end, covered with a removable top. In the top was a hole about two inches in diameter. Liquid caustic was kept in this drum. The rod with which they mixed this liquid caustic was not available. An employee, wearing glasses like my own and having only one good eye, found a piece of pipe a half-inch in diameter. The pipe was about 45 to 46 inches long. The drum was about 40 inches high. He stuck the pipe into the drum. On the bottom was about two inches of this caustic. A crust had formed on top. As the pipe struck the bottom a drop of acid, believe it or not, flew through the pipe and under his glasses and into the good eye—mind you, into the good eye.

I will give you another example. A man again was handling caustic wearing rubber goggles. They were rubber goggles that covered the eyes. Under one of the eyes there was an opening of about one-eighth of an inch. A drop of acid found that opening, lodged in the eye and produced an injury.

We communicated with the manufacturers of the goggles. They showed great interest and as a result they are trying a new experiment; they have sent us four goggles of different designs. We have tried them on 100 men. Seventy-five men were able to use one of those goggles so that they covered the eye completely. The others required other fits.

Now even in the fitting of goggles there hasn't been much progress; all of the goggles seem to be poured out of one mould, and if they do not fit, well, it is just too bad. The reason the workmen do not wear goggles is because there are no goggles that they can wear eight hours a day and do any work and under the circumstances we certainly cannot require it.

I should like to see a goggle produced that a man will be able to wear all day long and have complete protection, not only against flying objects but also against corrosive liquids and materials.

CHAIRMAN CAMERON: Has anyone had any experience in relation to eye protection for the man who is handling acids and caustics?

MR. BOYLE: I think that problem also involves the Interstate Commerce law. When empties are shipped, if there is anything in those empties and the truckman suffers an eye injury, the concern that is shipping them back is involved.

CHAIRMAN CAMERON: That is a very good point, the legal responsibility of the company shipping the containers.

EDGAR N. GOLDSTEIN (Consulting Safety Engineer, San Francisco): I think that the idea of having one type of goggle that is going to do for every industrial condition is expecting just a little too much. You cannot do that any more than you can give a carpenter one tool and have him do all the carpenter work that is necessary. However, some of the manufacturers make goggles with different nose bridge widths and if they are properly adjusted a man can wear a pair of those spectacles all day, just as easily as he can wear a pair of ordinary spectacles that he may require on account of his eye condition.

I want to ask if the present trend is toward 47 millimeter instead of 50 millimeter in order to afford better fit?

47 or 50 Millimeters

CHAIRMAN CAMERON: The question is whether in the use of industrial spectacles the 47 millimeter, which is the smaller size, the more or less standard size, is better from an optical standpoint, although perhaps not so good from a safety standpoint? Mr. Guilbert, will you answer that question?

HARRY GUILBERT: Your question is a very good one. I am going to ask an expert to answer it, if I may. Dr. Davidson, of the Pullman Car Works, will you come here for a moment and answer the gentleman's question?

DR. H. P. DAVIDSON (Pullman Standard Car Manufacturing Co., Chicago): It depends entirely upon the size of the man's face. Of course, you can decenter any lens, but you have to take into consideration the build of the man. For instance, when you have a very small, wizened man, if you put a 50 millimeter goggle on him, his goggle would stand out like wings, so in that case you would have to put on the 47. If you have a man with a large face, then you would put 50 or even larger on him.

MR. GUILBERT: I think that Dr. Goldstein made a very good point there about a carpenter doing a job with one tool. I think that most of us realize that there are hundreds of thousands of men in America today wearing goggles all day long. In our particular organization there are 25,000 men and women wearing goggles eight hours a day. That is the answer. Of course, it is impossible to make one goggle to suit every occasion. I think that Walter King will bear me out on that, and he has had a great deal more experience along those lines than I have. We worked together on the problem over twenty years ago. But today, let me repeat, that in our particular case every man and every woman wears goggles while they are working.

If a visitor comes to the plant he protects his eyes or he doesn't get into the plant, and I mean superintendents, vice presidents, foremen and everybody else. There is a sign at the entrance to each plant, signed by the president of The Pullman Company, that eliminates all arguments from some of these wise guys who come along and want to get into the plant without glasses. Personally, I have had more trouble with the

so-called executives than I have had with workmen.

I am not an expert, but you can put my subject in a nutshell. It is preventing eye accidents. And the only way to do it, in my opinion, is to get every man in the shop to protect his sight, because there is not a man in this room or anywhere else who can lay down a set of rules and say that accidents are going to happen here or they are going to happen there or they were unexpected. Well, management, of course, is supposed to be intelligent enough to take care of the unexpected situations.

I want to bring out one very important point if I may. It is this: To get men to take care of their sight we must render a service to them. When you take an automobile to a service station the attendant does everything but brush your teeth. Now in the average plant in America there is a tool room where men turn in their tools, but in this average plant where men are given eye protection the management leaves it to the men to take care of their eye protection and the men do not do it. That is what I call "individual control." You must substitute central control.

Let me illustrate briefly. I took a tour through one of our shops the other day where there are 1,700 men and I scrutinized very carefully every man whom I passed. I was in every department. I did not see one of the 1,700 men without goggles. Every pair of goggles that I looked at fitted the man and were clean. Why? Because those men have the privilege of going to what we call the goggle and respiratory dispensary, any time of the day and night, to get what in my opinion is the crux of the whole thing, and that is a proper adjustment. When you buy a pair of glasses—and lots of the men here are wearing glasses—what is the first thing that is done for you? They are adjusted, aren't they, and they are continually getting out of adjustment. Even the fellow's in the office. Now what chance do you think the man in the shop has of keeping his goggles in such condition that they fit him properly all day long? He hasn't.

MR. BOYLE: Mr. Guilbert, who adjusts the goggles in your organization?

MR. GUILBERT: A full-time man, and he is doing a very excellent job. I could prove that to you better if you could talk to some of the men and find out how they feel

about it. It is very unfair, I think, to expect 5,000 men in a plant to be very happy about wearing goggles all day long and do a good job if you do not render this service that I am talking about.

"Cafeteria" Service

CHAIRMAN CAMERON: I think maybe we have another answer here to that same question while we are on it. Mr. Simpson, of the Caterpillar Tractor Company, I think has a cafeteria wagon that goes around and fits goggles. Will you tell them about that, Mr. Simpson?

H. S. SIMPSON: We have the problem of some 160 or 170 acres of property, of which 70 acres are covered with buildings. There is a lot of walking involved. We pay people to work, and if they are in the back end of the shop, we figured that we could save money by using a push cart, like one of those ice cream carts, with a lot of disinfectants, etc. That cart is in circulation in each division continually on each shift. The operator of a cart goes right down an aisle and stops and talks to the machine operator, or whoever the person might be. One of those service men will cover from 100 to 150 employees per shift. There are five people doing that. It means that I continually have my hands on the focal point of that many conversations with that many employees. There are a lot of duplications, but it gives one a very good opportunity to know what the feeling is on certain things. It gives you a rather rapid return on the fittings.

On this fitting proposition and on prescription glasses, our safety glasses do fit very definitely into the program, but they themselves are not the total answer. The goggle manufacturer cannot make brains for your men.

Wednesday night five of our executives flew in here, and the top man of the group had his safety glasses on. He had gotten 155 miles away from the plant and had not thought of them yet—so they must have hurt his eyes very much. In decentering, we have an overall geometric sign through the center of the lens and quite often we can decenter two millimeters each way. We like to go a little to the outside, but if we go too far, on the second shift where we have artificial illumination we get back lighting

which gives you more trouble than anything else.

CHAIRMAN CAMERON: We haven't answered your question yet; we are still hoping that we may get the answer.

MR. WARZALA: I know that, Mr. Chairman. I think that in any intelligent discussion of the goggle question, we ought to make some distinction between goggles that are used in plants where corrosive liquids are handled and plants that do not handle them. On the train coming to Chicago I heard about an interesting accident. An office girl was sitting down doing her work, and another girl standing in back of her was handing her a piece of paper. In taking it, somehow the sheet of paper slit her eye. It came right across the ball of the eye. The girl naturally blinked her eye and continued working and did not report to the medical department that day. She reported the following day and by that time infection had set in, and I understand that the girl right now is in the Eye and Ear Hospital, in New York City.

When you are handling corrosive materials the plain eye glass kind of a goggle will not do. Neither will the cup goggle with ventilation, that is, with screens, baffles or other things. We have used the nod-and-shake goggles, but there is a complaint against them. It is a small goggle that fits tightly over the eye. The frame is filled with water. When the goggle fogs up and you cannot see, you just shake your head and the water in the goggle washes it off. There is distortion of vision, headaches, and a lot of other things. Now these rubber cup goggles cover the eyes completely, but they are not satisfactory. So in any discussion of goggles that anybody makes, I should like to see a distinction drawn. Let us talk about goggles for non-corrosive materials and goggles for corrosive materials.

Suggested Committee Study

CHAIRMAN CAMERON: Let me ask Mrs. Merrill a question. Would it be possible to set up a technical subcommittee within the National Society that could study this problem during the year and report back to the Congress next year, or if there is a report in the meantime, could it be made available to the National Safety Council?

MRS. MERRILL: I think, if we can have the cooperation of our Industrial Advisory Committee and of the Safety Directors, that it would be possible through the National Society to carry a clearing of that information and to assemble material.

CHAIRMAN CAMERON: How does that sound to you folks in the audience?

MR. BOYLE: I was in the Willis Morrell plant at Elmira to get the result of an eye survey. This was prior to the time they made physical examinations of employees. A number of accidents had occurred and they found that two employees were totally blind in one eye and did not know it. I will ask the lady if she has ever had that experience.

MRS. MERRILL: I think for that particular question, the leader of the discussion might want to ask someone else for an answer.

CHAIRMAN CAMERON: Yes, I have quite a few questions just on physical examinations and how much stress should be laid on the eyes. Let's try to settle this equipment problem if we can. Is there anybody in the audience who has made a home-made goggle or something else that answers this caustic and corrosive problem?

Mining Experience

A. AMRAM (Hamlin & Co., New York City): We have been discussing eye protection for various industries, and I dare say the industry in which they have more accidents than anywhere else is the mining industry. According to Dr. Davidson, 28 per cent have defective vision, a larger percentage than in any other industry.

I should like to go on record as saying that I do not quite agree with the comment that this is perhaps due to inferior intelligence. In my work, which takes me to a few mines—I am not a mine inspector but nevertheless it is one of my duties and I am referring to southeastern Missouri, to Utah, and Nevada—I find that the miner is just as intelligent as any industrial worker.

We have the greatest difficulty, especially out in the western mines, to get the proper type of protection. I might perhaps illustrate that by a letter I have just received from a mine superintendent who is out in California. He says:

"Referring to our conversation in regard

to making our men wear goggles, we wish to speed this matter all possible. We just had another very bitter experience; one of our men had a little dust in his eye and the local doctor treated it for about ten days."

I might say that we are eighty miles away from any doctor, or at least from any eye specialist. The letter continues:

"As he did not improve, we sent him to a specialist and he reports that the man will have permanent impaired vision; probably due to improper treatment. As we told you, 60 per cent of our accidents are eye trouble caused by dust and if we can find goggles that can be worn underground without fogging we want to start using them at once."

Well, I thought of a friend of mine, a superintendent of a mine, who had had a great deal of trouble getting the men to wear the right type of goggles, but he finally thought that he had solved the problem; so I wrote to him so that I could inform our mutual friend in California what he had done. This is what he says:

"At one time we thought we had solved the problem with a certain type of glass goggle, but it turned out that due to certain air currents and conditions these goggles only worked satisfactorily in one place. With the same men wearing the same goggles and being transferred to another part of the mine, the glass fogged up immediately and it was impossible to use them successfully."

"These glass goggles are much more satisfactory where there is a perceptible movement of air, as it seems to take care of the fogging."

"We still use in most cases a very crude wire goggle, which you are perfectly familiar with and we all consider very crude."

DR. M. DAVIDSON: Mr. Chairman, may I say that I did not mean to reflect on the intelligence of miners. I used that word because Mr. Murray, who reported his findings, explained the eye incidence among miners on that basis and I was just quoting him.

A. H. TRESTRAIL (Pickands, Mather & Co., Caspian, Mich.): I have been in mining about twenty-one years. When we first started out we had the goggle question. We still have it somewhat. At first we tried to get men in certain occupations to wear goggles, and while we saved some eyes that

way, we found out that we lost eyes in other occupations. We finally came to the conclusion that it would be necessary to have every man on the job, whether underground or on the surface, wear goggles.

At first we experimented with the screen goggles, but they were not satisfactory. The argument against the glass goggle was that it fogged. We got away from fogging largely by having proper ventilation in our mining places. The wearing of goggles is the hardest on the supervisor who has to travel from one place in the mine to another. If a fellow is working in a warm place his goggles become adjusted to that temperature and he does not have a great deal of trouble, but the supervisor, the man who goes from one temperature to another, does have trouble. We aim to have our temperature in the mine uniform all the way through, but that is impossible in certain types of mining, especially where you have heavy timber formation or bodies of ore adjacent to sulphur-bearing rock.

We came to the conclusion that a half a loaf is better than none. We do not claim that we are going to prevent anybody from becoming blind; we are not guaranteeing that; but if we can save 90 or 95 per cent of our eye accidents, we are going to do that.

In case of eye injuries, we take our men by automobile seventy-six miles; we just simply put the man in an automobile and take him to an eye specialist. In a group of 600 men, we have had within the last two years two eye injuries where there was a short period of disability. One of them ran as much as fourteen days. We have had compulsory goggle use in our mines now for two years, and in that time the maximum disability has been fourteen days. We haven't had any lost eyes.

In the company's experience in the entire Lake Superior district, where we have approximately 1,200 to 1,500 men employed and our records are interchangeable, I know of only one case that a man had a severe eye injury while wearing goggles.

I have also observed that the man who has to wear goggles with prescription lenses, somehow or other overcomes all the difficulties that these other fellows complain about.

C. A. De MONGE (Kelsey Hayes Wheel Co., Detroit, Mich.): I want to ask Mr.

Guilbert what type of goggle he uses and whether the company pays the cost of furnishing the goggles?

CHAIRMAN CAMERON: The question is whether or not you furnish prescription goggles to your men, and if so, do you charge them for the prescription or do you furnish them free of charge, and what control do you have over them?

MR. GUILBERT: We furnish everything free of charge.

MR. TRESTRAIL: So do we.

MR. De MONGE: Do you use one type of goggle all the way through?

MR. GUILBERT: No, the fewer types the better, in my opinion. We use practically one type throughout the whole organization with very few exceptions.

MR. BOYLE: Mr. Chairman, have you ever heard of a glass eye exploding?

CHAIRMAN CAMERON: Yes, I have. I think that perhaps a number of people who have worked closely with this subject have heard of experiences of that kind. Does anyone want to say a word about glass eyes exploding?

Goggles to Fit

H. B. BENJAMIN: I happen to have had that experience. I can also contribute something about the man who wears glasses and has to wear goggles over them. For eleven years I have worked with goggles over my glasses. I found that the average goggle is not made to fit the average eye glass. You will notice that those in the audience who are wearing glasses all have different style glasses. If every man wore the same style of glasses it would be easy enough for any goggle manufacturer to manufacture a goggle that would fit over those glasses, but that is not the case. So I took a pair of goggles that looked to me as though they were right, took them apart and I ground out and cut those protective sides to fit the glasses that I had. Now when I go to the doctor to have my glasses changed I take the glasses that I wear at the factory, also the glasses that I expect to wear on the street, and I have him make lenses for each pair of glasses. Then I put my sides back on those glasses.

You have noticed that some of them have high nose pieces and others do not. I happened to be foolish enough to buy a pair of those with a high nose piece one time. So I

took a pair of regular goggles and made a leather nose piece. I cut it out so that it fit properly. I do not use those any more because I like the pair that I made out of the other goggles the best; but I loan those goggles to men who want to visit the department.

As to glass eyes exploding, a glass eye is hollow, like an egg shell. There is a certain amount of air in there that gets hot. In fact, if one is in a very hot place, it almost turns to steam. If you step out into cold air immediately where a cold breeze hits that suddenly, it is likely to explode. I have had it happen three times.

CHAIRMAN CAMERON: That is just the kind of practical experience we need. Thank you.

MR. TRESTRAIL: That is a good argument to convince any man that he should wear goggles.

A Study Resolution

ROY S. BONSBIB (Standard Oil Co., New Jersey): The suggestion was made that this question of the development of proper eye protection should be studied by the National Society. In order to focus the thing, I think it would be well if we could state that it is the consensus of this session that this thing should be studied, possibly through the National Society in cooperation with the National Safety Council, through the Goggle Manufacturers Association, through the Bureau of Standards, and other agencies that are in a position to contribute to the details. I think that should be done because talking is never going to get us anywhere. In order to bring it to a head, I suggest that that action be taken.

CHAIRMAN CAMERON: All right. All in favor of requesting that this group go on record as requesting that the National Society for the Prevention of Blindness, in cooperation with the National Safety Council and the Bureau of Standards and the Safety Equipment Manufacturers Association, set up a technical committee to study types and kinds of goggles for various jobs and that their recommendations be presented before this group at the next Congress, raise your hands. Opposed? It is carried.

MRS. MERRILL: I am glad to have that request.

Job Placement

CHAIRMAN CAMERON: I think that the matter of being seventy or eighty miles away from an eye specialist may be covered somewhat in this next phase of our discussion. "What are the bare essentials that we must know about a man's eyes before job placement?" Dr. Hazlett, would you care to comment on that question?

DR. T. LYLE HAZLETT: I think that most of us are interested in the basic principle of visual acuity, which has more to do with job placement than any other factor. There are a few occupations, of course, where color tests are necessary and also depth perception, but, as a rule, if we have visual acuity we should be able to place a man on such a job that he can carry on without any injury to himself or injury to other workers beside him.

CHAIRMAN CAMERON: There is another question on that same subject here: "To what extent does industry refuse employment to one-eyed men?" Does anyone have anything on that subject? Suppose that a good machinist comes in but he has only one eye? Do you turn him down?

E. F. TINGLEY (United Gas Pipe Line Co., Houston, Texas): We do not hire machinists. We turn anybody down who hasn't good vision to begin with. If they lose their vision while they are working with us, we take care of them from that time on out. We find some job to put them on where they won't hurt anybody, but when you are handling natural gas under high pressures you want the man to see where he is going so that he can take care of the rest of them. We do not have them all under one roof where we can say, "You do this and you do that." We may have a man twenty miles from any other fellow and he has a job to take care of and he must do it.

CHAIRMAN CAMERON: I will ask Mr. Kroger if he will make a contribution on this subject. What do you do with men who come in with defective eyes?

MR. KROGER: The gentleman has stated that we need physically fit men, but I should like to remind you that industry is doing things for a reason, and if they will take a one-eyed man on a certain job or they won't take a one-eyed man, surely something must have taken place in the past to justify such a rule or restriction.

You cannot expect the boss to open a bag and let you dip your hand in as regards every one-eyed man who comes to the gate and asks for a job. We exponents of safety realize that we have a rehabilitation program in our forge plants. Ten or fifteen years ago our eye losses were terrific. Coming to our employment office now and asking for a new job is like asking for three-quarters of the stock in our company. We do not have such a thing as a new employee. The labor legislation took care of that, but we do this: We do not expect our doctor in examining anyone's eyes to tell us where the man should work. We feel that we know what kind of eyes are required on a job. I think it is one of the greatest evils to expect any doctor to know all about what is going on in your shop and what kind of glasses are needed for each job. He is out of order when he attempts that.

If a man coming in happens to be a clerk, we have no restriction against his doing clerical work, or if he happens to be a draftsman. We feel that we are able to take care of such one-eyed men. Our experience in the shop is very much like the gentleman mentioned. Those who have lost an eye while employed by us we will take care of, but we will not take any others. But in my opinion, sooner or later we are going to have to take them, and I hope that we do not get into the national defense program to the extent that we have to take too many until our brethren, the manufacturers, really find something that will take care of the one-eyed man as well as the two-eyed man.

Depth Perception and Color Blindness

CHAIRMAN CAMERON: I have another question in this same field: "Defective eyesight has been named as one of the contributing causes of accidents. Give actual cases where lack of depth perception or color blindness or other defects caused accidents." I understand that Dr. Kuhn is in the audience, who has made quite a study of this subject and I am going to call on her.

DR. HEDWIG S. KUHN (Hammond, Ind.): In direct answer to the question as to whether depth perception has caused accidents, we have so many illustrations in our recent survey of 16,000 individuals and their defects in industry that I could quote them

indefinitely. There was the crane operator who said, after he had had his depth perception and muscle imbalance corrected after six months of training orthoptically, "The fellows under me can now work with safety. When I first came in I could not tell within 20 feet where I was dropping my load. Now I can put it on a dime."

An ingenious safety director in a large corporation who had a man with no depth perception wanted to prove to himself that there was a hazard. So he took away all of the stationary machinery that he could possibly move away, destroying the landmarks with which this man had been working, and he said to him; "Go about your business." But he couldn't drop his load within 15 feet of where he was supposed to after the removal of the permanent fixtures which had guided him in his job.

Now with a crane operator who works with permanent fixtures, that is one thing; with somebody who works with changing conditions, like tractor drivers and automobile drivers, etc., it is another thing; we have never dug out the accident records on depth perception alone. But our charts show how many more people with lost-time accidents did have depth perception defects.

I am going to interject here one or two statements that are, I hope, a contribution to this discussion.

Our obligation to protect the worker's eyesight we feel is greater than realized, and includes, as Dr. Davidson indicated, additional factors besides goggles and the study of accidents and data on acuity. His basis of 8 per cent of serious visual defects was on a compensation basis, whereas 20/20 is taken as normal. Our figure of 15 per cent of serious eye defects is on the basis of what we designate a practically normal vision from industry's standpoint and, therefore, includes also serious eye muscle imbalances which interfere directly from a safety standpoint with that person's job. I think that ophthalmologists can learn and cooperate with management on what an individual's eye should do, because when we are all done figuring it out with management, we have to help them correct them, don't we?

The concept is that visual performance, as Dr. Davidson indicated, is a varying function arising from varying demands of the job. We designate eyes for the job and

I have just two thoughts to contribute to this discussion. The first is that there is a direct correlation between visual performance and accuracy, and accuracy is the same thing as efficiency. The second is a reference to Mr. Cameron's statement of the shortage of skilled labor. I take this figure out of our project:

According to statistics, if the efficiency of the present employed force of skilled labor could be increased three to five per cent, it would cancel out the present lack of skilled labor or the likelihood of such a shortage occurring. Job training inside of industry, plus the proper type of physical examination which includes visual performance as an aptitude test, which means more than acuity, could accomplish this three to five per cent increase in efficiency, and it would do this without any of the personnel problems, dislocations and moving of jobs, strikes, grievance committees, etc. While machine power has been geared up to 90 per cent of its efficiency, human power or efficiency has as yet been geared only to 40 or 60 per cent of its efficiency.

MR. TINGLEY: I do not want you to misunderstand me about not taking people

into industry just because they have one eye. We take clerical workers and people like that with very poor vision if they are corrected with glasses, but it happens that our particular industry is very dangerous.

MR. KROGER: I meant no slam at doctors when I made mention as I did. I will say this to Dr. Kuhn or to any other ophthalmologist, optometrist, or any other man who attempts to make fittings commensurate with the classifications of work, give him to me for six months and let him walk daily with me through the plant and after he gets his mechanical knowledge and education as to what is required of the worker, I will bet my shirt he can fit glasses 100 per cent better than he did.

CHAIRMAN CAMERON: I think that you and Dr. Kuhn should get together, because I think that she also has had a great deal of practical experience. I understand that the National Society for the Prevention of Blindness is going to make available the paper covering the results of a long series of studies performed by Dr. Kuhn to members of the National Safety Council and of the National Society.

Thank you very much for your splendid cooperation this morning.

ADJOURNMENT

Fire Control and Prevention

FRIDAY MORNING SESSION

October 11, 1940

The session was called to order by the Chairman, Roy M. Godwin, Director of Safety, Philadelphia Electric Company, Philadelphia, who presided. Chairman Godwin welcomed the delegates and guests,

briefly stated some of the problems of fire control and prevention, as experienced throughout the country, and then introduced the first speaker.

What Fires of Last Year Have Taught Us

By T. ALFRED FLEMING

Director of Conservation, National Board of Fire Underwriters, New York, N. Y.

In the field of fire control, there has been a rapid evolution. Fire chiefs and firemen are confronted with dangerous conditions never heard of ten years ago. Never in the history of industry have so many fundamental scientific discoveries in processes been made. These have been introduced into our factories, occasionally without sufficient investigation of their chemical reactions under different circumstances. We have thereby subjected both our employees and the firemen who may be called in time of emergency, to extreme danger from conditions which are beyond their control.

Before introducing any new processes which may in any way involve a chemical reaction, every business man should investigate thoroughly all possible chemical changes which may be anticipated. Workmen should be thoroughly acquainted with new elements, their use and the dangers possible, and such information should be conveyed to the fire chief of the city so that he may have time to investigate the fire hazards, inform his men how to proceed in case of fire and give advice as to the safe use or storage of any material involved.

Very large concerns comprising the chemical industry rank foremost in industrial research not only in developing new materials but in safeguarding their processes. The fire chief is concerned chiefly with the smaller manufacturer or the converter who has never acquainted himself with the hazards involved.

A few weeks ago in an eastern hospital, a lady who had entered for a minor operation was killed by an explosion in the rubber container of a cyclopropane anesthetic. This product is widely used in hospitals throughout the country and is considered one of the best anesthetics. It is extremely important that in its use every precaution be taken to eliminate the possibility of static electricity. Unquestionably the incident referred to was caused by static electricity outside of the anesthetic, creating a spark that ignited the gas inside of the rubber container, which ruptured the windpipe and the tubes leading to the lungs. This is the third fatal explosion from this product in one city. Similar tragic results have been found in different sections of the country.

A fire in a shoe store in New York City in March developed an unusual condition. Fire fighting was hindered by huge quantities of smoke which affected the firemen immediately and rendered first-aid and hospital treatment necessary. The loss was exceedingly large for a store of this type because of the inability of the fire department to properly cope with the flames under existing conditions. Various materials besides leather are used in the composition of women's shoes: artificial leathers, nitro-cellulose material used for box toes and heel coverings, bottom fillings, outer soles of crepe and other types of rubber, and various other materials, all put together to make rubber and nitro-cellulose cements. It is easy to imagine the

conglomeration of toxic gases evolved from such a fire.

One of the recent alloys used in industry, particularly in modern airplane and automobile construction, is a product called duralumin, containing from 90 to 98 per cent magnesium, a metal which weighs only about two-thirds as much as aluminum. The main other ingredient in the alloy is aluminum. In the form of lathe turnings, thin sheets, grinding or polishing dust, this metal is readily combustible. Ordinary hand extinguishers employing water, carbon tetrachloride, carbon dioxide and foam, should never be used on fires in this material. Applications of such extinguishing agents will intensify the fire and may cause an explosion.

A junk yard in an eastern city took fire and the fire department immediately applied a stream of water to the blaze in a pile which was apparently nothing but old iron, with oil saturation. There was an immediate explosion and an extremely hot white blaze which drove the firemen away from the property over a block. Not knowing what they had to contend with, they were compelled to protect adjoining property and allow the fire to consume the building and all burnable material on the premises. It was found later that in collecting the scrap some pieces of duralumin had been included from an airplane engine factory located nearby. Sand, talc or powdered stone should be kept near these products as the best extinguishing agent which can be used immediately by the operator.

Modern industry is making use of new fluids besides water and steam for transferring heat. One of these is mercury where controlled temperatures above 750 deg. F. are desired. Certain mineral oils and other organic compounds are used for temperatures between 450 deg. F. and 750 deg. F. With these substances, temperatures above 450 deg. F. can be produced at atmospheric pressure, whereas with steam, this temperature would require a pressure of about 400 pounds. These substances are combustible and unless their use is carefully safeguarded, serious results may follow.

A recent example is a factory in the Middle West where duralumin was used. Due to faulty circulation in one of the boiler tubes a rupture was caused in the fire box. Almost every conceivable extinguishing agency was used with scant results. It is es-

sential when any of these heat transfer fluids are used that the design and installation of the systems be entrusted to none but fully experienced engineers. Proper circulation of the fluid in the boiler and welding of the joints are most important. Steam or foam will extinguish such fires in confined locations.

Four fires in furniture plants in the past year, the last one with a loss of \$450,000, called for an investigation of processes used therein. Due to the recent popularity of bleached wood finishes, it was found that the industry had introduced a product known as hydrogen peroxide. The hazards involved in the process arise from the oxidizing property of hydrogen peroxide and the effect it has in promoting spontaneous heating of lacquer and other finishes. This product is usually applied in a spray booth, or other enclosure reserved for such use only. It is important that in any booth used for this purpose, all ducts and apparatus connected thereto should be thoroughly clean, for the slightest material of a combustible nature left in the area may cause spontaneous ignition.

While discussing finishing processes, we note that some large manufacturers using heavier lacquers apply this product by the spray method at temperatures from 150 deg. F. to 180 deg. F. Steam, hot water, or indirect electric heaters are used for temperature supply. It is claimed for this method that it reduces the number of coats required. Special attention should be given to the heating system used. It should be under thermostatic control and located where spray will not reach it. Precaution should be taken to avoid lacquer deposit on hot piping.

A recent development in the automobile industry has introduced the infra-red light rays for drying and baking lacquers in place of the oven system. This method employs a bank of electric lamps equipped with special reflectors. These lights are played directly on the newly painted section, thus drying and baking the finish. The number and arrangement of these lamps vary with the kind and size of the operation, from a portable bank of ten 250 watt lamps for touch-up and patchwork, to a regular unit of 800 or more. It is important that all such installations be made in strict accordance with National Electrical Code standards and that flammable vapor indicator test be made so that they will never reach the

flammable range of the solvent mixtures employed.

In one of the soy bean manufacturing establishments in the Middle West a fire caused by spontaneous combustion originated in a bin where cakes of soy bean meal were being stored. Around the manufacture of soy bean products we have always considered certain hazards natural—dust explosion, gasoline or hexane gas used as a solvent, and several others—but this is an unusual example of spontaneous ignition. In this operation soy beans were passed through a dryer which removed all moisture, then ground and placed under a press for the removal of the soy bean oil. The remainder in cake form was used for feeding purposes. It is barely possible that the high temperature of the dryer while removing all moisture intensified the oxidizing qualities of any oil that might be left after the extracting process. It is suggested that if a small spray of water had been applied at regular intervals in the storage room, there would have been no fire. The restoration of at least 10 per cent of the moisture would have avoided trouble.

In a very large plywood factory in the Middle West there were three different fires in the sawdust conveyor. These caused considerable alarm, even though they were extinguished before serious loss. The cause was static electricity in the conveyor system, which was entirely remedied by the proper bonding of the pipe and the introduction of CO₂ gas from the regular boiler stack.

We have experienced a great deal of trouble with the early type air conditioning systems and many of the earlier hazards found have been eliminated in the development of air conditioning, which has been used in hotels, theatres and department stores. It is also being applied to industrial operations and frequently without the benefit of any of the later safeguards necessary in such an installation. In a textile plant in Massachusetts, smoke and soot from a burning tar kettle in the yard were drawn through the air conditioning system into the third, fourth and fifth floors of the building, which were deposited on machinery and materials in process, necessitating closing the plant until the equipment and machinery were thoroughly cleaned for continued operation.

In a printing plant in New York State

fire started in the return air duct and spread to the filter which was of steel wool coated with mineral oil. The burning of the filter melted the solder in the refrigerating coils which were installed in the main duct system. This distributed toxic gases from the refrigerator in every room in the building which, coupled with the fire, endangered both life and property.

Besides being used as an anesthetic in hospitals, a new use for ethylene has been found for coloring, ripening and bleaching of different kinds of fruit. This is a combustible gas and will explode when mixed with the proper proportion of air. The limit of flammability is 3.2 to 34 per cent of gas to air. The usual practice in ripening processes is to feed the gas from the outside in a proportion of one part ethylene to 1000 parts of air into the building, thus keeping the mixture well below the explosive stage. It is obvious that no open flame of any kind is allowed within the building. We have many examples of total disregard of these safety features in the record of explosions, fires and deaths which are the result.

Recently in a midwestern city a second explosion within eighteen months took place, completely wrecking a special warehouse constructed for fruit storage. Gas stoves were used for heating and the ethylene tank was placed inside of the building. The first explosion did not seem sufficient advice to the owners so the structure was rebuilt and the same type of installation added. Last December, the second explosion completely wrecked the premises and killed two employees. Common sense would naturally dictate the recommendations referred to above. Heating by steam or hot water is perfectly satisfactory. All incandescent lights should be provided with vaporproof globes, the ethylene cylinders located outside of the ripening room being connected by steel or iron pipes which, of course, should be satisfactorily grounded to remove any static charge.

The hazard of carbon monoxide is as old as fire itself. It is the result of incomplete combustion. Today carbon monoxide is one of the most troublesome poisons in industry for there are few industrial activities that do not at some point offer a poisonous diffusion of this gas. It is chiefly caused by incomplete combustion in forges, furnaces, engines, gas burners and myriad other places. Recent extended applications of gas burning

in industry have increased the necessity for the understanding and control of this hazard particularly where groups of appliances are used.

There is danger to life if as much as .2 to .3 per cent of carbon monoxide is breathed from one to three minutes. Carbon monoxide poisoning is either acute or chronic. Acute poisoning often results in death, but immediate treatment such as removal to fresh air, oxygen therapy, and so forth, often results in complete recovery. Carbon monoxide is treacherous, is both odorless and colorless, hence there is no warning. The younger and more active members of the department are more susceptible to the effects of this gas than the older and more leisurely. The hazard increases with the rapidity of respiration. As the ignition temperature of carbon monoxide is above 1,100 degrees, it accumulates in a building until that temperature is reached and the explosion follows. This is frequently called back-draft.

An incident took place which proves the necessity of proper storage for chemicals in industrial operations in a factory in North Carolina where they were using small quantities of red phosphorus and kept it, with other chemicals, in a cabinet with glass front. In answering the fire call from this location, the volunteer fire department in the regular fire fighting operations broke the glass front and the force of the stream swept the chemical bottles to the floor. Members of the fire department in extinguishing the last remnants of the fire, stepped on these chemicals and on their way back to headquarters found their rubber boots had taken fire from the phosphorus on the floor. The fire burned intensely and six persons were seriously burned before it was

possible to remove the flaming rubber. In the meantime, the phosphorus remaining on the floor set fire to the plant a second time and the department was so depleted by the accident that the second response was too late and the building burned down.

Years ago specific instructions for proper and safe methods for cleaning tanks used for the storage of petroleum products were issued and widely disseminated. These must have been completely disregarded in the following incident: A seven-compartment rectangular 26,000 gallon tank, installed eight years ago, was being used for different types of petroleum products. One of these, which had been used for fuel oil, was being cleaned. The owner purchased a wooden scoop and a papier-mache bucket with galvanized metal handle. Under the supervision of the owner, three employees proceeded to operate. One entered the compartment through a 16-inch manhole, equipped with harness attached to a safety rope. Another prepared to remove the material as it was handed out, and the third operated the air blower.

The operation had only started when the explosion occurred. The owner, the man in the tank and the one in charge of the air blower were killed. The fourth man happened to be in the adjoining building at the time. The tank had been left open for a period of three weeks, making it possible for the accumulation of gasoline and other vapors caused by the delivery of thousands of gallons of gasoline into the adjoining compartment. There may even have been a small leak from corrosion. The spark may have been produced by contact with the bucket handle to the interior structural supports, or from shoemills, or like contact.

Spontaneous Ignition and Its Control

By A. L. BROWN

Chief Engineer, Inspection Department, Associated Factory Mutual Fire Insurance Companies, Boston

Spontaneous ignition is a common cause of fire.

The importance of spontaneous ignition is shown well by the total estimated fire losses from this cause, based upon fire reported to State and Provincial Fire Marshals. For

the United States and Canada combined these losses total \$15,000,000 to \$20,000,000 annually. Other estimates of the probable annual loss resulting from spontaneous heating and ignition are from 40 to 50 million dollars per year. The U. S. Department of

Agriculture reports as a conservative estimate that the spontaneous heating of hay causes an annual loss of \$20,000,000 in farm property in the United States.

Somewhat more accurate data in a limited field is provided by the experience of about 8,000 large industrial properties, mostly manufacturing plants, insured by the Associated Factory Mutual Fire Insurance Companies. For a recent five-year period (1933-1937) spontaneous ignition was reported as the cause of 760 fires out of a total of 8,514, or a ratio of about 1 to 11.2. This relatively high ratio in comparison with other records is due mostly to a low ratio for other common causes such as smoking, defective chimneys, overheated stoves and furnaces, hot ashes and open fires, which are much more prevalent than they are in carefully supervised industrial properties.

The 1938 nationwide figures for the United States and Canada give an average loss (\$865) caused by spontaneous ignition over twice that of the average (\$415) for all classes of fire losses. In contrast, the average amount of loss in the industrial properties, for the period mentioned, which was \$1,190 for each fire, is only slightly higher than the average of \$935 for all classes of fires.

One reason for the high average cost of the fires occurring in all classes of property due to spontaneous ignition may be that spontaneous heating fires are less likely than many others to be discovered promptly. It also seems reasonable to assume that, in contrast with the high quality industrial properties, conditions under which such fires frequently start are such that automatic protection has not been provided. Also, many spontaneous ignition fires start in large quantities of stored, low value, materials not ordinarily well protected, often arranged so that manual fire fighting is difficult, and which may have little salvage.

Spontaneous heating and spontaneous ignition have not been very well understood, even by specialists in fire prevention. As evidences of spontaneous heating may be obscure after a fire has occurred, it is not surprising that the public in general considers it a somewhat mysterious action, and a cause which often may be given because no other is evident and it cannot be readily disproved.

A not too technical conception of spontaneous ignition might be as follows:

"When a material starts to burn as the result of some action that has taken place within itself, and without having been exposed to flame, spark or other independent high-temperature ignition source, it may be said to have ignited spontaneously."

Usually such ignition occurs only after the temperature of some portion of the material involved has increased rather slowly from a moderate initial temperature until the heated material starts to glow or bursts suddenly into flame.

It is well to point out that not all action which might be covered by the above description is necessarily classed as spontaneous ignition. For instance, the combination of certain chemical substances may produce a very sudden and violent reaction with flame or other indication of fire or explosion. Although such action literally is spontaneous it may be referred to more commonly as a violent chemical reaction.

Although spontaneous ignition must be the result of spontaneous heating, not all spontaneous heating results in actual ignition and burning. Several factors, largely controlled by local conditions, determine whether or not actual ignition and fire result from the spontaneous production of heat.

A number of natural processes produce heat. With our present knowledge of natural phenomena the more important may be classed as chemical, physical or mechanical, and bacterial, the latter being most often disclosed as fermentation or decay.

It is well to keep in mind that many spontaneous heating processes produce heat at a very low rate. If temperatures sufficiently high to cause ignition are to be reached, the nature and the condition of the material producing the heat must be such that the heat is confined. It will then be expended to a large extent in increasing the temperature of the material. If the heat is dissipated into the surroundings as fast as it is produced, no dangerous, or even appreciable increase in temperature will be evident.

The most common chemical action producing heat is oxidation. Many natural substances have a tendency to combine with oxygen and it is common knowledge that a large amount of heat is produced when some substance like acetylene gas, gasoline, or carbon in the form of coal or coke, oxidizes

or burns completely. When we speak of spontaneous heating we do not refer to this rapid and complete oxidation but rather to a lower degree of oxidation which goes on slowly and often unnoticeably at temperatures far below that at which active burning will take place. As an extreme example, the surface of iron when exposed to a moist atmosphere containing oxygen reacts with the oxygen slowly forming iron oxide, or the common iron rust. The spontaneous heating of piled bituminous coal is a good example of a favorable relation between the composition and fineness of the coal, the access of just the correct amount of air and the insulating effect of a large mass of porous material.

Among common materials often found under conditions favorable to spontaneous heating are certain oils which have a particularly strong tendency to combine with oxygen, such as linseed oil or other so-called "drying oils" commonly used in paints, and also other vegetable and animal oils. Mineral oils in the class of kerosene or lubricating oils have such a slight tendency to combine with oxygen under ordinary temperature conditions that spontaneous heating does not occur. Lacquers and other quick-drying finishes usually harden as the result of evaporation of volatile solvents. Neither the base material nor the solvent need to be of the drying oil type but sometimes materials subject to spontaneous heating are used, so that such materials cannot be given any general classification as to spontaneous heating tendency.

The heating of a pile of moist hay or decaying vegetable or organic matter is usually an evidence of bacterial activity. This spontaneous heating is of a type that does not proceed directly to the point of starting a fire because bacterial action is usually automatically killed when a prolonged temperature of more than 100 degrees F. is reached. If temperatures exceed this it is usually because the initial bacterial action has produced new substances and induced the more dangerous heating associated with oxidation. This can continue to a dangerous temperature after bacterial action has ceased. Hay and other agricultural products are subject to severe damage by spontaneous heating even if fire does not occur in all cases.

A not unusual type of spontaneous heating which probably should be classed as physical rather than chemical, is that resulting

from the absorption of gas by the surface of some solid materials such as freshly formed charcoal. At the start of this action no chemical combination between the gas and the carbon is known to occur but the solid material may absorb a considerable volume of oxygen or other gas and in doing so a rise in temperature results. If heat retention conditions are favorable, active chemical oxidation may be started and fire result.

Many factors affect the progress of spontaneous heating and all of these have not been sufficiently investigated to be well understood. Some products formed in the early stages of heating unquestionably act as catalyzers to speed up the process which originally formed them. Even the presence of moisture in proper proportion, or any oxidizing agent or source of oxygen may aid the start of spontaneous heating. If spontaneous heating is to be prevented, it is essential to know what materials and what conditions are most likely to produce it.

Recognized testing laboratories specializing in the study of fire hazards have developed tests which they believe give results representative of field conditions responsible for fires. Bibliographies of Spontaneous Ignition obtainable from the National Protection Association, the Factory Mutual Laboratories, or the Underwriters' Laboratories afford many references to a wealth of interesting and informative material.

One type of spontaneous heating particularly troublesome to identify and reproduce in laboratory tests is that which occurs in large bulks of material not ordinarily considered subject to spontaneous heating. These materials may be baled textile fibres, baled rags or waste paper, bagged or bulk materials such as oil bearing seeds, or prepared animal feeds, and processed materials such as chemicals, building and insulating materials, or coated and impregnated products, some of which may be packed or stored while still warm from a manufacturing process. Unless it is positively known that the material used in the small scale laboratory tests is exactly like that being represented, negative test results cannot be considered conclusive.

The prevention of fires from the spontaneous ignition cause is simple in principle. Although rules such as that of keeping oily rags in safety waste cans until they can

be safely and promptly disposed of will avoid fires due to carelessness in handling this class of dangerous material, the real preventive process is the old one of general education, that is, knowledge of what kinds of materials and what conditions favor spontaneous heating and then avoiding the combinations of these which experience or test show to be the most troublesome.

From a practical point of view there are a small number of these combinations responsible for a large proportion of all spontaneous ignition fires.

When present in bulk, oils cannot heat enough spontaneously to cause ignition. It is only when the exposed surface is great and heat retention good that trouble occurs. Almost any spongy or loose material having an oil subject to spontaneous heating spread through or on it is inherently dangerous. In some industrial processes it may be necessary to have such combinations; for example, textile fibres or fabrics may be treated to improve manufacture or handling, or to produce insulating, decorative or moisture-resisting qualities. In such cases some choice may be possible in selecting the treating materials and unnecessarily dangerous ones avoided. Tendency to heat spontaneously can in some cases be reduced by diluting the worst offenders with some much safer materials. Such possibilities must be investigated by trial and test.

If hazardous combinations must be used, the manufacturing processes should be carried on with this in view, accumulations of lint and waste carefully avoided and the stock allowed to have all of its "heating action" take place in advance of any accumulation in rolls or piles. Careful watching may be needed for a considerable period to be sure that heating does not develop.

Spontaneous heating is greatly aided by high initial temperatures. Many materials which will not give any indication of trouble at ordinary atmospheric temperatures are certain to heat spontaneously if they are warm or hot. Finishing or curing processes very frequently include a heating or baking treatment. If so, safe oven temperatures must be selected and carefully maintained. There is a natural conflict between the desirability of high treating temperatures to speed up processes and the danger of such temperatures in inducing spontaneous heating. Even if fires do not result, the product may be ruined, and in this case it is cus-

tomary to consider that the loss is a "process loss" and not a "fire loss," a feature which may be quite important from an insurance point of view. Excess temperature alarms and special provision for heat control and ventilation are often arranged to guard against spontaneous ignition fires in ovens and dryers.

When the processing of any combustible material or any other material subject to spontaneous heating is completed at an elevated temperature it is essential to let the material cool to normal temperature by exposing it in such a way that the heat loss from the surface can be rapid and direct.

The spontaneous heating of coal is almost a problem by itself. As it affects the ordinary user, the tendency to heat spontaneously is limited to soft coals and is not present in anthracite coal or in coke. Although the tendency to heat is influenced by the composition of the coal, the usual analysis is not a sure indication.

The amount of sulphur is often considered an indication of spontaneous heating hazard and possibly it is as adequate for this purpose as any other that can be as easily secured. Sulphur itself is not subject to spontaneous heating so that it is some related quality which appears to accompany a high sulphur content that is really important. Other better indications are not well understood or easily determined. One per cent of sulphur is usually considered the value on the borderline between safe and unsafe coal.

A proper method of storing coal is just as important as are means taken to prevent spontaneous heating of other materials. Access of air to the interior can be greatly reduced by spreading the coal in horizontal layers so that the lump and fine portions will be mixed and not segregated as occurs when the coal is just dumped in a conical pile which leaves the fine coal in the center while the lumps roll down the outside to the ground forming a very porous base. Compacting the coal, as is done if it is spread with a caterpillar tractor, is an important secondary measure.

The temperature in large piles of soft coal should be watched closely by thermocouple thermometers in pipes driven into the pile. A moderate amount of heating may be expected and does not necessarily get out of control. If a temperature of above 125 degrees F. is reached the pile should be watched with special care. If 150 degrees F.

is exceeded the heating is almost certain to continue until fire develops, so that at this temperature it is advisable to dig out the hot areas. Applying water to the outside of a pile is ineffective in stopping spontaneous heating or fire.

Several expedients have been tried in preventing or controlling spontaneous heating. One large public utility covered a fifty foot high pile containing 120,000 tons with a water and almost air-tight layer of asphalt, applied hot by spraying much as is done in road construction. This treatment actually stopped combustion in one pile and

was considered an effective treatment justified for large piles to be in storage for at least nine months to one year.

Promising results have been secured from the treatment of coal with mineral oil applied in a small amount by spraying while coal is being handled. This has not developed to a state of general adoption.

Small amounts of coal in power house bunkers or bins should not be allowed to remain in storage where its initial temperature may be appreciably above normal atmospheric.

Precautions to Be Taken by Users of Hand Fire Extinguishers

By H. W. LANGE

Assistant Engineer, Underwriters' Laboratories, Inc., Chicago

Hand fire appliances provide the greatest saving of property and life of all fire protection equipment. Fifteen per cent of fires upon which alarms have been given to the Fire Department are extinguished before arrival of Fire Department equipment. Sixty per cent of the fires which the fire department are called upon to control are extinguished with hand fire appliances. Fifty to 90 per cent of all the fires occurring in industry are extinguished with hand fire appliances without the necessity for calling the Fire Department.

In one large industry employing hand fire extinguisher protection, where over 3,000 fires occurred during the course of a year, well over 90 per cent of them were extinguished with hand fire extinguishers. The fires which did not require hose streams involved little or no interruption of business or the losses attributed thereto. The fire and water damage involved in such fires naturally were kept at a minimum, and the consequent losses of life and property were practically eliminated.

The foregoing is mentioned to emphasize the importance of the proper treatment and handling of hand fire extinguishers. If properly distributed, maintained, and used it is possible that their record would approach perfection on incipient fires such as we are at present considering.

The first step, therefore, is to provide the proper extinguishers for the hazard to

be protected. Generally speaking, we recognize three classes of fire, A, B, and C. Class A fires involve wood, paper, textiles, and the like upon which quantities of water are effective. Class B fires involve flammable liquids upon which the smothering action of the extinguishing agent is important; and Class C fires are electrical types requiring a nonconducting extinguishing agent. There are, of course, separate isolated problems. For a complete description of the classification system and the classification borne by the various types of hand fire extinguishers you may refer to Underwriters' Laboratories, Inc.'s "List of Inspected Fire Protection Equipment and Materials."

Spacing is important too, for obviously if a suitable extinguisher is not readily available the incipient fire may soon grow to proportions not controllable with hand appliances. For recommendations as to proper spacing, reference is made to the Standards of the National Board of Fire Underwriters for the Installation, Maintenance, and Use of Hand Fire Appliances.

Maintenance cannot be stressed too greatly. There is a tendency to assume that because an extinguisher has nothing to do until a fire occurs, it does not require attention. Inasmuch as chemicals, pressure, mechanical parts, and other features having a bearing on proper operation are all subject to the ravages of time, and tampering or neglect, it should be obvious that frequent and intelli-

gent maintenance is prerequisite to proper performance.

Having an extinguisher that will perform as intended, another important item is its effective application. Regardless of its availability, condition, or potential effectiveness, all may be lost by blundering application. Furthermore, additional hazards may be created, including danger to the operator. It is such questions with which we are primarily concerned here.

As we have learned, the three major methods of extinguishing fire are cooling, smothering, and separation of flame from the fuel. By cooling we stop the generation of flammable gases, by smothering we cut off the oxygen supply which is necessary for combustion, and by separation of the flame from the fuel success is attained if no other source of re-ignition is present. The various types of hand fire extinguishers possess the above extinguishing characteristics, some in combination.

It is important, therefore, to know by what principle you are attempting to extinguish the fire when applying an extinguisher. Different methods of attack are often required depending on whether you are attempting cooling, smothering, or separation of flame. Otherwise, for example, cooling may be attempted with a device that has little or no cooling effect, smothering may be attempted with a device discharging the equivalent of a thin stream of water, and separation of flame sought with a device that possesses no such extinguishing characteristics.

For example, it is futile to throw a pail of water into a burning tub of oil. In addition to the splashing hazard, if the oil is hot enough, violent boil-over may occur causing danger to operator and to property. That fire is distinctly Class B, requires smothering treatment, or perhaps separation of flame, and use of an extinguisher bearing classification "B" is indicated. Such extinguishers include foam, carbon dioxide, dry chemical, or vaporizing liquid types. If the oil were at a temperature above its autogenous or self ignition point, foam would be most effective, since the others provide only a transient smothering blanket and their cooling effect is not great. If attacking with a foam type extinguisher, the stream should not be directed into the liquid since the force of the stream may throw the burning liquid about, and the foam when emerg-

ing from below the oil surface would be covered with flaming oil, and thus break down rapidly without forming the effective smothering blanket intended. Foam streams should be directed against the far inside wall so as to flow gently back up on the flaming surface.

Directing the stream from a vaporizing liquid type extinguisher into burning liquid is as futile as the similar application of water. While this type extinguisher is effective on small containers of burning liquids when the "freeboard" is at least equal to one-half the diameter of the container, it is necessary to attack by directing a forceful stream against the far inside wall so that the liquid is splashed back into the flame and thus create the heavy, fire smothering gas. Flammable liquid fires involving small quantities of liquid, such as a thin spill fire on motors or on floors, may be extinguished with this type extinguisher by dilution, a less common though useful principle of extinguishment. Larger area fires in bulk liquid (over 3 to 6 sq. ft.) are not generally controllable with vaporizing liquid-type hand fire extinguishers.

Close approach must be made with both carbon dioxide and dry chemical extinguishers which discharge their contents in cloud form. Such clouds are effective in smothering and in separation of the flame from the fuel. When attacking a container of flammable liquid with these types of devices, it is important to extinguish the area immediately behind the front wall, otherwise failure may occur due to reflash over the entire area.

Should the vessel contain burning alcohol, it would be desirable to use one of the latter type extinguishers, since foam is not as effective on the solvent type of flammable liquids as it is on oils, greases, gasoline, etc. Alcohol tends to dissolve foam rapidly and a foam blanket is thus difficult and in some cases impossible to form.

Water or water solution extinguishers should not of course, be applied to fires in live electrical equipment. While tests have demonstrated that hose streams played upon live electrical equipment from a distance do not conduct current back to the nozzle, and this also holds true for spray type nozzles for shorter distances, such attack should only be made with thoroughly trained men under expert supervision. All wet chemical extinguishers are water solution types

excepting the vaporizing liquid type which employs carbon tetrachloride base extinguishing liquid, a dielectric. Carbon dioxide and dry chemical extinguishers discharge a cloud which is less conductive than air.

For the common type of Class A fire, the extinguisher stream should be applied in a systematic manner. Indefinite direction of stream does not give the same effectiveness as planned attack. On vertical fires, attack should be directed at the bottom and progress made upward only after bottom areas have been definitely extinguished. Otherwise, reflashers will soon reach original intensity with portions of the extinguisher discharge wasted. Horizontal fires are properly attacked from the front with progress to be made only after front areas have been extinguished.

There are certain hazardous chemicals which present fire problems separate and apart from any general classification. Those interested in problems involved in fire-fighting phases of such chemicals are referred to "A Table of Common Hazardous Chemicals" prepared by Committee on Hazardous Chemicals and Explosives of the National Fire Protection Association and American Chemical Society.

Because of weight limitations necessary to retain portability, hand extinguishers have very short duration of discharge ranging in general from 15 seconds to one minute, depending on type. For this reason, it is important to know both the characteristics of the extinguisher and its duration of discharge. It is desirable, therefore, not to start operation of the device until actually ready to apply it in a reasonably effective manner. Such reasoning, of course, also presumes acquaintance with the device previous to the emergency, since costly delay will be encountered if it is necessary to study the device while the fire rages.

At this point it is well to point out the dangers involved in breathing fire gases. Each year many firemen lose their lives from this cause, and it has been claimed that loss of life due to fire gases far exceeds loss of life due to flame itself. Contrary to common reasoning, the danger is not confined to the simple lack of oxygen, the gases formed are seriously harmful. In addition, of course, hot gases take their toll. The commonest gases formed are carbon dioxide and carbon monoxide. We like to think in terms of carbon monoxide being

the killer and carbon dioxide the smotherer. Nevertheless, carbon dioxide is a strong ally of carbon monoxide, because in addition to its help as a smothering gas it serves to increase the rate of human inhalation and thus gives carbon monoxide its opportunity of doing harm.

Underwriters' Laboratories, Inc. publishes the following statement in connection with the listings of vaporizing liquid types and carbon dioxide types of fire extinguishers. "In using extinguishers of this type, especially in unventilated places such as small rooms, closets, or confined spaces, operators and others should take precautions to avoid the effects which may be caused by breathing the vapors or gases liberated or produced."

This statement may be considered as applying in the use of any fire extinguishing appliance. A 10-lb. carbon dioxide extinguisher (90 cu. ft. CO₂) while discharging pure carbon dioxide to extinguish a localized incipient fire with a high percentage of CO₂, only increases the CO₂ concentration in a 15 by 15 by 15-ft. room to about 3 per cent. This is about the concentration of CO₂ in the breath normally exhaled, and about the concentration of CO₂ theoretically computable for a small closed bedroom in which two persons have slept overnight.

The liquid from a 1-qt. extinguisher evaporates to about 10 cu. ft. of vapor. When a stream of carbon tetrachloride base liquid is applied to fire, it evaporates to carbon tetrachloride vapor which in contact with flame breaks down principally to chlorine and carbon. Chlorine is the gas which is sometimes administered to break up a common cold. Extensive breathing of it is, of course, not good for the human animal.

Under certain favorable conditions, hydrochloric acid gas in small quantity is generated by the application of carbon tetrachloride to fire. We have also established that under rare conditions involving intensely hot metal surfaces, phosgene is similarly formed, although in quantities hardly detectable by efficient scientific means. The fact, however, that phosgene has been detected has led to many bitter and unfair accusations.

At the beginning of this discussion, mention was made of the serious yearly death toll caused by fire gases. So far as I know, there has never been a case of death defi-

nately traced to phosgene alone as formed by the application of a vaporizing liquid type extinguisher, and there are very few cases where phosgene has been shown to be a factor. This despite the fact that there are millions of vaporizing liquid type extinguishers in service, and that they approximately equal in number all other types of extinguishers combined. In hundreds of fire tests conducted, I and others have been repeatedly exposed for a short time to heavy concentrations of fire gases with and without carbon tetrachloride application. There is no case of any of us having lost a day's work because of such exposure. Reasonably short exposure is one thing, long exposure another. It is agreed, however, that short exposure to hot gases can be quickly fatal.

There are so many factors involved in dangerous fire gases that we should fully consider possible consequences regardless of the extinguishing medium employed.

Let us now take up the problems of maintenance, such as will guarantee safe performance of the unit. All extinguishers should be maintained in working condition by following the Standards of the National Board of Fire Underwriters for the Installation, Maintenance, and Use of First Aid Fire Appliances. The program involves frequent inspection, to establish that the devices have not been tampered with or removed from their designated places, together with definite determinations at least yearly that the extinguishers are in working condition. Pump-type extinguishers require frequent trials to determine that the pumps have not been corroded and stuck. After trials of pump-type extinguishers, they should be placed back in service only after they have been properly attended to, and filled with the specific liquid intended for them. Vaporizing liquid type extinguishers for example, should never be filled with questionable liquid, or liquid which may have been exposed in a manner which would make it possible to contain moisture.

About once every year we hear of an internally generated pressure type extinguisher, such as a soda acid or foam type device, which ruptures when used in the field, sometimes with serious consequences. There are millions of these extinguishers in service, and while such accidents are less than "one in a million," none of us want that type of accident in our plant. The horrid details of such occurrences travel fast, but unfor-

tunately they are seldom accompanied by reasons for the failure. As a result some are inclined to be fearful of applying such extinguishers.

Let us analyze the safety features which are built into internally generated pressure type extinguishers and see what further can be done to guarantee safety in this respect. No labeled internally generated type hand extinguishers have shut off type nozzles, which are involved in many of the accidents. The open nozzle is the "safety valve" for your extinguisher. See that it is not clogged or deliberately plugged, (there have been such cases), and that the screen within the extinguisher at the outlet has full free screening area.

The regular charges for each extinguisher are properly designed to develop less than 100 lbs. per sq. in. pressure under normal operation at normal temperature, and less than the factory test pressure of the extinguisher if the nozzle happens to be completely clogged, the temperature 120 F., and the extinguisher shaken. See that proper charges are used in your extinguishers.

The parts of each extinguisher are properly designed to give the above operating characteristics. The acid feed in a soda-acid type extinguisher is regulated by means of a correct bottle and a correct stopple for the particular appliance. The combination of parts regulates generation of pressure. Break bottle type soda-acid extinguishers are not a labeled type. Regulation of acid flow in addition assures nonacidic discharge. See that replacement parts, if any, are designed for the particular device in question.

Each extinguisher of the internally generated pressure type is factory tested to 350 lbs. per sq. in. Hydrostatic strength tests on labeled extinguishers show an average ultimate strength of from 500 to 600 lbs. per sq. in. Thus an ample margin of safety is built into the extinguishers. Sometimes the strength of these extinguishers is greatly affected by injury in service. This may occur by mechanical means such as being knocked off its hanger, or by expansion encountered by freezing of the solutions. Such damaged extinguishers should be removed from service, and should not be repaired until the cause responsible for their condition has been ascertained. Certain causes, such as freezing, develop permanent weakness which repairing cannot overcome.

An ordinary soldering job is not an ef-

fective way of repairing any extinguisher. See that your extinguishers are not exposed to freezing temperatures unless they are of the antifreeze type. Make sure that repair-

"A Word to the Wise"

The final feature of the program was a sound motion picture, entitled "A Word to the Wise," which was presented by T. L. Osborn, Jr., of the National Retailers Mu-

ing when necessary is done only by a fire extinguisher manufacturer who will frankly tell you whether or not repairing will restore original condition.

tual Insurance Company, Chicago. The picture depicted in graphic style some of the causes of destructive fires which may be controlled by methods of common care and foresight.

ADJOURNMENT

Fundamental Causes of Accidents

TUESDAY MORNING SESSION

October 8, 1940

The session devoted to a discussion of the "Fundamental Causes of Accidents" was called to order by Chairman Edward R. Granniss, Director, Industrial Engineering Division, National Conservation Bureau, New York City, who presided.

The session was planned as a Panel Discussion, conducted by Moderator Granniss, with the assistance of two groups of experts. The first was a Board of Practical Safety Men, including the following:

C. G. Bender, Safety Director, Kellogg Company, Battle Creek, Mich.

L. P. Leonard, Personnel and Safety Director, Blaw-Knox Company, Pittsburgh, Pa.

Charles A. Miller, Assistant to Personnel Manager, The Texas Company, Houston, Texas.

N. V. B. Ziegler, Director, Safety and Compensation, Aluminum Company of America, New Kensington Works, New Kensington, Pa.

The second group was a Board of Experts, as follows:

Psychologist—Dr. C. G. Schaefer, Assistant Professor of Psychology, Extension Division, Pennsylvania State College, State College, Pa.

Medical Director—Dr. Louis H. Frechtling, Director, Department of Industrial Relations, Champion Paper and Fiber Company, Hamilton, O.

Director of Training—F. W. Dalton, Chief, Trade and Industrial Education, State of Michigan, Lansing, Mich.

Consulting Safety Engineer—A. W. Meinke, Superintendent, Audit and Engineering Department, Indemnity Insurance Company of North America, Philadelphia.

After a formal introduction of the members of the two Boards of Experts, Chairman Granniss outlined the method of procedure in the discussion.

Panel Discussion

CHAIRMAN GRANNISS: One of the great weaknesses of our accident prevention work, up to the present time, has been poor investigating, reporting and recording of accidents. The weakness can eventually be overcome only by unanimous use of a system common to all industrial men. Fortunately, through the development of the American Standard Code, accidents can be investigated according to formula, which will make it possible to consider accidents from any source on a common basis with all other accidents.

Here are the seven steps recommended in investigating accidents:

1. The injury first attracts attention and its details, as far as they are known, are written down.

2. Next, the object, tool, machine, building detail or toxic substance that was most closely associated with the injury and which was subject to correction, is named.

3. Following this is listed the part of the object, as the gears on a machine, should a part exist.

4. Next, the investigator notes if the object or its part was associated with the injury because it was unguarded, defective, in the wrong place or otherwise unsafe, and names the unsafe condition.

5. Then comes the identification of the accident type. Did the injured person fall into the machine or was he struck by the object previously named?

6. Next is shown the unsafe act which

precipitated the selected type of accident—the act which caused the injured to be caught in the unguarded gears or to slip on the oil on the floor—if such an act existed.

7. Finally, the unsafe personal factor which brought about the unsafe act—as perhaps lack of skill or poor eyesight—is determined, if possible.

This is the system that has been used by the plant men here on the platform, by which they have named in their accident descriptions:

1. Agency
2. Agency part
3. Unsafe mechanical or physical condition
4. Accident type
5. Unsafe act
6. Unsafe personal factor

That, gentlemen, concludes the preliminaries for our discussion. We will now go on with the work in earnest. The first accident to be reported by our Plant Safety Men will be given to you by Mr. C. G. Bender.

A Locomotive Crane Accident

MR. BENDER: Mr. Chairman, the accident which I am to explain today, and which the experts will pass on, involved a helper on a locomotive crane. During the regular course of duty in our cold storage yards, a locomotive crane started toward the plant. It passed through a switch which the helper threw in order to allow the crane to pass, and then, following the usual practice, the crane stopped a short distance ahead and began to revolve the cab. The last time they saw the helper, he was located at the switch and was throwing it back to its original position. However, as the crane cab revolved the operator heard a yell and realized that an accident had occurred. It was a very serious accident, resulting in the loss of a man's leg.

I have analyzed this accident as follows:

The helper had run to the crane and had boarded the step on the side of the left front part of the crane, and he had been caught between the cab and the crane bed.

My analysis is that the "agency" was the bed of the locomotive crane. The "agency part" was the cab of the crane. Those were the two parts, the bed itself and the cab, which were responsible, of course, for the

injury. The "unsafe mechanical or physical condition" was, first, the position of the step at the side of the crane, which, of course, encouraged the man to board it at that point; and second, the lack of some type of protective apron, which, in case a man happened to board the crane in the wrong position might sweep him off so that only minor injuries would occur instead of a major injury. The man was caught between two moving parts, or at least one stationary part and one moving part. The "unsafe act" was mounting the crane at the side, and the "unsafe personal factor" was inattention.

In regard to prevention of accidents of this type, we must study our problem from two angles; first, the mechanical angle; and second, the unsafe act itself.

In my opinion, the correction of the mechanical faults lie in two classifications. First of all, the step should not have been on the side of the crane bed. In other words, we have an attractive nuisance, you might say, which more or less encouraged the man to get on at the wrong place. Secondly, an apron of some type should have been on the crane so that only minor injuries would have resulted.

In regard to the unsafe act, we considered that, again, this fell into at least two classifications. First of all, it should have been a definite rule that nobody should get on the crane, or no helper should get on the crane, at the time the cab was revolving; and second, there should have been a system of signals between the operator and the helper so that the operator would know where the helper was, before he started to revolve his crane cab.

If those various measures had been in effect before this accident, the accident would not have occurred.

CHAIRMAN GRANNISS: Dr. Frechtling, have you any suggestions as to this first problem?

DR. LOUIS H. FRECHTLING: I should like to ask Mr. Bender if he went back to his initial records of the physical examination of that individual, and if so, what he found?

MR. BENDER: We did do that, and the man was physically fit. There was no physical defect in his body.

DR. FRECHTLING: I am not thinking so much in terms of physical defects as I

am of conditions that existed some time past that seemingly had been corrected. For example; did this man ever have syphilis, or did he ever have a condition which caused him to think less keenly than he previously had, and the like?

MR. BENDER: Of course, we did find several points which might have entered into this particular case. We found that this man was not mentally keen, you might say, because of several home problems which existed at the time of the accident. The man's wife had been in the hospital for four major operations within a period of two or three years prior to this accident. The result was, of course, that he had several thousand dollars in doctor bills to worry about, and that may have been a contributing factor in his accident, insofar as the unsafe act was concerned.

CHAIRMAN GRANNISS: Dr. Schaefer, doesn't this throw the accident more or less into your field? There are some psychological aspects which it might be well to consider.

DR. SCHAEFER: There are several questions I would be interested in asking. What is done about those situations in which you suggest to people that they step on steps, etc., and is there any study made of the negative suggestions, so far as the mechanical setup is concerned, that might cause accidents?

Mr. Bender said that some definite rule should have been made that men should stay off that cab, or that there should have been some set of signals. Whose responsibility is it to make such a rule, and to enforce that rule, or that set of signals? Is it the responsibility of the safety director, or the responsibility of the immediate foreman? Is it the responsibility of the safety director to see to it that the foreman enforces safety rules?

I was also going to ask about any emotional situation that might have occurred, but Mr. Bender has already mentioned that angle. What is done for men who do have worries? You may say, "Well, we don't know about their worries unless they come to us and tell us." I might suggest that every foreman ought to be made aware of the fact that a part of the responsibility of his job is not only handling the material and machinery in his department, but also handling the men—handling is a bad word, dealing

with them is better—and if that is part of his responsibility, then it is also part of his responsibility to find ways to detect those personal difficulties which the men have. The foreman should give the men freedom to come and cry on his shoulder, and one of his principal responsibilities as a supervisor should be to have a big, broad, well padded shoulder on which the men can cry.

CHAIRMAN GRANNISS: I wonder, Mr. Dalton, if there isn't some question here concerning training that you would like to bring out?

Employee Training

F. W. DALTON: Mr. Bender stated that he would devise some employee rules. I would be interested in knowing whether any instructions are to be given as to the interpretation of those rules, even to the point of demonstration as to how those rules may be made most effective. I think we pay too little attention to how safety rules will be interpreted. For example, we put up a sign, or we give out some rules and regulations, and then we assume that we have completed our job. That isn't enough. Rules and regulations concerning safety practices should be demonstrated to employees, or interpreted to them in the light of previous accidents, or possible accidents. It is my opinion that a lot can be done along that line.

CHAIRMAN GRANNISS: Mr. Meinke, is there any physical action that might be called to the practical safety engineer's attention?

MR. A. W. MEINKE: Mr. Granniss, you mentioned, in opening this meeting, that part of our objective is to set up some system, or introduce some system, whereby we can standardize the investigation of accidents. With that point in mind I wonder if there weren't two parts of the agency involved in the accident we are discussing? For example, this man was caught between two parts, the bed and the cab. In connection with the bed, I believe it was suggested that the ladder be removed, so that would definitely relate the accident to the bed. Also, there was an unguarded deck on the bed of the locomotive crane, which should have been guarded with a deck swipe.

In the cab there should have been a rear view mirror. The absence of such a mirror might have contributed to this accident, be-

cause in that case the crane operator couldn't look behind him and see the man getting on the crane.

Another thing, I wonder why this helper was so anxious to get on that crane? I wonder if the crane was rolling, and perhaps turning at the same time? In that event, the operator might have been giving his attention to the turning of the crane, and the helper might have been chasing the crane in order to get aboard before it got too far away.

CHAIRMAN GRANNISS: That raises an important question. We are not only looking for the means of prevention, but we also seek to ascertain whether or not the plant man is properly analyzing the accident according to the rules that are set down by the code. These plant men, of course, have been given a copy of the code so that they may be familiar with the rules.

Perhaps, Mr. Bender, in the light of these questions, you might want to change your analysis of the investigation.

Two Causes

MR. BENDER: I would say this: The crane was not moving at the time of the accident. The usual practice was being followed. The crane was being brought to a standstill before the crane was to be reloaded.

CHAIRMAN GRANNISS: It was a combination, therefore, of an unsafe physical condition of the crane and negligence on the part of the employee.

Before we turn this accident over to the audience for discussion, are there any further comments here on the platform?

DR. SCHAEFER: In looking over the code, I have been impressed by the fact that we are very much interested in the mechanical setup in the causes of accidents. I believe safety engineers have done a great deal in this respect. Due to their vigilance we have reduced accidents very much, but I wonder why we don't include in that code more of the human factors. As it is, we human beings don't know enough about human actions and human nature. Are those factors such variables that they are hard to put our fingers on, or is it just because we have never tried? Why don't we, in reporting an accident, report something of the habit structures of human beings, something

in regard to the matter of attention, etc.? Why don't we give the same weight, or as much weight, to the human factors, or the maladjustments of human relations in correcting accidents as we do to mechanics?

CHAIRMAN GRANNISS: I can answer your question in part, at least. We haven't so far included the psychological factor in our accident reports because many of the men who investigate accidents aren't too well qualified in that respect. It takes a man with considerable psychological training to bring out those factors, the same as it takes a medical man to reveal the unsafe physical conditions involved in the accidents.

Are there any further questions along this psychological line?

MR. BENDER: I would like to ask Dr. Schaefer a question. It is the usual practice, following an accident, to make a written report, which is sent not only to the management, but to all foremen. If a man is handicapped by certain social conditions, such as in this case, would it be a good idea to enumerate them in a report to be sent to all foremen? Is that giving information which might be embarrassing to the man?

DR. SCHAEFER: I suppose it depends, first of all, on how honest we want to be with ourselves in those situations. Secondly, it depends upon how much employee cooperation we can get. I think you safety engineers recognize the fact that there was a great deal of antagonism to some of your work when you started, and there will certainly be more in this case, because you are dealing with the private lives of individuals. But there is so much that can be done without going into the private lives of employees in such a way that you create a disagreeable situation. I think now of studying not only this accident in which a man has lost a leg, but of making a study of your near-accident situations in which you aren't going to hurt any individual's feelings. If you will study those near accident situations, of which there are approximately 50 to every one in which a man is actually injured, you might be able to find those human factors and classify them. When we once get into the habit of accepting those classifications, we will get into the habit of putting them down as causes of accidents. We used to say merely it was the victim's fault, or somebody else's fault. We used to report accidents as being due to carelessness. We have gotten rid of that now. We break it down

into various factors. We have made some progress.

Going back to the question of whether or not we are going to hurt people's feelings, I think perhaps it might be better to hurt their feelings a little once in a while than to put them in a position where their feelings can no longer be hurt, by killing them!

CHAIRMAN GRANNISS: Mr. Meinke, Dr. Schaefer has mentioned the record of no injury reports. You handle thousands of accident reports every month. What would your reaction be to no-injury accident reports?

MR. MEINKE: There is a definite benefit to be derived from investigating no injury accidents. I don't know as I can say any more than that. However, I would like to more or less sum up this case we are discussing.

It seems to me that the provision of a deck swipe on the bed of the locomotive tends to keep men out of the danger zone in similar cases. Also, the removal of the ladder is a good thing. I believe from a practical point of view that Mr. Bender has done enough to prevent an accident recurrence, but it also seems that there is still something further that may be done. We should delve more into the human element in accidents. There is much that we can do in that direction.

CHAIRMAN GRANNISS: Now, gentlemen, we can discuss this for a few minutes from the floor. I wonder what the audience thinks.

C. W. HAMMOND (New York Central System): We have a specific rule that covers such accidents: "Employees must not step on cranes or other cars attached thereto, except when it is required. Ladder may be used only when man on crane is fully informed."

We live up to that rule, and there is no man injured. The employee may not be able to read or write the English language. Therefore, we have rules and we go through all those rules and post them each day, and if a man is unable to read the rules, it is the foreman's job every morning to see that rules concerning him are read to him, and that he understands them.

ANDREW J. PERCIVAL (Westclox Division of General Time, LaSalle, Illinois): I would like to ask Dr. Schaefer if he would

outline some simple steps we safety men could use to bring out those human factors without causing too much antagonism.

The Human Factors

DR. SCHAEFER: I should say that the first job of the safety director in dealing with the human element is to recognize the fact that he, as a safety director, is a staff officer, and that if he is going to keep the industrial organization functioning smoothly, his job is one of study and advising. The man's own foreman should have a good personal human relationship with each of his men. If he doesn't have, he is not making a success as a foreman, either in efficiency of production, or in safety. If he is an effective foreman, then I, as the safety director, have no business saying "I have done this." I must stay in the background and get it done through the only man who can do it, the foreman. I know that hurts my dignity, but there are certain times when dignity ought to be shelved in order to accomplish results.

There are some foremen who are very good production men who are not too intelligent. We will have to recognize that fact. It means, then, that we must study our foreman to see on what level we must approach him, and he must be approached as an individual with whom we have good relations. The problem put before him to solve is not our problem thrust upon him, but his problem in which we are helping him. The foreman has the job of going out to the individual men and knowing those men. He will never supervise them properly unless he knows them as individuals, and knows how to talk to them on the basis of their personal problems. When he knows that, he can put anything across. He can not only train his men in their skills, which we have held him responsible for, but he can also deal with those human elements which may get them into trouble.

C. J. WEATHERSTON (General Mills, Inc., Buffalo, New York): Mr. Chairman, I would like to ask two questions. In the first place, I wonder what we might have done had we known about this man's family condition? Would we have laid him off due to that fact, or would we have transferred him to another job, or just what would we have done regarding that situation?

In the second place, I wonder if it might not have helped if we had had a rule in

effect that the helper had to be in plain view of the operator before the crane was swung?

CHAIRMAN GRANNISS: Mr. Bender, will you comment on the questions?

MR. BENDER: The occurrence of such accidents constitutes one reason why we have personnel departments. The institution of systems by which employees can be helped and advised concerning their personal difficulties has a definite value in the prevention of accidents caused by inattention. Had this man been assisted in this way, his accident might not have occurred. Had I been aware that conditions in his home were such that they were liable to distract his attention while at work, I would have pointed out this danger to him and requested his cooperation for the sake of his own personal safety.

MR. WEATHERSTON: I want to make that just a little more difficult, Mr. Chairman. Let's consider this is the day following his wife's operation, and this man has mental anguish. He just don't know his wife's condition.

MR. BENDER: Of course, that wasn't true in this case.

MR. WEATHERSTON: I want to make it that way, if you don't mind.

MR. BENDER: I think that is a question for the experts to answer.

CHAIRMAN GRANNISS: Would anyone of the experts care to volunteer?

DR. SCHAEFER: One suggestion I would like to make is this: Suppose you have had a lot of troubles, and a lot of difficulties, and you are not very effective in your work, and let's say effective rather than efficient. Suppose then something happened that interferes with your effectiveness. Certainly you don't want to be laid off, even for a day. While by temporarily laying off worried or troubled employees might save those particular men from accidents, the personnel manager is going to stir up so much apprehension in the minds of other men that he wouldn't get them to talk at all, if they felt that having told the truth about themselves they would be laid off for a day. This would be inviting them to button up their lips, and they would just seal the trouble up inside, and have more of it. Under such circumstances, how are you going to learn about your employees' personal troubles?

Let's take the hypothetical case of the operation occurring last night—the employee

not knowing the results, etc. The question I would like to ask is: If you were in that kind of a state, and you knew nobody could do anything for you about it anyhow, because it was your own personal problem, wouldn't it help you to just go to somebody in whom you had confidence and get it off your chest? It seems to me, and I have dealt with a lot of foremen, that those foremen who are most successful in getting effective work done are the boys who are known as approachable people. The men down on the floor will feel free to come to them and say, "Boss, I'm not feeling very good about something today," and it just sort of eases their minds. I know how I feel when I'm in a tough spot. If there is just somebody I can talk to—I am not asking them for any help, I don't want them to pay my bills, I don't even want them to pity me—I just want to tell them about it, to get, since we are social beings, somebody else aware of the difficulties that I am facing. It helps.

CHAIRMAN GRANNISS: Does that answer the first question?

MR. WEATHERSTON: It does very well.

CHAIRMAN GRANNISS: Specifically, the second question is, had the man who was injured been in plain view, so that he could have been seen, would the accident have happened?

MR. BENDER: No. That was one of our recommendations. The man should have been in plain view. After the accident happened, that was one of the things we decided must be done.

A. R. LAUER (Iowa State College, Dept. of Psychology, Ames, Ia.): I would like to suggest, touching upon the remarks made by Mr. Bender, and also Dr. Schaefer, that the personnel man, really scientifically trained, would probably be able to encourage the employee in regard to his troubles. I would like to point out, in the second place, that if the personnel man was really anxious to help, he would have a fairly good analysis of the individual's characteristics. Psychology is one of the greatest factors in keeping us out of accidents. The employee might not necessarily have a weakness, but he would know his wife was ill, and he would be more freely disposed to accidents. If, under such circumstances, the personnel director would take those facts into account and call the man in and say, "Bill, I know your family

is in trouble, and your wife is ill; you will have to be a little more careful. I can't tell you specifically how to be careful, but you just be very careful in anything you do," if he would do that, accidents would certainly be forestalled.

R. A. SCHULTZ (Detroit, Michigan): Handing people a set of rules is not a sufficient safety effort on the part of the director of safety. I feel that each rule should have a separate handling, and that after a man is thoroughly trained and versed in the applications of certain rules, he should sign those rules, only then receiving permission to operate any particular equipment, such as cranes, elevators, and what not. After this procedure, all we need to do is check that the foreman is sure the man is observing the rules. More emphasis should be placed on the individuality of our rules, rather than on just handing out a set of rules.

Steel Plant Accident

CHAIRMAN GRANNISS: Now, gentlemen, we may have time for other questions later. But to carry out our schedule I must now ask Mr. Leonard to give the next accident description.

MR. J. P. LEONARD: Mr. Moderator, the case I am going to discuss was an accident that occurred to an attendant in our steel plant.

The employee was placing an empty sand box between an oven wall and a pile of plates. As the box was lowered to the floor by the crane, the employee held to the side of the box, guiding it into the space between the oven and the pile of plates. The little finger of his right hand was caught between the side of the box and the pile of plates, requiring amputation.

This man could have held the end of the box and thus guided it into place, instead of holding to the side next to the plates. The rules are, and the men are instructed accordingly, to stand clear, and away from danger of being caught by loads; also, to see that hands and fingers are in the clear when moving or replacing loads.

I have selected these as the accident factors in the case: The "agency" was the sand box. The "agency part" was the side of the box next to the pile of plates. "Unsafe mechanical or physical conditions": None. "Accident type": caught between. "Unsafe

act": holding side of box next to the plates. "Prevention": supervision, and enforcement of rules.

CHAIRMAN GRANNISS: Again calling upon our body of experts, gentlemen, who cares to volunteer?

MR. DALTON: I am concerned particularly with the unsafe factor presented here, the willful disregard of instructions. Your first premise is that this individual was in the wrong spot. Some study of that individual probably should have been made. I would like to know if this was his first disregard of instructions. Had he shown any previous tendency not to pay attention to orders?

MR. LEONARD: This man had been in the employ of the company for five years. He was considered a very good man, and was not the type of man who had in the past ignored rules or regulations.

CHAIRMAN GRANNISS: Dr. Frechtling, could there possibly be any physical trouble in this man which might have had some bearing on the case?

DR. FRECHTLING: I would rather say that if you go back and review the accidents you have had in that plant, I am satisfied that in the majority of cases you will find that there exists a definite physical defect. Persons with physical defects ordinarily don't ask for special consideration because of those defects, and yet we are smart when we realize that those defects do occur, and place such individuals in positions where their defects will not work to their disadvantage.

CHAIRMAN GRANNISS: Gentlemen, one thing we don't want to lose sight of in analyzing these accidents, is whether or not we would place the same code analysis on the accidents. We recall that one of the objectives of this meeting is to aid us all in investigating accidents in our own plants, and in reporting them and having them compared with other investigations on the same basis. Mr. Meinke, you are quite familiar with the code. Is there anything here that you would question in the accident analysis?

MR. MEINKE: This is another accident of the type, caught in, or between, and I feel that there are two agencies. One is the sand box, and the other is the pile of plates. If we consider both agencies, we might possibly discover another cause of the accident. For example, I would like to know if the

cause in that case the crane operator couldn't look behind him and see the man getting on the crane.

Another thing, I wonder why this helper was so anxious to get on that crane? I wonder if the crane was rolling, and perhaps turning at the same time? In that event, the operator might have been giving his attention to the turning of the crane, and the helper might have been chasing the crane in order to get aboard before it got too far away.

CHAIRMAN GRANNISS: That raises an important question. We are not only looking for the means of prevention, but we also seek to ascertain whether or not the plant man is properly analyzing the accident according to the rules that are set down by the code. These plant men, of course, have been given a copy of the code so that they may be familiar with the rules.

Perhaps, Mr. Bender, in the light of these questions, you might want to change your analysis of the investigation.

Two Causes

MR. BENDER: I would say this: The crane was not moving at the time of the accident. The usual practice was being followed. The crane was being brought to a standstill before the crane was to be revolved.

CHAIRMAN GRANNISS: It was a combination, therefore, of an unsafe physical condition of the crane and negligence on the part of the employee.

Before we turn this accident over to the audience for discussion, are there any further comments here on the platform?

DR. SCHAEFER: In looking over the code I have been impressed by the fact that we are very much interested in the mechanical setup in the causes of accidents. I believe safety engineers have done a great deal in this respect. Due to their vigilance we have reduced accidents very much, but I wonder why we don't include in that code more of the human factors. As it is, we human beings don't know enough about human actions and human nature. Are those factors such variables that they are hard to put our fingers on, or is it just because we have never tried? Why don't we, in reporting an accident, report something of the habit structures of human beings, something

in regard to the matter of attention, etc.? Why don't we give the same weight, or as much weight, to the human factors, or the maladjustments of human relations in correcting accidents as we do to mechanics?

CHAIRMAN GRANNISS: I can answer your question in part, at least. We haven't so far included the psychological factor in our accident reports because many of the men who investigate accidents aren't too well qualified in that respect. It takes a man with considerable psychological training to bring out those factors, the same as it takes a medical man to reveal the unsafe physical conditions involved in the accidents.

Are there any further questions along this psychological line?

MR. BENDER: I would like to ask Dr. Schaefer a question. It is the usual practice, following an accident, to make a written report, which is sent not only to the management, but to all foremen. If a man is handicapped by certain social conditions, such as in this case, would it be a good idea to enumerate them in a report to be sent to all foremen? Is that giving information which might be embarrassing to the man?

DR. SCHAEFER: I suppose it depends, first of all, on how honest we want to be with ourselves in those situations. Secondly, it depends upon how much employee cooperation we can get. I think you safety engineers recognize the fact that there was a great deal of antagonism to some of your work when you started, and there will certainly be more in this case, because you are dealing with the private lives of individuals. But there is so much that can be done without going into the private lives of employees in such a way that you create a disagreeable situation. I think now of studying not only this accident in which a man has lost a leg, but of making a study of your near-accident situations in which you aren't going to hurt any individual's feelings. If you will study those near accident situations, of which there are approximately 50 to every one in which a man is actually injured, you might be able to find those human factors and classify them. When we once get into the habit of accepting those classifications, we will get into the habit of putting them down as causes of accidents. We used to say merely it was the victim's fault, or somebody else's fault. We used to report accidents as being due to carelessness. We have gotten rid of that now. We break it down

into various factors. We have made some progress.

Going back to the question of whether or not we are going to hurt people's feelings, I think perhaps it might be better to hurt their feelings a little once in a while than to put them in a position where their feelings can no longer be hurt, by killing them!

CHAIRMAN GRANNISS: Mr. Meinke, Dr. Schaefer has mentioned the record of no injury reports. You handle thousands of accident reports every month. What would your reaction be to no-injury accident reports?

MR. MEINKE: There is a definite benefit to be derived from investigating no injury accidents. I don't know as I can say any more than that. However, I would like to more or less sum up this case we are discussing.

It seems to me that the provision of a deck swipe on the bed of the locomotive tends to keep men out of the danger zone in similar cases. Also, the removal of the ladder is a good thing. I believe from a practical point of view that Mr. Bender has done enough to prevent an accident recurrence, but it also seems that there is still something further that may be done. We should delve more into the human element in accidents. There is much that we can do in that direction.

CHAIRMAN GRANNISS: Now, gentlemen, we can discuss this for a few minutes from the floor. I wonder what the audience thinks.

C. W. HAMMOND (New York Central System): We have a specific rule that covers such accidents: "Employees must not step on cranes or other cars attached thereto, except when it is required. Ladder may be used only when man on crane is fully informed."

We live up to that rule, and there is no man injured. The employee may not be able to read or write the English language. Therefore, we have rules and we go through all those rules and post them each day, and if a man is unable to read the rules, it is the foreman's job every morning to see that rules concerning him are read to him, and that he understands them.

ANDREW J. PERCIVAL (Westclox Division of General Time, LaSalle, Illinois): I would like to ask Dr. Schaefer if he would

outline some simple steps we safety men could use to bring out those human factors without causing too much antagonism.

The Human Factors

DR. SCHAEFER: I should say that the first job of the safety director in dealing with the human element is to recognize the fact that he, as a safety director, is a staff officer, and that if he is going to keep the industrial organization functioning smoothly, his job is one of study and advising. The man's own foreman should have a good personal human relationship with each of his men. If he doesn't have, he is not making a success as a foreman, either in efficiency of production, or in safety. If he is an effective foreman, then I, as the safety director, have no business saying "I have done this." I must stay in the background and get it done through the only man who can do it, the foreman. I know that hurts my dignity, but there are certain times when dignity ought to be shelved in order to accomplish results.

There are some foremen who are very good production men who are not too intelligent. We will have to recognize that fact. It means, then, that we must study our foreman to see on what level we must approach him, and he must be approached as an individual with whom we have good relations. The problem put before him to solve is not our problem thrust upon him, but his problem in which we are helping him. The foreman has the job of going out to the individual men and knowing those men. He will never supervise them properly unless he knows them as individuals, and knows how to talk to them on the basis of their personal problems. When he knows that, he can put anything across. He can not only train his men in their skills, which we have held him responsible for, but he can also deal with those human elements which may get them into trouble.

C. J. WEATHERSTON (General Mills, Inc., Buffalo, New York): Mr. Chairman, I would like to ask two questions. In the first place, I wonder what we might have done had we known about this man's family condition? Would we have laid him off due to that fact, or would we have transferred him to another job, or just what would we have done regarding that situation?

In the second place, I wonder if it might not have helped if we had had a rule in

effect that the helper had to be in plain view of the operator before the crane was swung?

CHAIRMAN GRANNISS: Mr. Bender, will you comment on the questions?

MR. BENDER: The occurrence of such accidents constitutes one reason why we have personnel departments. The institution of systems by which employees can be helped and advised concerning their personal difficulties has a definite value in the prevention of accidents caused by inattention. Had this man been assisted in this way, his accident might not have occurred. Had I been aware that conditions in his home were such that they were liable to distract his attention while at work, I would have pointed out this danger to him and requested his cooperation for the sake of his own personal safety.

MR. WEATHERSTON: I want to make that just a little more difficult, Mr. Chairman. Let's consider this is the day following his wife's operation, and this man has mental anguish. He just don't know his wife's condition.

MR. BENDER: Of course, that wasn't true in this case.

MR. WEATHERSTON: I want to make it that way, if you don't mind.

MR. BENDER: I think that is a question for the experts to answer.

CHAIRMAN GRANNISS: Would anyone of the experts care to volunteer?

DR. SCHAEFER: One suggestion I would like to make is this: Suppose you have had a lot of troubles, and a lot of difficulties, and you are not very effective in your work, and let's say effective rather than efficient. Suppose then something happened that interferes with your effectiveness. Certainly you don't want to be laid off, even for a day. While by temporarily laying off worried or troubled employees might save those particular men from accidents, the personnel manager is going to stir up so much apprehension in the minds of other men that he wouldn't get them to talk at all, if they felt that having told the truth about themselves they would be laid off for a day. This would be inviting them to button up their lips, and they would just seal the trouble up inside, and have more of it. Under such circumstances, how are you going to learn about your employees' personal troubles?

Let's take the hypothetical case of the operation occurring last night—the employee

not knowing the results, etc. The question I would like to ask is: If you were in that kind of a state, and you knew nobody could do anything for you about it anyhow, because it was your own personal problem, wouldn't it help you to just go to somebody in whom you had confidence and get it off your chest? It seems to me, and I have dealt with a lot of foremen, that those foremen who are most successful in getting effective work done are the boys who are known as approachable people. The men down on the floor will feel free to come to them and say, "Boss, I'm not feeling very good about something today," and it just sort of eases their minds. I know how I feel when I'm in a tough spot. If there is just somebody I can talk to—I am not asking them for any help. I don't want them to pay my bills, I don't even want them to pity me—I just want to tell them about it, to get, since we are social beings, somebody else aware of the difficulties that I am facing. It helps.

CHAIRMAN GRANNISS: Does that answer the first question?

MR. WEATHERSTON: It does very well.

CHAIRMAN GRANNISS: Specifically, the second question is, had the man who was injured been in plain view, so that he could have been seen, would the accident have happened?

MR. BENDER: No. That was one of our recommendations. The man should have been in plain view. After the accident happened, that was one of the things we decided must be done.

A. R. LAUER (Iowa State College, Dept. of Psychology, Ames, Ia.): I would like to suggest, touching upon the remarks made by Mr. Bender, and also Dr. Schaefer, that the personnel man, really scientifically trained, would probably be able to encourage the employee in regard to his troubles. I would like to point out, in the second place, that if the personnel man was really anxious to help, he would have a fairly good analysis of the individual's characteristics. Psychology is one of the greatest factors in keeping us out of accidents. The employee might not necessarily have a weakness, but he would know his wife was ill, and he would be more freely disposed to accidents. If, under such circumstances, the personnel director would take those facts into account and call the man in and say, "Bill, I know your family

is in trouble, and your wife is ill; you will have to be a little more careful. I can't tell you specifically how to be careful, but you just be very careful in anything you do," if he would do that, accidents would certainly be forestalled.

R. A. SCHULTZ (Detroit, Michigan): Handing people a set of rules is not a sufficient safety effort on the part of the director of safety. I feel that each rule should have a separate handling, and that after a man is thoroughly trained and versed in the applications of certain rules, he should sign those rules, only then receiving permission to operate any particular equipment, such as cranes, elevators, and what not. After this procedure, all we need to do is check that the foreman is sure the man is observing the rules. More emphasis should be placed on the individuality of our rules, rather than on just handing out a set of rules.

Steel Plant Accident

CHAIRMAN GRANNISS: Now, gentlemen, we may have time for other questions later. But to carry out our schedule I must now ask Mr. Leonard to give the next accident description.

MR. J. P. LEONARD: Mr. Moderator, the case I am going to discuss was an accident that occurred to an attendant in our steel plant.

The employee was placing an empty sand box between an oven wall and a pile of plates. As the box was lowered to the floor by the crane, the employee held to the side of the box, guiding it into the space between the oven and the pile of plates. The little finger of his right hand was caught between the side of the box and the pile of plates, requiring amputation.

This man could have held the end of the box and thus guided it into place, instead of holding to the side next to the plates. The rules are, and the men are instructed accordingly, to stand clear, and away from danger of being caught by loads; also, to see that hands and fingers are in the clear when moving or replacing loads.

I have selected these as the accident factors in the case: The "agency" was the sand box. The "agency part" was the side of the box next to the pile of plates. "Unsafe mechanical or physical conditions": None. "Accident type": caught between. "Unsafe

act": holding side of box next to the plates. "Prevention": supervision, and enforcement of rules.

CHAIRMAN GRANNISS: Again calling upon our body of experts, gentlemen, who cares to volunteer?

MR. DALTON: I am concerned particularly with the unsafe factor presented here, the wilful disregard of instructions. Your first premise is that this individual was in the wrong spot. Some study of that individual probably should have been made. I would like to know if this was his first disregard of instructions. Had he shown any previous tendency not to pay attention to orders?

MR. LEONARD: This man had been in the employ of the company for five years. He was considered a very good man, and was not the type of man who had in the past ignored rules or regulations.

CHAIRMAN GRANNISS: Dr. Frechtling, could there possibly be any physical trouble in this man which might have had some bearing on the case?

DR. FRECHTLING: I would rather say that if you go back and review the accidents you have had in that plant, I am satisfied that in the majority of cases you will find that there exists a definite physical defect. Persons with physical defects ordinarily don't ask for special consideration because of those defects, and yet we are smart when we realize that those defects do occur, and place such individuals in positions where their defects will not work to their disadvantage.

CHAIRMAN GRANNISS: Gentlemen, one thing we don't want to lose sight of in analyzing these accidents, is whether or not we would place the same code analysis on the accidents. We recall that one of the objectives of this meeting is to aid us all in investigating accidents in our own plants, and in reporting them and having them compared with other investigations on the same basis. Mr. Meinke, you are quite familiar with the code. Is there anything here that you would question in the accident analysis?

MR. MEINKE: This is another accident of the type, caught in, or between, and I feel that there are two agencies. One is the sand box, and the other is the pile of plates. If we consider both agencies, we might possibly discover another cause of the accident. For example, I would like to know if the

place where the sand box was being set down was the regular location of the sand box?

MR. LEONARD: It was.

MR. MEINKE: Next, I would like to know if those plates were in their regular location.

MR. LEONARD: They were.

MR. MEINKE: It seems that here there was no unsafe physical condition, but it would appear to me that there was a lack of sufficient room for hand clearance. Now, if we think of the agency as the sand box, we might put a handle on the end of the sand box so that the employee could take hold of that handle and keep his hands away from the exposed corner. If we think of the pile of plates as the agency, we might move that pile of plates back. We might even make a mark on the floor, or set up some stakes on the floor, so as to limit the distance those plates could be moved in the direction of the sand box.

We spoke of wilful disregard of safety rules. I wonder if we aren't quite often ourselves to blame rather than the employee? I happen to have something here which illustrates this point. It says: "The rules are, and men are instructed accordingly, to stand in the clear, and away from the danger of being caught by loads." That means loads in general—any loads.

In order to get the most out of accident prevention we should direct employee attention to particular loads, to particular situations. In other words, instead of generalizing we should be more specific. If the employee we are discussing didn't have a specific rule in that regard, he probably didn't wilfully disregard instructions. He just failed to use his mind and associate the rule with the particular hazard.

Mr. Granniss, a minute ago, joined the side of the experts. He said, "I wonder if we had to have the plates there, and if we couldn't have any more clearance, or if we could have provided that man with a glove?" Now, that is another thought on the matter. We want to get all of these angles in order to be sure, and get all the fundamental causes.

MR. LEONARD: Mr. Meinke mentioned that the men are instructed to stand in the clear and away from danger of being caught by loads. He stopped there. I stated further, "Also, to see that hands and fingers are in

the clear in moving or placing loads." He left that out.

Now, in a foundry we don't have a lot of room. As a matter of fact, most foundries are too congested. But get the picture here. Here is a condition that exists. Here is an operation that has been performed time and time again before, and no accident resulted. The plates are piled there permanently. The oven is there permanently, and it was between the plates and the oven wall that the sand box was going to be placed, and the same man had performed his duties many, many times before, and it was felt that there was ample room. The mere fact that the operation had been performed before, and the box had been put in and taken out before, was the reason I said that no mechanical or physical condition existed.

I wonder if Mr. Meinke, realizing that, still feels the same way about it.

MR. MEINKE: I apologize for not reading the whole story, but the fact remains that there was an accident, and we want to do something to prevent recurrence. Now, if you can't have any more room, you can't have any more room, and that is all there is to it. We probably still could put a handle on the end of the sand box.

MR. LEONARD: Pardon me for interrupting you, but the top of that box clear around is about three inches wide. There is a flat surface on the top. It is so constructed that had the man caught the end of the box instead of the side, and guided it in that manner, he would have been all right.

A handle would be very nice, but a handle on a sand box like that would perhaps at certain times and places be a hazard in itself. This man could have taken hold of the top of that box, with that three inch steel piece across it, and guided it safely.

MR. MEINKE: This man had instructions that he wasn't to put his hands in any exposed position while handling boxes? I think my best out on this thing is to turn it over to Dr. Schaefer.

DR. SCHAEFER: There is one thing I am very much interested in, and that is that all of us have accepted wholeheartedly the idea that we ought to get rid of that word "carelessness" in reporting accidents. It isn't in here, except that it just popped up under an assumed name, "wilful disregard." It is another one of those blanket terms. They won't allow us to use carelessness, so we

must break it down into inattention, or a certain pattern of habits, or an emotional instability, or a physical defect, or something of that sort, and it is a good thing to so break it down. But if you will stop to analyze "wilful disregard for instructions," and ask yourself, "What does that mean to me?"; well, it means just about as much to me as if somebody should say to me, "How is an ash can?"

I will have to stop and analyze it first, and if I stop to analyze that term "wilful disregard for instructions," I get what one of the other gentlemen said a while ago. I get the idea that perhaps there is low intelligence, and I haven't adapted myself in instructing this man, to the level of his intelligence. Or there may have been lack of attention, and whose fault is that? Well, it is certainly not the fault of the other person, because there is nothing you or I can do about our attention. Attention only follows objective situations which demand our attention; and if a foreman says concerning his men, or a safety director says concerning his man who has had an accident, "He wasn't paying attention," he is just indicting himself. He must do something to direct employee attention. To accuse the other fellow of not paying attention is just an easy way out, or no out at all.

If the man has a bad habit pattern, it is our responsibility to know that. To say that he wilfully disregards instructions is just indicting the person who is responsible for instructions. That person is not the safety director. It is the immediate foreman.

Then, going one step back, you may then indict the safety director for not understanding his foreman well enough to give him the idea that it is his responsibility to train his men.

MR. LEONARD: Bearing in mind the fact that this man had been steadily employed for five years, and doing this same kind of work every day that the plant worked, and had never met with an injury before, and yet this particular time he met with the injury of which I spoke, what category would you put that in rather than wilful disregard? That is, it is evidence in itself that the man must have paid attention to instructions which the foreman had given him, or he would have met with the injury before. Maybe there is a better term here to use rather than wilful disregard of in-

structions, but he seemingly never disregarded instructions before, and through that period of time he placed that box in there, and took it out each day. Now, how would you explain that?

DR. SCHAEFER: Well, we might say, first, that the fact the man had never had an accident was to be considered as proof that he had at one time paid attention. That isn't necessarily so because all of the factors of an accident situation may exist many, many times without the accident happening, all the factors but one, perhaps.

Let's assume that he had given attention. Let's go back and find out what the chief factor involved in accidents for old employees is, when we break it down into those human factors. Let's assume that the man is intelligent enough to understand the instructions, that the foreman has given the instructions in an understandable way, that the man does not lack knowledge, and that there is no immediate emotional upset at the time. There is one factor which is involved in more accidents for old employees, (and I mean old in terms of service) than any other, and that is momentary lapse of attention caused by a familiarity with the situation that breeds a contempt for it. "I have been here a long time. Nothing has happened to me," is an attitude that dulls attention.

I don't know what you can do about it, but I know you will never do anything about even that factor of inattention, which is probably a difficult one with which to deal, unless you first name it, and you aren't naming it when you just say, "wilful disregard." In fact, besides not naming it, you are actually insulting somebody, either the man who is not wilfully disregarding instructions, or else the person who has prided himself on being a good instructor in having gotten the idea across in the first place, and having formed good attitudes on the part of that fellow.

CHAIRMAN GRANNISS: Dr. Schaefer, in your indictment of the term, "Wilful disregard of instructions," are you criticizing it because the investigation of the accident was not sufficient, or because the term itself is a poor one?

DR. SCHAEFER: I wouldn't care to criticize it on the basis of the analysis. That wouldn't be fair. In the first place, I wasn't there. I don't know how complete that anal-

ysis is. I am merely saying that we have unwittingly chosen a term that defeats us at the outset. It doesn't give us a chance to deal with the real problem. It blankets it, covers it up. We can't do anything with it anyhow, because there just isn't any such thing, on the part of most people most of the time, as wilful disregard of instructions. They just have not been instructed, or if they have been instructed, there has been a lapse of attention, or something of that sort. Once in a great while you will find a person who gets himself into an accident situation who wilfully says "I am going to do this and see what happens," but I don't believe there was anything of that sort in this case.

CHAIRMAN GRANNISS: Then in that case, it is the accident investigation and not the term. If we had a hundred accidents, and many of them were wilful disregard of instructions, and we were sure that the reports were accurate, we would have a very serious situation.

DR. SCHAEFER: That is right.

No Injury Accidents

MR. MEINKE: I was asked about the importance of investigating no injury accidents. That point comes in here, I believe. We owe a great deal to the Travelers and Mr. Himmick for the theory called "The Foundation of a Major Injury," in which a study was made, and they found one major injury to every 29 minor injuries, and to every 300 no injury accidents.

This was a major injury. A man lost his finger. I believe if we could really check into the matter we would learn that there had been some minor injuries in which he just skinned a knuckle, and I believe, also, we would find a number of instances in which the man grasped the corner of the box in an exposed condition, but it so happened that the movement of the box just didn't catch his hand between the two objects.

Maybe instead of calling it wilful disregard of instructions we should say "lack of follow through on instructions." I don't think this man thought about those instructions at all. He was just relying upon his subconscious mind. He grabbed hold of the box and pushed it into place.

When we issue instructions we should also follow through to see that the man knows

why his instructions were given in the first place.

CHAIRMAN GRANNISS: Mr. Ziegler, on the other side of the board, has a comment to make.

N. V. B. ZIEGLER: We are talking about instructions to employees. I am wondering how much actual instruction the average employee is getting. We can instruct our safety committee members, and we can instruct our foremen. We have that pretty well covered. But in my place, at least, and I imagine it is true with all other safety directors, we have a great deal of trouble in getting definite safety instructions and information down to the last man on the floor.

Is it right to give a man a lot of rules maybe ten years ago, or five years ago, and expect him to remember them, and always be governed by them? We are in the habit of forgetting, unfortunately; we fall into habits of all kinds. Therefore, it seems to me that if we do not tell the story over and over again to our employees, warning them about the dangers and the hazards, and calling their attention to the fact that they must always be on guard, if we don't get that message to them pretty often, we are not going to solve this problem.

In our own plant we are solving this problem to some extent by having small group meetings all over the plant, conducted by the foremen, and sometimes by the safety committee members, and very often by the employees themselves. We have small group meetings day and night, twenty-four hours a day, maybe once a week, or once every two weeks, and in some departments, once a month, but we get the information to the individual so that he always is kept in the habit of thinking of safety. We do not allow the employees to get away from that idea of safety.

CHAIRMAN GRANNISS: If there are no further comments from the platform, then, gentlemen of the audience, the accident is yours for discussion.

MEMBER: Was this the first time the employee had his hands on the end of the box instead of on the side of it?

Could it have been set on the floor in such a position that he couldn't put his hands on the side of the box, and therefore would have to put his hands on the end of the box?

MR. LEONARD: All we have to guide us is that the man himself told us that he always held the end of the box. As far as anything being on the floor was concerned, I wasn't there at the time of the accident. The floor was clear with the exception of those plates. In other words, there was no obstacle to interfere with the man's standing in a position where he could be guiding the box from the end instead of from the side.

MEMBER: Why don't they make the boxes so that they can't get hold of the end or the side? It seems to me that is important. A careful study of these boxes might prevent such accidents. Perhaps somebody slipped up on how the box should be constructed.

CHAIRMAN GRANNISS: The suggestion is made that possibly the box might be redesigned so that the operators couldn't take hold of it in an unsafe manner. I believe that is a thought to take home with you.

MR. LEONARD: Yes, I appreciate that thought. But I must point out that these boxes get heavy usage and some of them are pretty heavy. I still feel that it is a matter of supervision from the standpoint that even if there is a handle or something like that on the box, a man still has an opportunity to do as this man did in this case. Personally, I don't believe that is the answer to the problem.

R. L. SMITH (Local Car Wheel and Railway Supply Company): I can't help thinking that if this working condition can't be changed, and if it is allowed to continue, just by the law of averages, you will hurt somebody else again at that same spot. I have worked a little with my hands, and I know you can't be so perfect that you can keep your hands on a box in a certain place every time, wilfully or any other way. If you are going to pick up a box, or guide a box, you are pretty apt to get on the side, as well as push on the end.

MR. VERNON (Citizens Gas and Coke Company, Indianapolis, Indiana): Isn't it a fact that the man, in handling this box, was very expert? He had done this job hundreds of times. Isn't it true, then, that there is something in that case that decidedly belongs to the doctors on this end, some mental quirk that would have permitted him to take hold of the side of the box, which he says he has never done before, although it

is quite probable that he had done it many times, and gotten away with it? Isn't there some mental thing in this that is the answer to this question?

MR. LEONARD: I quite agree with you. CHAIRMAN GRANNISS: Dr. Schaefer, do you want to answer this question?

DR. SCHAEFER: As the old Quaker said to his wife, "Methinks perhaps the whole world be a little queer, except me and thee, and sometimes I have my doubts concerning thee." So perhaps we can say we all have those lapses of attention.

Let's assume that the man had been properly trained and instructed, and he usually paid attention, and usually did put his hands on the end of the box, and when he put them on the side, he didn't recognize the fact.

I suppose it is perfectly possible for us, when the situation is a little different than usual, to do things a little differently, and I don't know that we can meet that problem. The best thing we can do is observe men in their general habits, and also in their habits concerning specific things. If we find that a man is in the habit of putting his hands on the side of the box, and getting away with it without getting hurt, then we had better change that habit pattern, which is a difficult thing to do because it is hard to change habits.

I don't know that we can prevent every accident, but we can aim at preventing a great many of them if we will watch those habit patterns as they are formed. That looks to me to be the job of the immediate supervisor, to study the habits men have as they perform their work, and to make them aware that they have habits which are unsafe. They may not even know they have these habits, just as I don't know which arm I put into a coat sleeve first, although I am sure, from my study of habits, there is one I always put in first.

A Truck Driver Accident

CHAIRMAN GRANNISS: The next man on the plant staff is Mr. Charles A. Miller, who will analyze an accident for us.

CHARLES A. MILLER: Mr. Chairman, the case I have here today is perhaps very common with all of us, as most of you in the audience drive a car.

We have a truck operator in our company

who has been in our employ for 18 years. We have a system whereby we award "safe driving" buttons. We started this some five years ago, and this man had a clear record up to the time of his accident, and received his award each year. But on this particular day he was returning to the bulk station after completing deliveries. It was his last call for the day. He was driving along a straight road, and he came too close to the curb, and the truck wheels hit the curb, which caused the steering wheel to spin. He severely wrenched his shoulder to the extent that he lost some ten or twelve days' time. These are the agencies under which I have classified this accident:

The "agency," of course, was the tank truck. The "agency part" was the steering wheel. The "unsafe mechanical or physical condition" was the hazardous proceeding. The "type of accident" is struck by. The "unsafe equipment" was using equipment unsafely; and the "unsafe personal factor" was the failure of the employee to concentrate on the job being performed.

CHAIRMAN GRANNISS: Gentlemen of the Board, you have heard the case. What are your comments?

MR. DALTON: I would like to ask one question. This man had been a safe driver, with 18 years of driving experience. I wonder if in the instructions at any time he had been made to recognize this particular type of hazard—that of the wheel striking the curb and spinning the steering wheel as a result, the effect of speed, or the effect in other ways of driving against the curb?

I have seen a great many books on driving instructions, and I can't recall any attention ever being called to the effect of hitting the curb, and the resulting effect upon the steering apparatus.

MR. MILLER: The speed, according to our investigation, was within the limit, and it is our supposition that had he been going faster perhaps the truck would have glanced off and the wheel wouldn't have spun, but by going slower the wheel spun.

DR. FRECHTLING: Are we safe in assuming, since this man had driven for 18 years without having had a serious accident, that his vision was all that it should have been? Secondly, I should like to ask whether or not the man had been on the job an overly long period, to ascertain whether the factor of fatigue may have been involved.

MR. MILLER: Doctor, he had not been on a long tour, and it was during regular hours.

As to his physical condition, particularly his eyes, he was wearing glasses. He claimed he had some adjustment on his glasses some seven or eight months prior to the accident, but there is one thing which did develop there, to give the experts an insight on this thing. I think the question has been projected here from many angles this morning, and it is a fact that he had sickness in his home, that one of his grandchildren was quite ill. Having been on the job all day, and making his last delivery, he was anxious to get home, and we hit upon the fact that he didn't have his mind on what he was doing.

CHAIRMAN GRANNISS: Dr. Schaefer, I wonder if you have any observations?

DR. SCHAEFER: I don't know how to keep your mind on your work. I suppose that the best fortification in that respect is to give to men, or develop in them, an attitude of safety-mindedness as a sort of general protective habit.

I don't know that this attitude was lacking in this man but safety-mindedness is the best safeguard for an individual, when we can't stand alongside of him and tap him on the shoulder, and say, "Here, now, keep yourself safe."

CHAIRMAN GRANNISS: Getting back to the analysis of the accident, Mr. Meinke, how does the plant safety man's analysis coincide with your ideas?

MR. MEINKE: I believe there was no unsafe condition. Outside of that, I would say the analysis, according to our rules for standard investigations, is O. K.

Now, I may cause a few eyebrows to raise when I say this, but if this man had only one accident in 18 years, we probably shouldn't get too excited about it. We can't control all accidents. We can only try to reduce them. If this were a procedure that happened every year or two, or if a number of other drivers had this same sort of difficulty, then the thing we would look for is what caused this man to turn his attention away from his driving. That is a hard thing to find out, but he might have been under some pressure due to this sickness at home; he might have been hurrying. When you are under pressure, it seems as though some-

body is pushing you, and he might have been hurrying.

With that point in mind, I wonder if he had to swerve to miss some car in the road, a pedestrian, or some other object. If he did swerve, that would cause him to hit the curb.

Another thing that might have happened, we will say, was his doing something like making an entry in his book, something which took his attention away from his driving. If we really want to control this type of accident, that is what we have to find out, just what the driver was doing that took his attention away from his driving.

I notice it says here, "We have carefully stressed safe driving." That is too general, I think. We should stress some particular thing, like "Don't write in the book when you are driving," or "Don't drive too fast through congested districts where you are likely to have to swerve to miss some object, and hit the curb."

CHAIRMAN GRANNISS: Gentlemen, time is getting very short. Have you a couple of questions we can take care of rather quickly?

R. L. SMITH: What was the condition of the road bed, the traffic?

MR. MILLER: It was a main street, with very heavy traffic.

MR. SMITH: The road bed was safe?

MR. MILLER: Yes, it was a good road bed.

CHAIRMAN GRANNISS: Did you check for carbon monoxide gas?

MR. MILLER: No, we did not. He had an open cab, and we didn't check that.

CHAIRMAN GRANNISS: Apparently there is no carbon monoxide in an open cab. Are there any other questions?

MR. STEWART: How about shock-proof steering? Isn't that effective? Wouldn't that be a means of preventing accidents?

MR. MILLER: Yes, our engineers are considering that now.

MEMBER: I wonder if a check was made to determine whether or not he could see clearly, or was there an eye examination?

MR. MILLER: There was not.

CHAIRMAN GRANNISS: Well, gentlemen, we will go on to Mr. N. V. B. Ziegler.

Mr. Ziegler, will you give us your accident description?

Punch Press Accident

N. V. B. ZIEGLER: Mr. Chairman, this has to do with a young lady who got caught between a punch and the die of a single action press, and had the end of her finger amputated. Two girls operate this press. One girl was away from the press at the time of the accident, and the press was not in operation. The injured girl was the operator. She was removing some scrap from the die with her hands when she got caught, the press turning over just once. There were no witnesses to the accident. The injured girl stated she did not know why the press turned over, and she did not have her foot on the pedal.

The agency here is the "press"; the "agency part," the functioning die; the "unsafe mechanical or physical condition," none; "accident type," caught between; "unsafe act," placing hand under die; "unsafe personal factor," violation of rules and instructions.

Careful inspection showed that the press was in good condition, well guarded, entirely safe to operate. We arrived at the conclusion, therefore, that she must have had her foot on the pedal and unconsciously as she reached around behind the guard to remove the scrap the movement of her body caused enough pressure on the pedal to trip the press.

Now, it wasn't necessary for this girl to use her hands to remove the scrap from the die. This is done by a properly formed wire, which was at the machine at the time of the injury.

We placed the blame of the accident almost entirely on the operator. She violated safety rules, and in our opinion, used poor judgment all the way around. The company probably could have extended the guard further around the die, which might have prevented the accident, but even so, the employee had no right to reach behind the guard and place her hand at the point of danger. She should have used the wire hook provided for the work.

CHAIRMAN GRANNISS: From your description I find two very interesting questions which I think will be handled by the experts. First, the guard. Mr. Meinke, I

imagine you have some comment ready on the mechanical protection afforded in this case.

MR. MEINKE: Yes, I would like to ask our friend just what is made on that press? The second question is, (he said it is fully guarded) I would like to know what kind of a guard is at the point of operation? Then I also have in mind that this girl might have taken the scrap on the die and thrown it to the floor and hit the pedal. I wonder if there is a pedal guard?

MR. ZIEGLER: There is a small enclosure, a bottle cap, we call it, for ordinary work. (But don't think of beer bottles right away, think of milk bottles.) The press was guarded sufficiently in the front, and on both sides of this die, so that the operator could not get into the die from the front or either side. She had to reach around behind it and come into the press from the rear, and get her fingers in under the die from the rear. This was absolutely unnecessary.

Then, she didn't use the little piece of equipment that is provided for removing small pieces of scrap from the die. She just took her hands, thinking the press was standing idle anyhow; she took a chance, and got her finger taken off.

MR. MEINKE: The other question was about the pedal guard.

MR. ZIEGLER: No, there was no so-called guard on the pedal itself. I wonder if there is such a guard made.

MR. MEINKE: A pedal guard is just a bent piece of metal that extends over the pedal, so that in the event a worker should bring a box of work over and set it beside the press, that box couldn't accidentally trip the press.

MR. ZIEGLER: There wasn't any box around. We think she must have unconsciously had her foot on that pedal, and as I say, the pressure of her body in twisting around and getting in behind to reach in under the die just might have caused enough pressure to make this press trip just once.

CHAIRMAN GRANNISS: Are you satisfied, Mr. Meinke?

MR. MEINKE: No! Was this young lady standing in front of the press, or behind the press when she reached in behind the die?

MR. ZIEGLER: She was in front of the press, and she reached around in back of the guard.

I made the statement that perhaps the company was a little at fault in not running the guards a little further around, but there is a condition where you must get into the rear once in a while in taking the scrap out, and we have tools for that purpose, and that is the reason the guard was not fully covering the press.

MR. MEINKE: I wonder if it would be worthwhile to extend the guard to the rear?

CHAIRMAN GRANNISS: We will assume that you have been altogether satisfied that a perfect job was done in guarding the press.

The second opening we have, Dr. Schaefer, leaves you an excellent opportunity here. Mr. Ziegler said they placed the blame wholly on the operator for this accident.

MR. ZIEGLER: No, I said *almost* wholly.

CHAIRMAN GRANNISS: All right, "almost wholly" on the operator.

DR. SCHAEFER: Mr. Ziegler knows exactly what I am going to say.

I have told him many times that there is no question of placing the blame wholly upon anyone when it involves dealing with the employees. I don't care how much personal responsibility the workman has, it is still absolutely impossible for the supervisor of that individual to dodge, to delegate any of his own responsibilities in a training set-up. Whether or not the supervisor can train all employees so that they will develop the proper habits, I don't know, but I know a much better job could be done.

You may say this person individually disregarded all of the things she should have done, but that does not say that you place the blame wholly upon her.

MR. ZIEGLER: I said "almost wholly."

DR. SCHAEFER: It doesn't say you even placed the blame almost wholly upon her. You can never escape the responsibilities which you have, even though you may not have clearly stated them for yourself. They are still there, and one of the responsibilities of every supervisor in industry, both moral and legal, from the top down to the bottom, in line supervision, is the safety of employees, and the responsibility for doing everything that it is possible to do to train each individual to be safe.

Going back to something I stated before: most of us who are safety directors, have

made the assumption that it is our job, and that we will do that training. The only job we have is to advise the supervisor as to the best methods by which he can do it, because in the final analysis, he is the only one who can do it; and that responsibility for training is there, no matter how much responsibility you place on the employee. I happen to know there is a lot of that training done at the Aluminum Company.

MR. ZIEGLER: Right. I agree with Dr. Schaefer. That training is necessary. But I also want to say that these girls are being constantly trained by their foremen, by their night superintendent, and also through the efforts of the safety director, to never, under any circumstances, put their hands under these dies. But this girl did it anyhow.

CHAIRMAN GRANNISS: Of course, the natural question then is, if it is never necessary for girls to reach around the dies, why not extend the guard all the way around so it wouldn't be possible?

MR. ZIEGLER: That is a fair question. I explained that it is necessary, because quite frequently the material we are punching out is light, and sometimes it lodges in

the die; you have to get it out of there; so we have a piece of steel, bent at the end, the proper tool for that purpose, and that tool is always at all times on the press. That is the reason we don't have the presses closed from the rear. But the girl didn't use the tool!

That may or may not be an agent, or reason, but that is the way it is. The die is three-fourths of the way closed.

CHAIRMAN GRANNISS: Dr. Frechtling, you undoubtedly have something to say on this particular item.

DR. FRECHTLING: It seems to me that there can't be any marked physical defect that might have been responsible. Again you must consider the problem of fatigue, fatigue that sometimes comes from a glare from the material that is being used. Sometimes that may come from imperfect lighting on the object on which you are working. Those things must be taken into consideration.

CHAIRMAN GRANNISS: Mr. Dalton, have you any comments?

MR. DALTON: All I can say is I don't like to see that kind of a press.

ADJOURNMENT

Governmental Safety Service in Industry

TUESDAY MORNING SESSION

October 8, 1940

The session was called to order by the Chairman, Voyta Wrabetz, Chairman, Wisconsin Industrial Commission, Madison, Wis., who presided. In his opening remarks the Chairman discussed briefly the scope and importance of the service which government

is capable of rendering the various industries in the prevention of accidents, and particularly in assisting in the organization of standard safety measures. He then introduced the speakers in order, as follows:

Safeguarding Manpower for Greater Production

By V. A. ZIMMER

Director Division of Labor Standards, U. S. Department of Labor,
Washington, D. C.

We are today engaged in the greatest safety campaign in the history of the world, a 10-billion-dollar campaign. Upon its success depends the security and the welfare of every man, woman and child in the western hemisphere.

In comparison with this colossal undertaking for the safety of civilization, any effort to save the lives and limbs of a few thousand human beings may to the superficial mind, seem trivial. In reality the reverse is true. Never has there been more urgent need for safety action than now. Wars today are won or lost in the factories. Planes, tanks and guns are factory products. Lost man-hours in the factory may mean lost battles in the field. Aircraft on order cannot repel enemy bombers. Unfinished tanks are no protection against a mechanized invading force. They are effective only when actually on hand and ready for action.

These vital implements for defense are fashioned out of raw materials by human hands skilled in craftsmanship and trained in production methods. Here in this country we have raw materials aplenty; a supply practically inexhaustible. Too, we have

ample manpower to operate our war implements, even against the rest of the world, if necessary. But our supply of trained mechanics is certainly not limitless, and indeed may not be ample if we are negligent in safeguarding against accidents and health exposures under a vastly accelerated pace of production.

Accidents and other employment hazards under ordinary operation of American industry annually cause about 16,000 deaths and one and a half million disabling injuries. These disabilities result in a billion and a half lost man-hours of production. Moreover, thousands of these disabled workmen suffer permanently crippling injuries which not only make them ineffective for any future skilled production work, but also render them unacceptable for any active military duty. No country can afford this labor wastage when preparedness production is working against a deadline.

As it stands today under plans and appropriations already made, this defense program will involve the employment of an estimated 4,500,000 men, over a period of four to five years. Of these, 3,000,000 will

be skilled or semiskilled workers, and only 1,500,000 will be classified as unskilled. How to get and how to keep this vast army of trained men in continuous, uninterrupted production is the essence of the whole defense problem.

It is imperative, of course, that we immediately speed up our processes for training more mechanics to keep pace with the demand for more output. Fortunately plans to this end are already well advanced, plans which are sufficiently broad in scope to insure a continuous source of supply upon which industry may draw. The United States Department of Labor has its particular part in the concerted drive to develop more resources of sound craftsmanship so essential to the production of needed implements of defense.

It has already, under the sanction of the Congress, expanded its apprenticeship promotion functions and is devoting its full facilities to the development of apprenticeship programs in industry. The Office of Education, the CCC, the Youth Administration, and the WPA are all engaged in building up a reservoir of trained production manpower. But while we are setting in motion the machinery to augment our skilled labor supply, we must concurrently make every effort to avoid the unnecessary loss of men who are already skilled, and who are now engaged in important productive work. Mechanics are not made overnight. It may sharpen this point to keep in mind that four years' time is needed to turn out the full-fledged machinist, which incidentally is exactly the time required to produce a junior army officer in our greatest military school.

And incidentally, just as the officer is the key man in his unit of the Army, so is the skilled mechanic the key man in the production unit. Replacement of either is too costly to be lightly regarded.

Fortunately there is no reason why industrial accident and health hazards should continue to sap our supply of skilled workers. Every experienced safety man in the country knows by experience what are the prevailing causes of accidents. They know that every work accident has a definite cause, and that usually it is one that can be easily remedied or corrected. Those men know well that the old adage "Accidents will happen" is true only if there has been failure of management to provide safe condi-

tions, or failure of workmen to observe safe work practices. The substantial truth of this statement has been proved by the experience of scores of our leading industrial enterprises. Many of them have almost completely eliminated lost-time injuries incident to work operations simply by diagnosing the accident causes and then removing the causes.

These results were not obtained through the use of secret formula, patented processes or highly technical procedure, but through a practical common-sense application of knowledge acquired through experience and intelligent observation. The only kinship to genius about these successful programs lies in the fact that safety, like genius, consists of infinite attention to detail.

There would probably be no reason for the present concern about the conservation of manpower in industry if the safety lessons learned and applied by some of our largest concerns had inspired the majority of our industrial enterprises, including the large number of relatively small units, to follow suit. Unfortunately this is not the case, as shown by reference to the annual toll of deaths and injuries. These heavy casualties plainly are occurring in the many operations wherein management, for one reason or another, has failed to adopt sound accident prevention methods.

We have already entered the first phase of a vast preparedness program which probably will not reach its peak for another year. Contracts for goods and supplies are being widely distributed among relatively small industrial units; new workers are being brought in; older and more experienced mechanics are being recalled after a long period of idleness or intermittent employment. Thus we have the "green" and the "rusty" worker facing new and unfamiliar hazards, often brought about by changes in processes and methods.

Records have shown clearly that work accidents and injuries occur most frequently among newly employed workers. The recent report of the Bureau of Labor Statistics shows that industrial employment in this country increased approximately one-half million in the month of August, an increase larger than in any similar period since 1929. Along with the increased accident hazard incident due to this great influx of new workers, it can be expected that as the

tempo of production increases, a substantial increase in accidents may be expected, even among the seasoned plant personnel.

In the main, labor wastage through work injuries is largely a small plant problem. If we can prevail upon these smaller enterprises to adopt and apply preventive methods, so successfully used by leading industrialists, we will be able to reduce materially, or even eliminate the multitude of disabling injuries which fashion a dragline on production.

With this thought in mind, the Secretary of Labor recently developed and announced a plan whereby any industrial unit in the United States, no matter how small, that is engaged upon Government contracts, can, without cost, have the advice, the counsel, and the technical services of leading American experts in the field of accident prevention. Under this plan these experts will not be supplied from Washington. They will be supplied by industry itself.

From some of the foremost industries in different sections of the country the Department of Labor has secured the voluntary service of a group of highly trained, thoroughly experienced safety engineers, who stand ready to serve the Government and the Defense Program. These experts have placed their services at the disposal of any plant management producing goods or materials for the Federal Government. They stand ready to go into the shops and factories, and upon request, to appraise existing health and safety exposures, to analyze the conditions, and to give to management detailed advice on the correction or control of these exposures. They will aid in setting up and instructing plant safety committees; they will advise about methods of educating employees in safe work practices; they will suggest means for gaining the workers' cooperation in accident programs.

In short, these safety specialists from within industry itself, will bring to small operators everywhere exactly the same talent and technique with which large industry successfully combats these human losses.

I should like to make clear that this is not a policing project. Our voluntary safety experts are not enforcement officers; they are not factory inspectors. The plan does not supplant the regulatory authority of the States as applied to all work places. It is expected that plants operating on Govern-

ment contracts will continue to comply with all of the requirements of the States in which they operate. Neither does the plan add any irksome or restrictive regulations to any existing Federal standard. It simply brings into play along our entire defense production line the highly specialized engineering and educational facilities which can be expected to wipe out that persistent enemy to the smooth flow of production, namely disabling injuries of our trained workers.

Perhaps it would not be an overstatement of the situation to term this project an all-profit pool, in which the Government, management and labor participate and share equally in the benefits. Management profits through uninterrupted and less costly production. Labor profits by uninterrupted wages and earnings. Government profits by an assurance of on-time delivery of urgently needed defense materials.

As part of this plan there has been set up a National Committee for Manpower Conservation, composed of widely known industrial safety promotion experts, together with representatives of labor, having a primary interest and concern in accident control. Aided by this committee, the Department of Labor has already prepared and issued a special bulletin outlining the major factors in the elimination of work injuries, as well as important information in respect to methods for controlling health exposures through the application of relatively simple engineering devices and techniques. This bulletin is largely directed to the attention of the employer, who alone can bring about the proper physical conditions requisite for control of work hazards.

Special Bulletin No. 2 will be off the press in a few days, and it is directed definitely to workers in defense industries and will attempt to show concisely what the worker can contribute to accident prevention programs. In this latter undertaking we have had the full cooperation of advisers from labor organizations, who will actively assist in arousing keener interest of labor in the safety-for-defense movement. These bulletins will be followed by a series of others dealing in greater detail with various specific exposures and information about acceptable and practicable methods of control. To summarize in a single sentence what I have said in this talk: If we are to be assured

of prompt and continuous delivery of essential weapons of defense we must not only train new workers and retrain older work-

ers, but we must restrain accidents, which fritter away our supply of skilled hands producing these weapons.

Maximum Allowable Concentrations of Dangerous Industrial Dusts and Gases

By ALICE HAMILTON, M.D.

Medical Consultant to the U. S. Division of Labor Standards, Washington, D. C.

I have been asked to make a brief summary of our present-day knowledge with regard to dangerous degrees of air pollution from gases, vapors, dusts and fumes, and the data which have been secured so far as to the maximum allowable concentration which can be assumed to be within safe limits, below the danger point. A few of the dangerous dusts and vapors have been studied intensively enough to afford us fairly full data on which to establish such standards, but only a few, and even with regard to them our knowledge is not complete, and it would be a great mistake to embody in legal regulations the standards which we are at present tentatively recommending, for it is certain that, as our knowledge increases through investigations in this field, we shall have to change our figures. I believe that the State departments of labor or of health which have adopted standards of allowable concentrations regard them as advisory only, and that is right.

The first attempt at the establishment of a maximum figure of air contamination by an industrial poison was made in England in 1910 by Duckering and Legge, who used the procedure since generally adopted; that is, they determined the amount of lead in the air of a workroom and matched it up with the record of lead poisoning in that room. In this way they were able to state that, if the amount of lead were kept under 0.5 mg. per cubic meter of air, there would be no serious plumbism, no palsy or encephalopathy

and only rarely colic. This amount, you see, was not to be taken as safe, only as free from serious danger. In 1933 our own Public Health Service concluded that the amount of lead dust or fumes in the air should be kept 0.15 mg. per cubic meter for safety. This was on the basis of an investigation of a storage battery plant, and a sickness study of 2,303 men employed there. For "prolonged exposure," the figure must, it seems, be still lower, for some cases were found which had developed even at 1.2 mg.

I believe the next important contribution in this field was made by the Benzol Committee of the National Safety Council, which, as you all remember, established 100 parts per million as the maximum allowable concentration for benzol. That figure still stands, though we have a good deal of evidence that it is too high. You are probably familiar with two remarkable reports on industrial benzol poisoning which appeared in 1939; one from the Massachusetts State Department of Labor on benzol in the manufacture of shoes; the other from the New York State Department, on benzol in rotogravure printing. In both studies cases were discovered that had developed after exposure to concentrations below 100 ppm. As a result, Dr. Francis Hunter of Boston declared that, "It is doubtful whether any concentration of benzene greater than zero is safe over a long period of time."

The American Standards Association has had for some years a committee on this sub-

American Standards Association Committee

Substance	Parts per Million	Length of exposure
Carbon monoxide	100	Not over 8 hours daily
Benzol	100	" " " " "
Carbon disulphide	20	" " " " "
Hydrogen sulphide	20	" " " " "

Suggested Standards for Illinois and Massachusetts

Substance	Parts per Million		Milligrams per Cubic Meter	
	Illinois	Mass.	Illinois	Mass.
Arsenic	50	100		
Aniline	5	5		
Benzol	75 (and derivatives)	75		
Carbon tetrachloride	100	100		
Chlorine	0.35	1.0		
Chloronaphthalenes			5	1 to 5
Chlorodiphenyls			5	1.0
Chromic acid			1.0	0.1
Gasoline	1000	1000		
Glycols	25			
Hydrochloric acid		10		
Hydrocyanic acid	10	10		
Hydrofluoric acid	3	3		
Lead			1.5	1.5
Mercury			1.5	1.5
Methyl alcohol	100	200		
Nitrogen oxides	10	10		
Nitrobenzol		5		
Ozone		1		
Phosgene		1		
Phosphine		2		
Sulphur dioxide	10	10		
Tetrachlorethane	100	200		
Tetrachloroethylene	100	200		
Trichlorethylene	100	200		
Toluol	75	200		
Turpentine	500	200		
Xylo	100	200		
Zinc oxide	150			15

ject, composed of industrial physicians, ventilation engineers, industrial insurance carriers and toxicologists, who are trying to set up standards for use in industry.

So far we have dealt conclusively only with two gases and two volatile solvents, carbon monoxide and hydrogen sulphide, benzol and carbon disulphide. The limits adopted for the present are shown on the accompanying chart. Benzol stands at 100 ppm., chiefly because of the insistence of our insurance members that this is an ideal that

can be realized practically while a more rigid standard would be rejected, and we should be left with no standard at all. Myself, I am always willing to accept half a loaf rather than no bread, but Manfred Bowditch, of the Massachusetts Bureau of Occupational Hygiene, is unwilling to go higher than 75 ppm., and Yandell Henderson, of Yale, enters an emphatic protest against 100 ppm., saying that if 20 ppm. is feasible for hydrogen sulphide and carbon disulphide, he can see no reason why it is

Tentative Standards Adopted By Public Authorities For Maximum Allowable Concentration Of Silica Containing Dusts			
Authority	Millions of Particles per Cu. Ft. of Air		
	Free Silica Content		
	High	Medium	Low
National Silicosis Conference, 1936. Medical Committee.	5	10 to 20	
Idaho Engineering Committee.	5	10 to 30	
U.S. Labor Department 1936 Division of Labor Standards.	5	15	
New York Department of Labor, 1940.	5	10	100
Connecticut Department of Public Health, 1936.	5		
California Industrial Accident Commission, 1936.	5		50
Wisconsin Industrial Commission, 1932.	5	15	
Massachusetts Department of Labor & Industries 1940.	5	10	100
		(granite)	25
			Foundry Nuisance Dusts

impossible for benzol. Certainly it is to be hoped that ventilation engineering will progress to the point where a lower figure than 100 ppm. may be reasonably demanded for benzol users.

The standard for carbon monoxide does not need to be defended. This gas has been exhaustively studied by the Public Health Service, by State bodies, by industry and by toxicologists in many universities. Carbon disulphide and hydrogen sulphide are the two dangerous gases which must be dealt with in the manufacture of viscose rayon, and the maximum allowable concentrations given in the chart were established through careful studies made by the American Viscose Corporation, the du Pont Company and the Tubize-Chatillon Company.

When it comes to the other toxic substances I have listed here, we can say only

that the figures given represent our best judgment at the present moment, but we admit that that judgment is often based on something not far from guess work. Take the one on which I happen to be engaged at the present time, tetrachlorethane. We know it is the most dangerous of the chlorinated hydrocarbons used in industry, and we have known since the first world war what its action is on the human body, for it was used by both the Germans and the British in airplane dope, and in both countries gave rise to cases of acute yellow atrophy of the liver; but, in spite of a voluminous literature and an impressive number of clinical cases, we find no instance in which the amount of poison in the air was determined. Therefore, the standard, ten parts per million, is based on Zangger's statement that this solvent belongs with

aniline and nitrobenzene in the most toxic group. We have little data with regard to the other chlorinated hydrocarbons, except CCl₄, about which we do know somewhat more. As to the others, our knowledge comes chiefly from the studies made by pharmacologists who sought a relatively non-toxic agent for cases of hookworm infection which is not the same thing as industrial poisoning from fumes.

To pass over to that very controversial field, silicosis, I need hardly emphasize the fact, so evident in the accompanying charts, that there is still much confusion and little agreement among the authorities as to the amount of dust containing varying proportions of free silica that may be permitted in a workshop. This is to be expected. Poisoning from gases and fumes, even if slow, does not take fifteen years to make itself evident; silicosis may. Moreover, other factors, aside from the actual proportion of free silica, affect the dangerous character of a given dust.

Take foundry dust. It may be rich in silica, running as high as the notoriously dangerous granite, yet, while consumption has for centuries been the occupational disease of stone cutters, this has not been true of foundry workers. Recent brilliant studies of this particular dust, notably the one by Hatch and Moke, have provided an explanation for the difference between foundry dust and other silicious dusts, for it has been shown the silica content of the former is chiefly in the large dust particles, and as the particle size decreases, the free silica falls, till it may reach, for particles under 2 microns, only one-fifth or even one twenty-fifth of the percentage in particles over 10 microns. This is, however, not true of the foundry dust caused by sandblasting and by chipping, jobs which everyone familiar with the industry knows to be dangerous. Steel foundries are the worst, probably because more chipping is needed on steel castings.

If our knowledge of the minimum dose required to produce poisoning needs amplifying, this is still truer of our knowledge of what constitutes dangerous dust concentrations. Here the Public Health Service is doing much valuable work. Their two monumental investigations, of the Vermont granite industry and of Pennsylvania anthracite mining, have carried us a long way forward, and, in cooperation with the experts of the

Saranac Laboratory, they have found it possible to establish certain fundamental facts. For instance, the Laboratory is able to state that the percentage of tuberculosis to be expected among workers in an establishment where there is no special dust hazard, is 4.79 per cent. If the rate is higher, there is something wrong; of course, not necessarily dust in the air; perhaps low wages.

Donald Cummings, of Saranac, urges the adoption of two limiting concentrations of free silica: first, the "primary threshold," a concentration of dust in which a healthy man may be employed throughout his working life without a disabling injury; second, the "secondary threshold," a concentration in which a healthy man will "inevitably contract silicosis if regularly employed for several years." General experience shows that the first is at about five million particles less than ten microns in diameter; the second is probably at a level not higher than 100 million.

At the National Silicosis Conference held in Washington in 1938, this formula was suggested for determining the maximum permissible concentration of free silica in the air breathed. Multiply the percentage of free silica by the total small particle dust count by impinger. If the result is under 5 million, the condition may be looked on as permissible. If it is over 5 million, the condition is to be looked on as poor. For example, 10 per cent free silica with an average total dust count of 30 million particles would mean 0.1 times 30 million, or 3 million, good practice; while 30 per cent free silica and 50 million particles would mean 15 million, too much. This formula cannot be applied to a dust with less than 5 per cent silica.

Both New York and Massachusetts have made fairly recent studies of the foundry industry and of work with granite, such as quarrying and stone cutting, tunnel and foundation excavating. New York recommends for dust containing less than 10 per cent free silica, 100 million particles; for 10 to 70 per cent, 10 million; for 70 per cent and over, 5 million. Foundry dust, averaging 20 per cent free silica, should be kept down to 25 per cent; the dust from abrasive blast cleaning, averaging 70 per cent down to 10 million. Massachusetts allows 25 million for foundries, 10 million for granite stone mills and 5 million for pure silica dust.

Source of Dust	Percent of Quartz (Free Silica)	Suggested Standard In Million Particles (Below 10 Microns) per Cubic Foot of Air.
Gold Mines, South Africa	86 to 95	5 to 4.5 million.
Metal Mines, Broken Hill, Australia	10 to 17	14 "
Tunneling, Sydney, Australia	90	Under 6 "
Gold Mines, Ontario 5 to 10 (2 Mines 25 to 35)		8.5 "
Iron Mines, Canada	50	5 "
Granite Quarry, Barre, Vermont	(Quartz 85%) 25 to 35	9 to 20 "
Metal Mines, In-State Area	90	5 "
Potteries, West Virginia	20 to 30	
Anthracite Mines, Pennsylvania	(Quartz 95%, Coal 5%) (Quartz 95%, Coal 5%) Such workers dust average 35	5 to 10 "
Subway and Foundation Drilling, New York City	Less than 1 to 54	10 "

We must not forget that the adoption of any of these standards does not mean that there will be no silicosis among the workers. In the South African gold mines, the free silica in the air was brought down to 3 to 4.6 million particles per cubic foot by 1933, but cases have continued to develop, taking 14 years now, on an average as against an earlier average of 9½ years. In Barre, Vermont, the Public Health Service found cases appearing after only ten years at 6-9 million particles and after 9 years, at 10 million. They have placed the maximum allowable number of particles at 9 to 20 million, which is certainly not extreme.

I need not say anything more about the

great need of careful studies of actual conditions under which damage from poisons and dusts occurs in industry. It is in our country that these studies must be made. The day is past when we could look to Germany as the source of knowledge of industrial toxicology. Now that authoritative position has passed to us. And this particular method of determining safety limits by means of a combination of experts in several fields, chemists, ventilation engineers, and physicians is peculiarly American. No other country has made anything like the contributions to this branch of industrial hygiene that we have. But we need a great deal more.

Standardizing State Industrial Safety Requirements

By W. T. CAMERON

Chief Safety Adviser, Division of Labor Standards, U. S. Department of Labor,
Washington, D. C.

The title of this address might well have been "Democracy in Action" for I know of no other place in our National life where democracy has gone to work in more typical fashion than in the field of developing State industrial safety requirements. I imagine everyone promoting the art of safety has at one time or another visualized himself in the role of Safety Dictator of the United States and, as such, has "laid down the law" to abolish all the conditions, which, year after year are responsible for identical accidents happening in the same old way—over and over again.

By one stroke of the pen you unified automobile hand signals and standardized the method of making a left turn. You outlawed the make-shift ladder, and you made it a prison offense to sell an unguarded machine. But then you came to a safety meeting like this and realized that about 10,000 other people also have some good ideas and that, while perhaps slower, the Democratic way was, after all, best.

"Democracy in Action" in the field of industrial safety regulation is a slow educational process of "give and take," of trial and error. It means consulting the victim before invoking the penalty, consulting the industry which has to make the standard fit its process, the industry which has to foot the bill, and the worker who has to use the device and still get out the production.

There is no need to argue here the cause of uniformity in State safety codes, rules and regulations. Resolutions of recent conventions of the International Association of Governmental Labor Officials, committees of the American Society of Safety Engineers, statements of machine builders, guard manufacturers, the American Standards Association and the National Safety Council, all stress the need for uniformity and the need for ironing out the discrepancies which already exist between individual State requirements. It is rather my duty to point out what progress has been made and the methods which have proved successful in

speeding up our democratic processes to keep pace with modern industrial needs.

There are still those, of course, who say that State Governments have no business in the field of industrial safety—that, given enough time, industry itself will carry their methods and self-developed standards to every nook and corner of industrial America. To these let me suggest that they trade places with the State Workmen's Compensation Commissioner who is daily confronted with an ever-increasing line-up of victims of accidents and see, if under these circumstances, he could refrain from "doing something about it"—from trying to speed up the spread of the Safety Movement. The States are now definitely "in the swim" and have, as has already been demonstrated in a number of jurisdictions, an accepted place in the fight to prevent industrial accidents and occupational disabilities.

The problem now is not whether the States should be promulgating enforceable safety codes, but rather that those codes which are developed shall follow a logical National pattern—free from conflicts and discrepancies; in other words, that they shall be consistent with regulations being put through by other States and now in use as self-applied standards by a large segment of industry.

As we look over the methods employed by the 48 States we find a variety of approaches. All are presumed to lead to the same end—to protect the worker from the mechanical and environmental hazards of his job.

Some States write the technical details into the basic statutes where, I'm sorry to say, they stand frozen and unmolested while industrial progress rushes by.

Others have laws setting forth the principle that the employer is duty-bound to provide a safe and sanitary place to work. Under this set-up each inspector decides what is safe or unsafe with administrative guidance in the interpretation and application of the law varying with each change of administration.

Some depend solely upon recommendations having no force and effect of law and hope that, if given enough time, all workers will be assured equal protection from similar job hazards, whether the plant is large or small.

But, I am glad to say, an ever-increasing number of States are putting "democracy to work" on a plan which keeps pace with the modern tempo of industry—a plan where safety engineers, workers, regulatory bodies, compensation commissions and the public sit around the table and adapt and fit a set of National safety standards to meet the requirements of the individual State and the industry within that State.

The legislators of 28 States have realized that they cannot know all about the safe limits of pressure vessels, the requirements of a punch press guard or the intricacies of construction safety, and they have delegated to an administrative board or commissioner the responsibility and power to work out the details. And what is equally important, they have, to a greater or lesser degree, written into the law delegating the rule-making power the democratic procedure by which the standards are to be developed. Not all of these 28 States have made use of this authority and in a few cases the legislature unwittingly did the job twice, and we find States with perhaps the labor department and the workmen's compensation agency both with the necessary authority.

The Sixth National Conference on Labor Legislation, which met in Washington in November 1939, summed up the State's obligation in safety and the modern democratic approach to this end, thus:

"Adequate authority should be provided for the prevention of industrial accidents and diseases. The provision for reporting all disabling injuries and occupational diseases should be compulsory.

(a) "Every State should adopt a basic safety and health law which should:

(1) "Require all employers to provide reasonable protection of the lives, health, and safety of persons employed in the States;

(2) "Vest in the labor department or industrial commission the power to establish minimum standards of safety and health by the promulgation of industrial health and safety codes;

(3) "Set forth the right of the enforcing agency to enter places of employment;

(4) "Invest the agency with power to tag or seal dangerous machinery and unsafe or unhealthful places of employment; and

(5) "Provide for a penalty or penalties that may be applied in case of violation of the industrial health and safety codes.

"The language of delegation of power must be specific and the law should provide for (1) public hearings in formulating the codes; (2) publication of the codes after promulgation; (3) administrative and court review; (4) the enforcement by the agency of the minimum standards; and (5) power, by the department or commission head only, to make variations or exceptions from the standards (if strict compliance would work an unnecessary hardship or injustice)."

Right here let me emphasize that, while the long-range program of every State should be toward a revision of administrative set-up along the above lines, much can be accomplished with the use of present machinery if the will is there.

This can be illustrated by a situation which existed in one of our northwestern States, where two State agencies have some inspection and regulatory powers, but in each case the lack of clear definition as to how far each could go had prevented either from taking action. When these two agencies got together and expressed a mutual willingness to cooperate in establishing a single code program, it was found to their surprise that, operating jointly, they had all the authority needed. Of course, this is unwieldy and cumbersome, but much history, tradition and political consideration is involved which may take years to change. In the meantime, however, the work is going forward and the accident situation in that State is being improved.

From the standpoint of National standardization, I am pleased to report that recent studies and field trips have revealed very little of the old attitude that conditions in a particular State were "vastly different" from those found in another. In past years this has been one of the chief stumbling blocks in getting governmental officials in particular jurisdictions to cooperate with other groups, on a nation-wide basis, in establishing rules and regulations. We are at last on the way toward building a single group of rules and regulations which will

be adopted and enforced uniformly throughout the country.

I know of no greater safety service that can be rendered by State agencies to the cause of universal safety than the adoption by all States of, first, the democratic proc-

ess of code building, and second, the use of proven mechanical safety standards, as developed through the American Standards Association procedure as the foundation for State action on safety.

WEDNESDAY MORNING SESSION

October 9, 1940

The session, which was planned as a panel discussion of State Industrial Safety Services, was called to order by the Chairman, Harvey Saul, Director of Labor, Rhode Island Department of Labor, Providence, R. I., who presided.

Chairman Saul outlined the objectives and procedure of the meeting, and then introduced the members of the Panel, as follows:

J. T. Faust, Chief Deputy, Division of Factory Inspection, Illinois Department of Labor, Chicago.

H. D. Immel, Director, Bureau of Inspection, Pennsylvania Department of Labor and Industry, Harrisburg, Pa.

S. D. Kelley, Chief Factory Inspector, Colorado Industrial Commission, Denver, Colo.

R. McA. Keown, Engineer, Industrial Commission of Wisconsin Madison, Wis.

E. J. McCrossin, Chief, Division of Safety and Inspection, Alabama Department of Industrial Relations, Birmingham, Ala.

Harry Sain, Assistant Superintendent, Division of Safety and Hygiene, Industrial Commission of Ohio, Columbus, O.

The program plan presented a number of service problems for discussion by the panel members, as follows:

1. Building Safe Machinery.
2. Using Accident Records to Guide Inspection Activities.
3. Safety Contests.
4. State-Wide Vs. Regional Safety Conferences.
5. Educational Techniques — Exhibits, Films, Posters, and Radio.

(Unfortunately, since no record of the discussions was taken, no detailed report can be presented in these Transactions.)

ADJOURNMENT

Health Service in Industry

TUESDAY MORNING SESSION

October 8, 1940

The session was called to order by Dr. A. E. Russell, Surgeon in Charge, Office of Syphilis Control in Industry, U. S. Public Health Service, New York City, who presided. Dr. Russell, in welcoming the dele-

gates, briefly surveyed the general problem of adequate health service which might be given, and pointed out opportunities of this service. He then introduced the scheduled speakers in order.

First Aid Training as an Aid in Promoting Accident Prevention

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

Chief Surgeon, Chicago Rapid Transit Company, Chicago

Twenty-seven years ago, I, as a young doctor fresh from medical school and hospital training, was given the opportunity of becoming affiliated with the Chicago Elevated Railroads (now known as the Chicago Rapid Transit Company). I was commissioned to make a study of ways and means, so that in time of accidents with resultant employee injury, these employees would be given immediate First Aid service by their fellow workers, until the arrival of medical authority.

Experience had shown that many useful lives might have been saved, had immediate surgical service been available. In those early days, emergency service by doctors was not always at hand after accident occurrence. Accidents frequently occurred in the field and considerable time would necessarily elapse before the arrival of the doctor. These intervals of little or no emergency service generally determined whether the patient would survive or pass on. Especially was this true in those accidents in which electric current was the causative factor. Saving seconds meant saving lives.

It was soon apparent that there must be devised some medium of service to injured employees until the doctor arrived on the scene. It was considered practical to train the layman employee in the fundamentals of First Aid service so that he would be competent in administering to the injured person. At no time was it our desire nor our

intention to make doctors out of laymen or to usurp the prerogatives of the private physician. These first aid men were to function between the accident and the arrival of the surgeon and then to assist the surgeon in administering to the patient's needs.

From our study of employee First Aid training and from the practical experience during these twenty-seven years, we have been greatly impressed with the reduction of fatalities from electric shock, they being relatively rare today. Complications resulting from injury likewise were reduced to a minimum and permanent unfavorable conditions practically eliminated. The period of convalescence from injury was reduced making possible the return to gainful occupation of the employee in the shortest time compatible with safety.

Our success was attained only after careful planning, with subsequent training and close medical supervision of our First Aid system. Many obstacles had to be overcome in those pioneering days in First Aid training of the layman. The medical profession were skeptical that laymen could be trained to render intelligent and competent First Aid, and they had good cause for their doubts, judging from the bungling in those early days by untrained laymen. However, the passing years have proved beyond a doubt that there is a definite place in industry for the expertly trained layman in First Aid. The present world emergency will

have a definite specialized sphere in the defense plans of our Nation for those men and women who have given so generously of their time and efforts in perfecting themselves in the fundamentals of life saving and in rendering intelligent first aid services.

Teaching of First Aid to a person does not necessarily mean that he will become a good safety man unless he is grounded and trained in the fundamentals of accident prevention.

Where statistics have shown that trained First Aid employees had a better safety record than those not having First Aid training this can be explained by the fact that, any industry organizing First Aid classes must select those employees whose work records have shown them to be of the intelligence necessary to become good First Aid men.

No industrial surgeon would endorse a plan of First Aid instruction unless his industry has a well established accident prevention program, as a good safety man makes a good First Aid man.

It is essential to bring to light here what my experience in industrial medicine and surgery and in accident prevention shows are the two basic factors in accident causation through man failure.

First, the lack of visualization of accident possibilities before they arise; and second, the lack of self discipline on the part of the individual himself. With the explanation of these factors, I am confident that I will have answered the question, "Does First Aid Training Promote Accident Prevention?"

What is the "lack of visualization in accident causation?" Simply that many persons lack the ability to foresee the possibility of conditions and circumstances that are potential accident causative factors. For example, the worker about to perform a particular piece of work should be able to picture mentally just how he will go about the performance of a given task, what tools the work requires, that those tools are in safe working condition. He should formulate in his mind the environmental circumstances in which he is to work, and quickly determine attendant hazards and what protection is necessary for safe work performance. He should be able to formulate what possible conditions might arise, either on his own part or the part of others, that might make an otherwise safe practice a hazard. He

should take a personal inventory of his own physical ability to do the particular work called for. Is he physically free from distracting elements such as pains, aches, trivial symptoms and physical defects, so as to be able to give full attention to his work performance without these diverting his mind from his work and so causing him to do something that will precipitate an accident.

His mind should be free from emotional disturbances such as fear, grief, worry, anger, hatred, jealousy, malice; in fact, any state of mind that may tend to cause inattention should be avoided. These strong emotions have a tendency to submerge the processes of thought that govern orderly performance. While the mind is distracted with these emotional states, accident causation may occur or work errors develop with the resultant waste of product and the employee's time.

The motorist, before taking his car from his garage should visualize machine failure in the car by testing his brakes, steering mechanism, lights, and inspecting his tires. Then he should make a physical audit of his ability to drive. Is he feeling well and in good spirits? Is his mind free of disturbing thoughts and his nervous mechanism functioning in a normal manner? He must also then visualize the possibility of unforeseen conditions arising while on the street from the actions of others, pedestrians and motorists, and be ever alert to act with precision and without delay.

The value of visualization of accident possibilities is best evidenced by the excellent results obtained in accident prevention by one safety engineer, while in a similar industry another safety engineer has an unfavorable record. The former possesses the ability to visualize potential accident causative factors and correct them, thereby preventing accident occurrence; while the latter, not having this ability, overlooks dangerous conditions within his plant and does nothing toward correction of hazards until after an accident occurs. The former is an asset to his company, while the latter is a liability.

It is common knowledge that many persons have limited mental capacity for analytical interpretation, and are therefore unable to foresee or mentally recognize dangerous practices productive of accident occurrence prior to the actual accident itself.

Post accident investigations very often show this to be a fact.

The second basic factor in the causation of accidents is the lack of self discipline, which is simply the failure of the individual to govern his words and actions in accordance with safe rules of conduct. The fellow who cheats himself while playing solitaire, the golfer who forgets to count all his strokes, the individual who hisses his displeasure in the darkened theater or throws missiles at speakers of his opposite belief, all are persons who lack self discipline.

If a person lacks the ability to discipline himself in the personal things of life, it is reasonable to believe that he will have very little regard for safe practices in his home, at the factory or when he is driving on the street and highway.

We have in mind also the fellow who is considered in the shop as a safe employee with a good safety record, but who when away from the job will cross the street between intersections, dodging traffic and violating all safe traffic rules. He knows that he is doing wrong, but lacks self discipline of his actions. In the shop you have the employee who uses a defective tool, knowing that it is dangerous, but uses it because he lacks self discipline.

Getting away with such unsafe practices without resultant harm to themselves, soon makes such persons callous and unresponsive to safety instruction. In fact they are what is known as accident prone workers. All of us, none excepted, are accident prone at one time or another, in proportion to our ability to visualize potential hazards and to so discipline our actions that our conduct will not be productive of accidents.

Just because a person is given a course in First Aid does not necessarily mean that he

will be influenced to work and act in a safe manner. It is, generally speaking, an incentive to use care in his daily life, knowing the results of accidental injury while the training is still fresh in his mind. Should he lack the ability to foresee a hazardous situation and fail to have the moral stamina to control his actions in conformity with safe practices, then he is a menace to his fellow man.

In my experience I have seen excellent First Aid men become injured in the plant and on the street, and investigation revealed that they were responsible for the accident. Their First Aid training did not keep them from accident causation. Then again, I have seen the First Aid man, as well as others who were safe men in their shop work, but were unsafe and accident prone while driving their motor cars. This may be explained that while at work they were under industrial discipline and when they drove their automobiles self-discipline determined their safety.

First Aid instruction can be beneficial to the individual if he has a comprehensive knowledge of the subject with thorough training in the principles of emergency service. He should have periodical refresher courses to keep the subject always fresh in his mind, and he must have experience in rendering emergency treatment to patients. Then the most important factor is a thorough course and training in accident prevention prior to his First Aid course.

Please do not think that I am minimizing the importance of First Aid training; but where we find a First Aid man with a good safety record, I believe that man received his knowledge of what constitutes safe practice, not from the First Aid training, but that he was a good safety man before taking such training.

The Control of Sprains and Strains

By DR. J. J. WITTMER

Medical and Personnel Director, Consolidated Edison Company of New York, New York City

Quite commonly this series of so called minor injuries, which should also include contusions, is glossed over and thought to be of little significance. I cannot emphasize too strongly that this is a very erroneous

impression. When the sum total of the original injury plus the after effects are all counted, contusions, sprains and strains rank among the top notchers for total lost time and total accumulated cost.

There are several outstanding reasons for this. (1) They are treated with contempt by almost everyone. (2) They rank highest in frequency. (3) Because they are thought of as being very simple—competent treatment is either not given at all, or certainly in a great many cases—postponed. (4) Commonly, the noticeable slight injury is covering up or masking a more serious injury which is coincidentally present, either in the immediate site or in some other area. (5) As a consequence of the foregoing—complications are unusually common and the sequelae of neglect are frequent and outstanding.

Contusions

Contusions or bruises are caused by blows, crushes, or by friction. In many cases there is no break in the skin. A contusion is accompanied by a flow of blood or lymph, causing swelling, the amount being in proportion to the severity of the bruise. It most commonly affects the soft parts of the body, including the cartilages and the covering of the bones. We can best visualize what happens in a contusion—if we stretch a piece of cord over the top of a vise and strike the string a sharp blow with a hammer—the string immediately breaks—and if there were pieces of cloth or paper in the area between the string and the vise—these also are torn.

Likewise with the muscle tissue, nerve tissue, tendons, the tendon coverings, the lymph vessel and the blood vessels—in fact, all tissue between skin and bone can be injured—from a slight shock to a complete severance—in the degree that the severity of the blow was applied. Keep in mind that the weight of the instrument is not the only factor—with weight, the force applied to the weight and the speed behind it are all definite factors in determining the extent of injury.

Medical men should always take a careful history of the occurrence of the accident. I need not emphasize that a heavy weight applied slowly and gradually will do very little damage while a very small weight, with great force (such as falling a long distance) or sharply applied, will do tremendous damage not only to soft parts, but the bone parts beneath. A sharp blow on the abdomen can cause a tear in the liver, the spleen and quite commonly actually severs the intestinal wall. An apparently simple blow on the head may not

only injure the scalp covering but also fracture the skull and even damage the tissue in the brain.

Therefore when the history shows that the accident is of a character that should result in a major injury—always treat the case as such, even though the external signs denote a very slight condition. It is far better to reduce treatment when it is proved that the injury is less than was suspected, than face the music of having to increase the treatment when you find at a later date that the condition is greater than was first thought.

The symptoms of contusion are pain, swelling and hemorrhage. The pain varies considerably with the individual and with the location of the contusion. Pain is brought about by the local nerve injury and by the pressure caused by the effusion or collection of blood or lymph. The duration is generally about 24 hours and that varies, of course, according to the extent of the contusion.

Certain sites of the body are particularly painful, the finger tips, testicles, knee margins, nerves and cartilage being the most sensitive. The back has an extremely low susceptibility to pain from contusion.

Swelling is a constant symptom. Contusions are always accompanied by hemorrhage of a varying degree. Hemorrhage here should be distinguished from congestion in that the former means the oozing of blood from its normal vessels into the surrounding tissues, and congestion means simply the accumulation of a greater amount of blood than normally in the vessels.

Certain individuals are more susceptible to hemorrhage than others. In hemophiliacs, subcutaneous hemorrhage or hemorrhage beneath the skin may be widespread and very difficult to control. Women are particularly susceptible to subcutaneous hemorrhage. Areas of ecchymosis or in laymen's terms "black and blue" will result from an injury that may not bring about the same result in men.

Treatment—First be absolutely certain that you are dealing with a simple injury of the soft parts. Take a detailed and complete history in all cases. Be sure that large blood vessels are not broken, that the tendons are not seriously affected and that the nerves have not been disturbed. Certain contusions, such as those of the testicles, are accompanied by marked shock, and the first step in the treatment is to

combat the shock by appropriate measures. After the shock, if any, has been dealt with, the contused part must be put at rest. Rest is nature's miraculous way of healing and nothing has ever been lost by putting an injured part at rest for at least 24 hours. Contusion of the arm or hand calls for a sling. Contusion of a thigh or leg requires rest in bed. The injured part should be elevated to facilitate the reduction of the swelling.

In the early stages, a contusion is benefited by application of cold. Cold applications tend to contract the bleeding vessels and minimize the degree of hemorrhage or effusion. This is generally continued for several hours or until the acute symptoms have subsided and no further bleeding takes place. Following cold applications, heat is applied to increase the amount of circulation in and about the injured part. This increase in the circulation more rapidly removes the products of the contusion such as blood and lymph, all of which will be carried away by the circulating blood. This may be well illustrated by allowing water to drop slowly upon a lump of sugar; solution and disappearance take place slowly. If on the other hand the water is allowed to run upon the sugar in a small steady stream, the sugar is more readily dissolved and disappears faster.

Disappearance of the swelling results in relief from pain because there is no longer any great pressure exerted upon the nerve ends present in the injured area.

There are some cases where infection either concurrently or at a later date follows a contusion even though the skin has not been broken. This infection may occur in the loose connective tissue or as is quite usual, in the periosteum, the covering of a bone. You may be surprised to hear that an infection can occur without a portal of entry. However, quite a few people, although in perfect health, have infective organisms in their systems, but normally have enough resistance to hold this invading army in check. Allow a contusion to occur, which causes the breaking down of the resistance in a particular part of the body and the fifth column goes to work. The seriousness is further enhanced if the infection occurs in the periosteum, because the next site is the bone. A bone infection, osteomyelitis, takes a long time to clear up. Again a detailed history will bring out

the fact that a person has had osteomyelitis and those that have had it only need a slight contusion to have a recurrence. Extra precautionary measures must be used for this type of individual.

Sometimes a contusion will be accompanied by a blister. This is an extravasation of lymph fluid into the layers of the skin. Its size can vary from a flat penny-like formation to a hen's egg. Because of the annoyance of its presence, some individuals pierce these blisters and allow the fluid to exude. Unless this process is performed under unusually sterile conditions, it is the finest invitation to an infection that one can have. The piercing of a blister when necessary would best be left to a doctor.

Sprains

Sprains may be defined as wrenches of joints, that is, minute injuries or ruptures of the individual fibres or of small groups of fibres of the ligaments which hold joints in place. Sprains are brought about by over stretching of these ligaments as in twists, falls or blows. The most common strain is of the ankle joint when the foot is suddenly turned inward causing stretching and tearing of some of the fibres of the ligaments. However, all joints are subject to sprains.

Here again I give the same admonition about a complete history as in contusions—it is not the severity of the fall but the angle at which it occurs. The weight of the body above the fulcrum and the force applied to the body denote the degree. Sprains are commonly accompanied by fractures. The exertion which will tear a ligament can also tear away a small piece of bone from the joint. This piece of bone is usually the part to which the ligament was attached. It also can be strong enough to break the pointed and slender ends of the bone that form the joint. Every injury to a joint demands an x-ray. A sprain should be considered as the siamese twin to a fracture until the x-ray shows no fracture present.

The symptoms of a sprain are immediate pain and a rapid accumulation of lymph, and occasionally of blood, in the neighborhood of the ligament involved and into the area surrounding the joint. A further important symptom is the inability to use the joint completely. However, being able to wiggle the toes does not mean that a fracture is not present. It is even possible to be

able to walk with a fair degree of comfort and yet have a fracture of a bone present either in the ankle joint or the foot proper. Those motions of the joint, which require the use of the affected ligament or ligaments, are extremely painful. One of the cardinal signs which indicates that a sprain is present is that when tension is put upon the injured ligament, pain is produced but when tension is placed upon the opposite ligament, (for instance, on the opposite of the ankle), there is relaxation of the injured ligament and the pain disappears.

Treatment—The treatment of sprains is extremely variable. Trainers and rubbers on athletic fields often employ widely different methods to their own specification. The principles which should underlie rational treatment of a sprain are, first, rest of affected ligament and the muscles or tendons which may be attached to it; second, measures directed toward improving the circulation such as, heat and gentle massage or alternating hot and cold applications and, gradually early resumption of use of the sprained part. For example, when an ankle is strapped, the foot is bent toward the injured side and an attempt is made to maintain it in that position by means of wide adhesive plaster. This removes the tension upon the injured ligaments. The strapping should be done so extensively that no motion will result upon the injured ligament or tendon, when active motion such as weight bearing is attempted.

A sprain takes many weeks to clear up. Putting stress on the injured ligament at too early a date causes a recurrence and if repeated several times, allows a permanent relaxation of tissue—resulting is a joint which chronically dislocates at the slightest provocation.

Strains

Strains are likened somewhat to sprains except that they more often involve muscles.

A muscle may not inaptly be likened to a large cable. Fibres of the muscle correspond to the individual fibres or wires of the cable. Extreme tension upon the cable may cause parting or rupture of certain strands or wires without the parting of the cable itself. Similarly, in a muscle which has been overstretched, certain muscle fibres will rupture or part without complete separation of the muscle itself. With the rupture of these individual fibres, hemorrhage occurs causing pressure upon the adjacent

intact fibres. The result is pain and a limitation of function. A common example of this injury is in certain types of "tennis leg" "riders thigh," etc.

Strains are due to three factors which easily can be controlled. (1) The individual is not physically able to do the work involved. Allowing a poorly developed rangy man to do heavy manual work cannot but increase the potential accident risk. Pre-employment and pre-transfer physical examinations with the definite underlying thought that the employee must be physically able to do all the work that is required in a particular job are mandatory. An applicant who has passed a physical examination for a clerical position is not necessarily eligible for work as a stock-man some months later. I must repeat from a previous paper—that the examining doctor must think of the applicant as a picture and the job as a frame. We must always be sure that the picture will fit the frame. This of course obligates the doctor to know the size of the frame before he can properly put his picture into it.

(2) Improper handling and lifting of materials. This subject has been covered in a very comprehensive manner in other papers of the National Safety Council.

(3) The material is heavier than expected or that something has caused the beam or door to be so wedged that it cannot be readily moved. In these cases the man has set his muscles to pull against a definite amount of force. The force is much greater; the muscles are not ready for this greater pull and the result is a tearing of the tissue. A few seconds' investigation, a comprehensive idea of what must be done, a proper accommodation of all the muscles to meet the situation will eliminate this factor.

Treatment—It was formerly believed that "tennis leg" and other ruptured muscle fibre injuries required complete immobilization, and the condition was treated with considerable respect because of the great length of time required to bring about healing. Patients with "tennis leg" were at that time put in plaster casts to immobilize the leg, and they did not recover for many months. An English surgeon discovered that those of his patients who neglected to follow his instructions as to extreme rest recovered more rapidly than those who had their legs immobilized in plaster casts. He felt that this phenomenon was due to the fact that in the

immobilized muscle, scar tissue developed at the site of the small hemorrhages and that painful adhesions were produced between the adjacent muscle fibres.

Accordingly, modern treatment of strains of muscle is as follows: If the pain is very severe, the patient is put to bed with the affected part elevated, at rest and subject to applications of hot, wet dressings. As soon as possible, the patient is encouraged to use the muscle in gradually increasing degrees. Occasionally, the application of a snug bandage over the affected area will prove to be a valuable adjunct to the treatment. Gentle massage should further hasten recovery. If stress is put on the part too soon, it is perfectly logical to expect not only an exacerbation of the original injury but further damage to the contiguous tissue.

Summary

There would be a definite decrease in the total lost time from work, a decrease in the ultimate cost and far less invalidism—if the patient, the supervisor, the safety engineer, and the doctor gave the proper importance to contusions, sprains and strains in the field of industrial accidents. This can be accomplished by:

I. Realizing that this group of injuries are not minor but that all are potentially major.

II. With this realization take greater precautions for their prevention.

III. Insist on medical treatment of every-

one of those cases regardless of how trivial they may seem.

IV. The doctor must take a careful and detailed history of the accident before making a diagnosis.

V. A thorough examination of the part that might have been involved in the accident: In a hammer accident, only the hand, but in an automobile accident it should be from the hair to the soles of the feet.

VI. In the case of contusions, an x-ray where more extensive injury is suspected. and in sprains, an x-ray in every case.

VII. The involvement of other tissues such as nerve fibres, tendons, tendon sheaths, etc., must be ruled out before the contusion is treated only as such.

VIII. The opening of a blister by a layman should be considered an act for discipline.

IX. Persons suffering from chronic osteomyelitis should not be in jobs where contusions readily occur.

X. A medical follow-up on all cases to check: (1) A beginning complication. (2) A new condition which is only now becoming apparent. (3) The beginning of an infection.

XI. Competent and thorough treatment until the condition has entirely cleared up.

XII. Extensive and comprehensive education of the worker that contusions, sprains and strains should not and cannot be treated with contempt, nor neglected with impunity.

Light—Antidote for Accidents

By A. K. GAETJENS

General Electric Company, Cleveland, O.

Light is instinctively reassuring to man. In its utter absence he gropes fearfully, wondering at each move whether an accident will ensue. In its presence he is at ease. The marvelous sense of sight brings to him a complete and continuous report of his surroundings. He pursues his work with constantly renewed confidence in his safety.

Such is an oversimplified statement of the relation between light and safety. However, light is needed for the amazingly complex function of seeing which is taken so much for granted. Consequently the quantity of light and quality of lighting (direction, dif-

fusion, source size and brightness) affect tremendously our ability to see. Everyone has been amused and mystified by the optical illusions which magicians use. Of primary importance to this discussion is the fact that conventional plant lighting in many locations provides the same visual illusions. When the eye is sufficiently fooled or fatigued by the effort of seeing, an accident is the logical result.

Safety engineering in industry consists essentially of mutually adapting the workman and his environment so perfectly that he can work without injury to himself or

to others. It is generally recognized that the individual workman is in most situations the final arbiter of his own safety—"a careful workman is the best safety device." Yet how much do we consider his ability to recognize his situation accurately and quickly? Psychologists have estimated that an overwhelming majority (over 85 per cent) of all mental impressions are received through the eye. Therefore, this essential sense through which so much of our awareness of environment (the surroundings, work surfaces, tools, etc.) must pass should be aided in every possible way.

Industry in hiring a man is really obtaining the services of a body, a mind, any skill in using these which he has developed through training and experience, and the five senses through which the man coordinates his activity with the remainder of the organization. Of these attributes the body, the mind, the skill and the senses of hearing, taste, touch and smell are the responsibility of the employee. Whether they are useful or useless to him and his employer depends entirely upon him.

However, the sense of sight, which has been shown to be all-important, is dependent not only upon him, through the selection of eyeglasses when necessary and other care of the eyes, but also upon his employers. For sight, alone of all the senses, is affected by an external agent, light, to an extent not fully known even today. And light, through the sense of sight, affects every activity of the workman, his productivity, accuracy of workmanship, mental attitude (morale), and physical welfare.

Probably of greatest importance to the safety engineer, it minimizes and retards the development of fatigue. Good light is the one environmental factor which is fundamental to the efficient operation of the plant personnel, yet it is not accorded the importance it deserves or will obtain when a fuller understanding of its value is realized.

In common with most other human behavior which psychologists have studied, short period tests often indicate compensation or over compensation by the subject. In other words, over relatively short periods a man can maintain a given rate of work under poor seeing conditions without apparent detriment. However, this is done at the expense of his nervous and visual strength which eventually reduces his usefulness due to fatigue or impaired seeing ability. Under

such conditions he can be accurately described as "accident prone."

Also, if an accident should occur, it is seldom recognized that poor illumination was a contributing factor. Everyone has observed men who faced windows ten or twelve feet away while engaged in intricate machine or bench operations. Window brightness may range from 100 to 1000 footlamberts, while it is rare that the brightnesses of the working surfaces are more than 10 to 50 footlamberts*—and they are often much less. A cap is little protection in such cases. These working conditions are extremely fatiguing to the eyes, yet they seldom have been considered contributory to an accident. Such accidents frequently list negligence or carelessness of the workman as contributory where actually an environmental factor, poor lighting, may be responsible in large part.

For this reason it is obvious that accident cause reports, even the more carefully planned ones, do not present a complete picture of the relation between light and accidents. As a matter of fact, detailed analyses of the accidents in which poor light is listed as a contributing cause seem always to indicate clearly that this cause is given only for a lack of light, and therefore does not include the great majority of cases where poor lighting may have affected the man's judgment by visual or nervous fatigue.

Seeing is highly dependent upon external lighting conditions. It is necessary to consider not only the visibility of the object of regard but also the brightness and brightness ratios found in the entire visual field.

The visibility of any object is determined by four factors: (1) size of the object, or details to be seen; (2) contrast of the object with its background; (3) brightness of the object; and (4) the time it takes to see.

These factors are so interlinked that, for any particular visual task, if any three of them are established, the fourth is determined by the other three. Within our work world today both the size of the object and its contrast with the background usually are determined by the character of the work. Brightness and time are inversely variable since eyes require a definite time interval

*A "footlambert" is the brightness of a surface which is emitting or reflecting one lumen per square foot. One foot candle falling upon a surface having a 100 per cent reflection factor would give this surface a brightness of one footlambert.

to see, just as a camera requires a definite exposure time to obtain a picture.

It is possible to carry the analogy further since eyes see more quickly with higher illumination than with low, just as a camera requires a shorter exposure time under the midday sun than at dusk. If a wheel rotating at constant speed is seen with good illumination, one obtains an impression in a very short time, during which the wheel has not moved appreciably. By a rapid series of impressions we have the knowledge that the wheel is rotating at a relatively slow rate. However, if the illumination is suddenly decreased to a low level, but one frequently found in factories, the wheel apparently is moving much faster. You might consider that a camera under the same condition would require a longer exposure time, during which the wheel would have moved appreciably and blurred the negative. The eye goes through the same process, and thus we get a blurred impression—one which takes longer to obtain and in which there is a longer time interval between impressions. Consequently, the wheel appears to be moving considerably faster under poor illumination.

Consider the very large proportion of accidents which are attributed, not to a single material cause or unsafe act, but rather which can be considered the result of a chain of events which culminated in the accident. If foreseen and acted upon quickly enough, the accident could conceivably have been averted. A split second increase in the speed of vision may mean a margin of safety. For this reason, also, the ability to see quickly and accurately is a definite factor in any safety program.

In addition to poor visibility of the work task, another frequent environmental condition is excessive glare. In so many plants the first things one sees are either bare, unshielded lamps or lamps inadequately shielded with small half-shades placed a few inches from the point of work. In many cases the men are conscious of this glare and turn the half shades away from them or even paint the lamps, but in either case the lamp is exposed to the man facing him, with the same detrimental results. This is unnecessary as there are supplementary lighting units on the market today which eliminate this difficulty.

A much less obvious type of glare is that caused by a metallic surface or reflection of

excessively bright light sources. Consider, for example, the appearance of a micrometer when lighted by an ordinary lighting system in common use. The detail of the scale will be completely obscured by the bright streak on either side of it. For metallic surfaces of this sort it is necessary to have the reflection of a uniformly bright light source over a considerable portion of the surface. There is extreme improvement when the micrometer is reflecting a large light source. Here there is no glare since the entire surface is uniformly bright and affords a background to the cut detail of the scale, which is similar in appearance to a well printed page. Accurate visibility measurements have indicated a three-fold improvement in visibility due to this simple change.

Accidents are frequently caused by unusual shadows which confuse. Again there may be plenty of light, but if it is from too small, bright sources, shadows will be accentuated. This can easily be remedied by adequate diffusion of the light. The new fluorescent lamps, which have been widely accepted in the two years since their introduction, are excellent from this standpoint because of their large size. Light from such sources softens shadows to the point where they are no longer annoying. Such long light sources can also be used to advantage in providing the type of visibility needed for seeing machined surfaces.

Falls on stairways are a type of accident prevalent and difficult to eliminate. In active working areas proper mechanical safeguards and education often are quite effective, whereas on stairways there is frequently a tendency to hurry, occasional horseplay, and other factors which tend to make an accident more nearly possible. Have you considered the possibility of lighting the stairway properly and painting the risers a contrasting color so that maximum visibility would be obtained? Here, as in many other cases where an accident may or may not occur due to the alertness of the man in perceiving his danger, maximum visibility is an undoubted aid. More often than not the lighting consists of one lamp, either bare or in a shallow reflector at the head of the stairway. Often this is placed so that obscuring shadows are cast by each step over the step below. Also, the steps are commonly painted black, a dark gray or have no paint on them whatsoever. In either

case, what one sees is deceptive and conducive to accidents.

Quantity of light is the factor most universally controllable and also the most difficult to estimate in the entire illumination field. The eye is absolutely no judge of quantity since it is affected so greatly by its previous adaptation. However, there are available today small, portable, inexpensive light meters which give an accurate indication of light at any given point. It is not to be expected that the safety engineer, with his multitude of responsibilities, should also qualify as an illuminating engineer. However, with the aid of a light meter and a knowledge of the simple fundamentals, he can determine in many cases whether seeing conditions are likely to be hazardous either for short periods or extended ones.

The illuminating engineer has also benefited in recent years by the development of a visibility meter which measures relative quantities and qualities of lighting in terms of seeing ability. This instrument has enabled field experiments and tests to supplement laboratory procedures. Several types of brightness meters are now available which also extend the practical measurements which can be made of visual conditions.

The publications of the Illuminating Engineering Society can be of great benefit in planning a lighting program. The I. E. S. "Recommended Practice of Industrial Lighting" discusses in more detail the various factors of illumination, the quantity of light which is recommended for various types of work, the necessity for an adequate program of cleaning and maintaining the lighting system, a discussion of natural lighting, of the various types of artificial light sources and a brief discussion of wiring.

(Illumination is directly dependent upon the cleanliness of the reflectors. It is recommended that a cleaning schedule be maintained which keeps the illumination above 75 per cent of its initial value.)

A summary of footcandle recommendations is included in Table I. These represent minimum operating illuminations as

TABLE I

Recommended Minimum Standards of Illumination for Industrial Interiors

	Minimum Operating Footcandles Measured on the Work
Precision Work.....	Over 100
Severe and Prolonged Visual Tasks.....	50-100
Critical and Prolonged Visual Tasks.....	30-50
Ordinary Visual Tasks.....	20
Casual Visual Tasks.....	10
Rough Visual Tasks.....	5

many progressive plants have found economies in using much more light. In this publication there is also reference to the many reports on the lighting of specific industries which have been worked out by representatives of the industries in question in collaboration with members of the Illuminating Engineering Society. Such reports are of great value since they correlate laboratory knowledge with practical field experience.

The following have been completed: Lighting in the printing industry; Gray goods and denim textiles; Shoe manufacturing; Candy manufacturing; Intricate production, assembly, and inspection processes; Silk and rayon throwing and wide goods weaving; Machining of small metal parts; Power Press Operation.

The many benefits of good industrial lighting have been determined by progressive management. Among these are increased production; a greater accuracy or workmanship which results in an improved quality of products with less spoilage and rework; a more complete utilization of floor space; a greater ease of seeing, especially among older, experienced employees, thus making them more efficient; improved morale among employees which results in a decreased labor turn-over; more easily maintained cleanliness and neatness in the plant as well as fewer accidents.

ADJOURNMENT

Industrial Nursing

WEDNESDAY AFTERNOON SESSION

October 9, 1940

The opening session for the discussion of industrial nursing problems was called to order by Joanna M. Johnson, R.N., Supervisor, Industrial Nursing Division, Employers Mutuals, Wausau, Wis., and Chairman,

Industrial Nursing Section, N.O.P.H.N., who presided. The Chairman called attention to the importance and breadth of the program that had been scheduled, and then introduced the speakers in order.

New Concepts of Visual Performance in Industry

By HEDWIG S. KUHN, M.D.

Hammond, Indiana

Perhaps the most dangerous person in today's complex economic set-up is the unconscious saboteur. In industry, man or woman, this employee is the eye cripple. His number is legion. His lack of visual co-ordination makes of him an unwitting and usually totally unconscious so-called "fifth columnist."

Industry must give recognition to this employee because he is a potential threat to both safety and progress, as we see it in the effort to obtain maximum efficiency in our national defense effort. He can wreck a re-armament program just as easily as the faulty depth register of his vision can cause him to misjudge the dump spot for a crane ladle of molten metal and snuff out the lives of a dozen workmen.

The enormous complexities inherent in the understanding of the concept—industry—makes necessary great divisions and subdivisions of knowledge and technique. Small worlds have grown to feed the needs of industry. Banking institutions, raw material markets, constant scientific research efforts, transportation experts, technical training centers, great purchasing concerns, gifted leadership in management, new leadership for the guidance of mass labor and skilled labor, organizations to study safety hazards, factories to supply safety shoes, goggles, masks, and nurses and doctors to meet the human needs. Nurses and doctors must seek to accomplish their special technical task expertly, but always seeking to understand

their obligations to the interests of industry as a whole, to develop tact, and adhere to policy and to seek ways and means of adding their special skills to serve the actual practical needs of industry.

The productivity of the individual worker and the increasing complexity of power machinery has forced management to evaluate all factors that contribute or detract from the precision of the human being in the performance of his specific task. Industrial efficiency now demands the utmost of human efficiency.

It is important to have this background in order to understand why medical findings in physical examinations are now seen to have a direct relationship to production and efficiency, as well as to health and safety. Let me outline what is meant by the phrase, "visual performance."

Eye examinations now have to be geared to determine whether a given pair of eyes can meet the requirements of a given job. An overhead crane operator may have to drop a load on an exact spot at an exact moment, 150 feet from where he pulls the levers. To do this he has to have depth perception. A girl at a looping machine in the hosiery industry working at a distance of eight inches from her eyes has to have a perfect binocular coordination, and ocular balance in order to sustain a sharp focus for eight hours. These are examples of two extremes in the demands made on eyes.

How do we analyze an individual's visual

performance in order to determine who can be a crane operator, or a looper, or a stenographer or a machinist?

Whereas the usual industrial eye examination has consisted in the past of vision taken on a wall chart, one eye at a time, it now includes four main factors,—visual acuity taken binocularly, (which after all is the way a workman walks around a plant), measurement of stereopsis, or depth perception, determination of ocular muscle balance, and color tests. A person may have perfect vision and no depth perception—he is not a candidate for the job of crane operator. A girl may have perfect vision and a marked muscle imbalance—she makes a poor inspector and a poor comptometer operator.

A modern visual program and technique of examining eyes in industry, which is based on evaluating these four visual aptitude factors contributes a great advance to safety. (The man on the ground whose shoulder is broken by a crane load dropped on him is studied not only in regard to where he was and what doing, but the man at the levers of the crane is studied also.)

It contributes a new item in the determination of merit ratings, and promotions where qualifications now include physical aptitudes. It contributes a saving of dollars and cents in such departments as inspecting and assorting where *direct* statistical correlations have been shown to exist between visual perfection and accuracy. It contributes to the size of the pay envelope in industries where piece work is done. It contributes information on which to base rehabilitation needs in setting up the great training programs for national defense. The Government will not want to finance the training of an individual who, when trained, will be sure to be rejected by injury.

It contributes directly to safety as we have been able to prove conclusively. In a special study where we analyzed the visual defects in 80 per cent of the men involved in lost time accidents in a very large plant in 1939, we found a *direct* correlation in all five visual defects which make up visual performance and lost time accidents. The plant average of acuity uncorrected was 8.8 per cent, while the acuity uncorrected in the lost time accident cases was 19.2 per cent! Color vision, which means the reading of red-green signals was 3.1 per cent in

the plant as a whole and 9.6 per cent in accident cases.

The rehabilitation programs for employees found defective in a visual survey of a given plant, and for applicants seeking training for skilled jobs in industry, is still another great field of allied service. And rehabilitation does not confine itself to getting an employee to buy a pair of glasses or have a cataract operation performed. Rehabilitation, as well as advance correction of existing defects, has tremendous possibilities in training programs. You can train certain visual aptitudes, just as training departments train other aptitudes. Muscle imbalances and often minor defects of stereopsis can be corrected by orthoptic training.

This can best be illustrated by citing the case of a young crane operator. He came to us with headaches and trouble. He had perfect vision but a marked muscle imbalance, and had just completed a program of orthoptic training on the day before Christmas. He said, "The fellows working under me do not know it but they have a good reason to celebrate. When I started training here, I could not tell within 10 feet of how close I was to the spot where I was to drop my load *except* as I judged by pillars, stationary machinery, windows, etc. Now I can drop my load on a dime without any such assistance." Whenever this story is told to the Safety Directors, their hair rises on their heads, just as yours and mine would if we were flying with a pilot who could not judge how far above a high tension wire he was while landing his plane.

Now, one more vital fact just beginning to seep into the understanding of management. According to recent statistics, if the efficiency of the present employed force of skilled labor could be increased 3 to 5 per cent, it would cancel out the present lack of skilled labor or the likelihood of such a shortage occurring. Job training inside industry plus the proper type of physical examination (including visual performance, which includes more information than acuity data, as well as other aptitude tests) would accomplish this 3 to 5 per cent increase in efficiency. It would do this without any of the personnel problems arising when it is necessary to displace men now at work, causing grievances and restlessness and strikes. Machine power in industry has been geared to about 90 per cent of its possible efficiency, but to date, human power has only

been geared to 50 or 60 per cent of its possible efficiency.

In closing, may I emphasize the following specific concepts; first, that scientific but practical eye examinations for individual purposes must include testing the entire range of visual functions; secondly, that the data secured from such an examination is basic to the proper placing of employees, to their efficiency and level of production and to their safety; thirdly, that medical and

especially ophthalmological consultants to industry have only begun to see the potentialities of service not only possible and needed, but soon, I believe to be demanded of them by management, and; fourthly, that a program such as discussed is both preventive of trouble, analytical of particular job problems, and also the real basis of rehabilitation objectives inside industry as well as among trainee applicants.

Follow-Up of Findings on Physical Examinations

By O. A. SANDER, M.D.

Milwaukee, Wis.

Physical examinations of industrial workers have been called the keystone of industrial health work. They are beginning to be recognized as a major factor in the improving health of the industrial population.

The guiding principle of any successful examination program is that it must mutually benefit both employee and employer. Its chief purpose must be to prevent accidents and illness. It should never be carried on with the idea of weeding out the unfit or of ridding a plant of undesirable employees. Labor has objected to such motives in industrial examinations, and rightly so. Labor, however, has cooperated and will continue to cooperate with programs that are genuinely based on the idea of prevention. Workers know that they will not be dealt with unfairly or discriminated against when the principle of mutual benefit is rigidly adhered to.

The Wisconsin Industrial Commission has recognized the need of clarifying the purposes and of establishing a more or less uniform method of industrial examinations by issuing a Plan of Physical Examinations in Industry. The Commission realized that engineering methods of preventing accidents have eliminated many hazards which formerly were the source of serious injuries. Moreover, improved hygiene and housekeeping in plants and workshops have considerably reduced the number of general diseases resulting either directly or indirectly from the various occupations. In spite of these preventive measures, too many accidents and too much general sickness still were occur-

ring because of the failure of the human factor.

Accident-prone persons usually are not so because of innate carelessness but because of some physical impairment which prevents the necessary coordination between their mental and muscular functions. Those persons who lose much time from their work because of illness should not be tagged as mere weaklings and discarded. Some physical defect or disease usually can be found as a cause of repeated illness, which when corrected will make such persons just as healthy and efficient as their fellow-workers. There is no more excuse for firing an accident or sickness repeater than there is for scrapping an automobile because one of its cylinders is missing. Unless the source of the trouble is looked for and corrected, an employer has not used his human machinery to the best advantage.

That is the one and only purpose of physical examinations of industrial workers under the Wisconsin Plan of Examinations—to find the physical defects which may be the source of illness or accident, so that they may be corrected before the sickness or accident develops. That necessitates examining all employees in a plant or shop, not merely those who appear to be unhealthy or those who are exposed to special hazards. Unless all are examined, a dangerous focus of infection or a serious physical handicap may be entirely missed. Industrial workers are, after all, no different than other groups of adults. They are subject to the same diseases and infirmities that all mankind is

heir to. Industrial physical examinations are general health examinations which happen to be made on a special group of adults. There is no more reason for examining only those exposed to special hazards out in the plant than there is for examining those working in the shop office. An office clerk with open tuberculosis is a much greater menace because of contact with fellow-employees than is a foundry laborer with silicosis. The fact has too often been overlooked in planning health programs in industry.

Before enumerating individual defects which can be found with the Wisconsin Plan of Examinations, I want to discuss the general subject of correction of physical defects, because, after all, that is where the industrial nurse fits into the picture.

I feel that you are the only ones in your plants who are equipped to properly follow up on examination findings to see that the doctor's recommendations are carried out. Your training in general medical knowledge and in prevention of illness gives you an understanding of physical findings which the layman personnel directors can never acquire. If some of you happen to be unfortunate enough to be working in a plant where the personnel man has assumed the responsibility of such follow-up investigations, I feel it is your duty to point out to your employer the deficiencies in this most important phase of his examination program and to show him how much more effective you could be in getting remediable defects corrected. I have yet to see a plant in which a layman is the follow-up man where there is much follow-up done. Usually the doctor's report is safely tucked away in a file and forgotten—and often has not been read at all. Much of the benefit from such examinations has thus been wasted and very little of constructive value has resulted.

If one of the purposes of the examination of workers is to improve their health and efficiency, then painstaking follow-up of the doctor's recommendations must be made in each case. Experience shows that most unskilled workers and many who have a reputedly higher intelligence level show the greatest unconcern about remediable physical defects. Often, of course, the reason why defects are neglected is an economic one. The bread winner, who theoretically should be the most desirous of maintaining his health, all too often neglects himself and in-

sists that his family's medical requirements be taken care of first. In plants with group health insurance plans, such problems are solved more readily than where no such plan exists. But regardless of the cause, physical defects usually are not corrected in most workers until someone in the plant assumes the responsibility of seeing that they are. The one who is charged with this responsibility must not only have sympathy and understanding but should know the significance of medical findings. I repeat that no one can carry out such a job quite as effectively as the plant nurse.

To you who now have examinations in your plants or who are contemplating such a program, whether or not you are the follow-up worker, I recommend a detailed study of the Wisconsin Plan. The procedure outlined in that plan was designed as a complete health survey to discover most of the major diseases and physical abnormalities. Too many examinations in industry have been too sketchy and cursory to be of any value. Some actually have been harmful because they created a false sense of security in both employee and employer. Every examination should be as complete as is necessary to discover all major abnormalities, yet not too long and detailed to be impractical. In the past eight years I have used the procedures outlined in the Wisconsin Plan in the examination of over 18,000 industrial workers and I am convinced that it is an adequate and practical device for industrial health maintenance.

The best way to study the plan is to see how it proposes to discover the more important diseases or physical defects:

1. *Tuberculosis.* It now is well known that physical examinations alone will not discover more than half of the cases of active tuberculosis. Some special case-finding method is necessary, preferably a 14 x 17 inch x-ray film of the chest. The Wisconsin Plan suggests that every employee be x-rayed regardless of whether or not his work involves a dust or fume hazard. Although the expense of such a program might at first appear to be prohibitive, experience shows that x-raying of large groups can be done at a fairly nominal cost.

Active and open tuberculous persons must, of course, be removed from their jobs and sent to a sanatorium. It is here that a plant nurse can be of tremendous help in solving

the economic and social readjustment problems in the homes of such persons. Those whose tuberculous lesions are found to be inactive after thorough clinical and laboratory studies are kept at work. Frequently their jobs must be changed, particularly if their regular work exposed them to dusts or fumes and if their work was unusually heavy. Here also the nurse can be of much help in making these necessary adjustments. Such persons are re-examined at rather frequent intervals—every three or six months—so as to detect any reactivation as early as possible. With such a plan the danger of infecting other employees through contact exposure is reduced to a minimum and the incidence of tuberculosis in the industry will drop below that of the general population.

2. *Heart Disease, High Blood Pressure, etc.* Persons found with heart disease requiring lessened physical exertion require special placement at suitable work. Those with high blood pressure when it is accompanied by a damaged heart must occasionally be shifted to less responsible work where the safety of other employees is not jeopardized. Crane operators often are shifted to jobs on the floor for this reason, usually at a reduction in wage-scale. Such adjustments are made with the least feeling of resentment where the plant nurse has collaborated with the doctor in reassuring the worker that the change is necessary in the interest of safety to himself and his fellow-workers. When special treatment is required, nurses can be of invaluable help in steering the patient into competent medical hands and in seeing that the proper treatment is continued as long as necessary. With such control, it frequently is unnecessary to require the worker to lay off during the treatment course.

3. *Visual Defects.* Under the Wisconsin Plan, the vision of all employees is tested both at 20 feet and at 14 inches. Those with impairment of the vision require special examination by a competent oculist to determine the cause. The practice of allowing opticians to make mass eye-surveys in plants is to be condemned. I have seen many eyes fitted with glasses where the defect was due to unrecognized eye disease rather than to a correction error. Others with practically normal vision have had glasses sold to them unnecessarily, a procedure which a reliable oculist would never engage in. The

requirement for wearing glasses should be a flexible one and should depend on the visual acuity required by the job each worker has to do. Obviously, a machinist requires more accurate visual correction than does a general laborer.

This follow-up work on vision is one of the most important jobs a plant nurse can do. Figures are available to show that a visual correction project in a plant will not only result in a reduction of accidents, but will actually speed up production.

4. *Teeth and Tonsils.* The teeth and tonsils are still believed to be potent sources of infection elsewhere, particularly of the joints and kidneys. Industry generally has paid little attention to the improvement of mouth sepsis as a preventive measure of general sickness. If a reduction of sickness absenteeism is one of the results expected from an examination program, then the eradication of these sources of infection should be part of the general follow-up procedure.

5. *Impaired Hearing.* This has been known for years to be a source of accidents and should, therefore, be considered in any well-planned health program. The Wisconsin Plan requires only a rough estimate of hearing, but more and more plants are making more thorough tests with an electric audiometer. When appreciable degrees of loss of hearing are found, such workers should be referred to a competent ear specialist to determine if improvement is possible. When it is not, it occasionally is necessary to change the job of such a man, when his safety and that of others depends on his ability to hear well. On the other hand, for jobs not having such a hazard, deaf-mutes may be safely employed, as they are in a number of plants under my supervision.

6. *Hernias and Varicose Veins.* I am grouping these two defects because they are the cause of more rejections on pre-employment examinations today than any other findings. Under the Wisconsin Plan they are not a cause for rejection and in my experience there is no reason why they should be in most cases. If a hernia is reducible and can be held reduced with a truss, a truss is required for employment. Experience shows that a man with a well-fitting truss can do the heaviest kind of work without difficulty. Moreover, the old

bugaboo of strangulation is largely a myth. Follow-up is necessary with such cases, so that they do not drift into the hands of quacks. Any reliable appliance dealer usually gives a much more satisfactory fit than will a mail-order house.

The same situation holds with varicose veins. If the worker or prospective employee agrees to wear elastic stockings or elastic bandages, he is allowed to do any kind of work. Out of the thousands of varicose veins I have seen, I have still to see the first one break down into an ulcer where bandage or stocking had been worn. Insurance company claim departments have assured me that they are not concerned about liability from either hernias or leg ulcers provided the special preventive measures are carried out. The important thing is to discover them and support them. If that is done, they are not a hazard either from a safety or liability standpoint.

7. *Diabetes.* Although diabetes is not a very common finding among healthy workers, it is found sufficiently often and the complications are sufficiently serious to warrant looking for it in every examination. In my opinion, a routine urinalysis is a necessary part of every health examination and should not be neglected. When even a trace of sugar is found, follow-up analyses should be made. If these are repeatedly positive, the worker should be placed in the hands of his family doctor for control treatment. Here also, there is no need for refusal to hire or for discharge of such an employee, because adequate control of diabetes is such a relatively simple procedure today.

8. *Syphilis.* No health program in industry is complete today without a routine blood test for syphilis. The Wisconsin Plan advises it not only for pre-employment, but for periodic examinations as well. Although it is one of the most valuable procedures with industrial examinations, it can be grossly misused, and has been all too often. In our program, only infectious cases and those with central nervous system involvement are considered unfit for employment. The vast majority of cases found are latent and without any open lesions or late complications. They are asked to agree to carry on a complete treatment regime until they are cured, but they are hired or continued at their work regardless of their positive blood test.

Experience has shown that it is unwise to inform a layman employer or personnel man of such cases, because it is too easy for him to discriminate unconsciously against such an employee. The plant nurse, however, should have this information, because she is ideally fitted to steer the employee into competent hands for treatment and to inquire from time to time how his treatment is progressing. Cures have been much more frequent in plants where the nurse carried on such follow-up work. In plants not having a nurse, it is necessary that the examining physician assume the responsibility of contacting both the employee and the family physician from time to time to determine if the treatment is being given regularly. With the companies whose employees I examine, not one case of syphilis is known to the employers, superintendents or foreman, yet approximately 50 per cent of the positive tests have become negative. I repeat, that if a syphilis program in industry is to be effective, the results must remain confidential and in professional hands. This is more or less true for all physical findings in employees, but is especially advisable for syphilis.

Other diseases and defects might be mentioned, such as the general contagious diseases, bone and joint deformities, etc., but the same general principles apply to them; which is, follow-up on examination findings, have remediable defects corrected, and place on more suitable jobs if necessary.

I want to make a special plea for a more common-sense viewpoint on pre-employment examinations. You as nurses who are serving industry can do much to change the general attitude of employers and employment managers on too rigid employment requirements. Let the hiring depend more on the apparent ability of the man to do the work expected of him rather than on laboratory and clinical findings which are causing no disability and which in all probability will not if they are corrected. Such a point of view is advisable not from humanitarian considerations alone, but also for the very practical reason that too many valuable workers have been unnecessarily discarded for less experienced ones. Such waste of human machinery is costly to industry and would be especially unfortunate now when all available skilled workers are needed in the national defense program.

Moreover, ~~oppressive employment requirements tend to throw all industrial examinations into disrepute.~~ Our experience indicates that no more than 2 per cent of all applicants for work have sufficient abnormalities to warrant their being rejected for work. Any figure appreciably higher than this will eventually break up any examination program, regardless of the good work it may otherwise have accomplished.

The principle of maximum benefit to workers as well as employer must always be strictly adhered to, with new employees as well as old. I recommend to you and to your plant management the Wisconsin Plan of Examinations for its adherence to this principle. With it, any industry cannot help but improve its general employee health, which in turn will result in a general increase in efficiency and production.

Traumatic Neurosis

By LEWIS J. POLLOCK, M.D.

Chicago, Illinois

In America an introduction to a mysterious condition was afforded the medical profession when it was observed that, following railway accidents, many peculiar symptoms occurred in the absence of external evidence of trauma. The condition was then termed "railway spine." Erichsen, who wrote on the subject in 1866 to 1875, later termed it "concussion of the spine." Subsequent observation and study showed that no physical change was present, even on microscopic examination, and it was recognized that the patient presented the same symptoms as in cases of hysteria, at that time remarkably described by Charcot, and in short, suffered from hysteria.

The terms "railway spine" and "spinal concussion" gradually disappeared, and for them was substituted "traumatic neurosis." As the hysterical nature of the disease was recognized, traumatic hysteria was commonly used, as were the terms "traumatic neurasthenia" and "traumatic hysteroneurasthenia."

One might subdivide the neuroses into groups as psychasthenia, neurasthenia, anxiety states, hysteria, etc. The greatest number of post-traumatic cases are those of hysteria and in it the conditions of cause and effect are common to all the neuroses.

In the course of association with industrial medicine one becomes familiar with many symptoms, following accidents but not associated with evidence of actual injury; pain, spasms, contractures, paralyses, convulsions, etc. It may be said that in hysteria every symptom of every disease or injury may be found. We have loss of memory, delirium, confused states and stupors. We

may have paralysis of one or more of the extremities, spasms, contractures, convulsions, pain or loss of sensation, dizziness, blindness, deafness, loss of speech, vomiting, diarrhea, incontinence or retention of urine, and symptoms without end.

It is natural to ask if one is confronted with one of these symptoms, how can it be shown that it is not due to real injury?

Disease or injury of the body or its organs produces a disturbance of function of that particular part. This disturbance of function presents signs and symptoms peculiar to itself. The signs are constant, and are associated, one with the other, in a consistent and determined manner. For example, a paralysis of the hand due to an injury of some of its nerves shows an atrophy in certain muscles and in these only, a paralysis in only these muscles, a loss of sensation in a certain constant part of the hand and definite changes of response to stimulation with electricity. An injury to the spinal cord produces constant and definite changes of the reflexes, paralysis of a sharply defined part of the body, loss of sensation with certain characteristics, and disturbances in muscle tone and bladder and rectal function. So with every part of the body. In hysteria there will be found absent such as would necessarily be present were the symptoms, such as paralysis, due to an injury or we would find signs and symptoms which are adventitious and could not be associated with such a paralysis as the result of injury.

In short, it may definitely be stated that a careful examination by a competent observer can serve to differentiate an organic

from a functional condition, a real disease or injury from hysteria.

Naturally, one asks how is it possible to have a symptom such as a paralysis or even a pain, and yet not have any disease of the body or its organs? If a risqué story be told in the presence of ladies, it is common even now-a-days to observe them blush. This blush is not imagined, we see it, it is physical; and yet it is caused by an emotion. Similarly, if one is frightened, he may be stricken speechless or motionless, his hair stand on end, his heart beat fast, he may burst out in a cold sweat, and he may even have a diarrhea. Here, too, we are dealing with physical changes not due to imagination, injury or disease, but to emotion.

Some years ago amusement was afforded us by viewing the startling feats of hypnotists. A common enough trick was to make the cheek insensitive so that the subject felt no pain when a needle pierced it; or to produce a rigidity of the body sufficient to permit one to break, with a sledge hammer, a rock placed on the body of a man whose head and feet only were supported by chairs. In such a hypnotic state any disability suggested to the subject would cause him to suffer from it.

Hypnosis is produced by suggestion and just as a hypnotized subject may accept a suggestion and feel and act accordingly, so does an hysteric. Some of these suggestions come from the patient himself. If he fears disability he becomes introspective and attentive to his general sensations. None of you felt the collar about your neck until I now mention it; now you all feel it. Our skin is so sensitive that we can feel the lightest wisp of cotton, yet it is seldom that we feel our clothes. We become inattentive to such feelings as experience teaches us are of no consequence. If I were to assure you that the feeling of a collar about your neck is indicative of impending insanity, and you believe me, you would feel your collar all day long.

Much of the suggestion comes from without. Consoling, anxious, and over-solicitous friends and relatives, injudicious examinations by physicians, and re-examinations without end, conversations with attorneys, repetition of symptoms in court, observation of and acquired knowledge concerning other patients, all contribute to the hypothesized picture.

Such signs as loss of sensation, or a concentric diminution of the field of vision may illustrate the point. Before being examined, the patient has no conception of being unable to feel or to see only in a restricted field. When an examiner asks him "do you feel this?" the inference is that if an injury or disease is present, the patient should not be able to feel the touch of cotton or prick of a pin whichever stimulus may be used. The patient is likely to respond doubtfully that he feels it a little, the next stimulus less and finally he will be unable to feel over an area usually referred to a part injured as below the elbow or thigh, etc. The same is true of other examinations. The greatest care must be exercised by all who come into contact with a patient that new signs or symptoms be not carelessly suggested.

What is the cause of hysteria? Is it trauma or injury? Is it shock, great emotional disturbance, over-exertion, fatigue, or privation? Among the many lessons taught by the late war, many may be gleaned relative to hysteria. In this war a new type of destructive agent was used, high explosive shells. There were observed many cases of peculiar nervous manifestations which were attributed to the concussion resulting from explosion of shells close at hand. These cases were therefore called shell-shock.

Careful observation by trained neurologists soon showed that grouped among such cases were patients suffering from various well recognized nervous disorders not produced by accidents of warfare; that the majority were suffering from hysteria. Here, therefore, was a huge experiment in hysteria. The first problem was to determine whether any possible physical change produced by the nearby explosion of high explosive shells was responsible for the hysteria. Evidently not, as the symptoms, tremor, paralysis, mutism, etc., were found to have developed in soldiers in training camps, in the United States, on transports en route to Europe, in the S.O.S., back of the lines and on the way back to base hospitals from the trenches. Such cases are even now developing among our discharged soldiers. It followed that the explosion of shells alone was not responsible nor was the privation, hunger or exhaustion.

Was it emotion? Apparently not; rarely were paralysis or other major hysterical

symptoms observed on the battle field itself. Only after some time elapsed did such symptoms appear. In torpedoed vessels when the passengers were removed to rafts amid signs of disorder and carnage, and exposed to extreme hardship and privation, hysteria did not develop. Only when rescued did the passengers develop such a condition. Some illuminating observations were made. Soldiers were more frequently affected than officers. Crack regiments showed fewer cases than others. Men with severe wounds never developed it. Prisoners of war did not experience it. Here, as in civil life, it was seen that the disease was a disorder of conduct. It occurred among those men who were dissatisfied and fearful and who could not be separated from actual warfare by legitimate causes, as capture or injury.

A state of dissatisfaction leads to the illicit motive back of hysteria in civil life; it may be due to unrequited love, marital incompatibility, inadequate efforts to support a family, fear of discovery of crime, etc. In warfare it was due to fear of death and desire to escape. Following injury it may be due to several causes: fear of being severely injured, inability to resume occupation and support a family with ensuing desire for pension; resentment and desire for compensation, and more rarely for causes not associated with either of these two, such as would have produced hysteria had any other "accident" than injury occurred.

Thus, a woman nearing mid-age in charge of a large number of telephone operators working under high pressure with attending fatigue, without adequate social contact or recreation, unconsciously fears incompetency with subsequent financial difficulties and a lonely, single existence in poverty, receives a "crack" in the ear and develops a torticollis; a young girl who, frequently reprimanded by a harsh employer, slips and strikes the back of her head against the floor, develops fugues, finds herself in an unknown part of the town upon a number of occasions when she starts for work, is only running away from her job. A man who prior to a minor injury was fearful of insanity, unconsciousness and of losing control of himself, develops a hysterical paralysis of an arm, throwing upon his wife the responsibility of earning a living because she had been unsympathetic with him when he was earning it.

Is it meant by this that these patients are

faking, putting this on, that they hypothesize their illness? It is not. They suffer just as much as if they were disabled from organic causes. Is the condition imagined? It is not. No more than the hypnotized person imagines that he can feel no pain. He feels no pain. The symptoms are real enough but they occur only because of suggestion, not because of injury or shock.

Usually the patient is injured or is in an accident, he experiences some pain or slight disability, he is fearful lest it be serious, he becomes introspective, attentive to himself, sensations which formerly he would dismiss are now indicative of serious ailment. His friends ask him innumerable questions with entailing suggestions. An enforced period of idleness occurs. He is examined by physicians, who, by injudicious questions suggest new symptoms. He is fearful lest he be unable to resume his occupation and support his family. Here in short is a well prepared field for the development of severe signs of hysteria. He seeks compensation and legal advice and forthwith a hysteria develops. It does not occur immediately after accident; it occurs following a latent period during which time suggestion has had an opportunity to act.

It would appear that this description would fit a malingerer. Are these conditions the same? Emphatically not. A malingerer is a willful imitator of disease for the purpose of gain. One may not be able, by means at our hands, to say that this man is a malingerer or is a sufferer from hysteria. This inability is our own fault and not the man's. It would be the grossest of injustice to many patriotic and consciously willing soldiers to compare those who developed hysteria to one of the cases I observed in France in a man nicknamed "Bosco." He imitated a case of painful bent back and exclaimed to those about him, "Follow Bosco and go to Hoboken—follow Black Jack and go to Hell." Although back of both conditions is an illicit motive, the hysterical patient is not aware of it. Of course, exaggeration and prolongation of symptoms may occur along with hysteria.

Frequently a malingerer may readily be detected and the condition at times easily differentiated from hysteria.

What relation does compensation bear to hysteria? It has already been said that desire for compensation induced either by wish

for pension to assist in livelihood or by vengeful spirit, may provoke, engender or prolong a hysteria. How do we know this to be true? German statistics show that in spite of medical and surgical methods progressively improving, the duration of incapacity in some ailments and in accidents is greater than it was in the pre-insurance days. Before the Netherlands adopted insurance, the German working man took much longer to recover than one injured in the same way in Holland. When, however, the Netherlands adopted an accident insurance, the duration of the illness suddenly increased. In Denmark it is the custom to pay insured working men, lump settlements at a very early stage of their incapacity and 93.6 per cent recover from what is known as traumatic neurasthenia. In Germany, however, where the injured is entitled to a pension, only 9.3 per cent recover from the same disease. The introduction of the accident law in England in 1907 saw a marked increase in the number of accident cases. In France accident cases have increased by one-fifth and the duration of temporary disability is decidedly longer than before the operation of the law.

Some illuminating observations relating to these considerations may be mentioned. Five or six months after the Messina earthquake there was not a single person suffering from a neurosis caused by the earthquake. No source of compensation was available. When, some years ago, railroad employees were not compensated for injury, they were eager to return to work following an accident and it was the passenger who was afflicted with a traumatic neurosis. The availability of compensation, however, has caused the employee to develop such states as well. It is a common observation among social workers dealing with the poor, that if following illness, prolonged pension is carried out and return to work not encouraged or enforced, the individual becomes a chronic invalid and a ward of the charities. It has been found that in a certain group of people investigated, some 75 per cent of pauperism resulted from illness and this state was fostered by constant assistance without intelligent direction of rehabilitation by labor. At first assistance is abhorred, avoided, reluctantly received; then the morale weakens and assistance is sought, next it is expected and finally demanded.

Litigation holds out promise of reward

and fosters the neuroses. Prolonged litigation prolongs the duration of a neurosis and prolonged forms of compensation work to the same end. Litigation is productive of ill effects through other causes. The presence of a patient before a board or court while his case is being discussed awakens a sense of resentment or distrust. A feeling that the corporation through its expert is trying "to do him." He develops the conviction that he is very seriously and permanently injured through the histrionic efforts of his counsel and statements of ignorant witnesses. He has suggested to him new symptoms and promptly develops them. Some responsibility therefore, rests upon our legal system for the production of these neuroses. It was held by the Fourth Chamber of the Tribunal in France in a certain case, that the incapacity with which the workman seemed to be affected resulted not from the accident, but from the erroneous opinion which the man formed of the rights to which he was entitled by persuading himself that an income was necessarily due him. For this reason compensation was refused.

What is the result following a settlement of the case? Although it is claimed by some that settlement always cures a traumatic hysteria, I believe that there are occasionally exceptions to this rule. At times a traumatic hysteria may persist many months or years following such a settlement. This is rare and is always due to such difficulties as would have produced the hysteria had the accident not occurred. Such difficulties may be social maladaptations or deep rooted fears. If judiciously treated these cases may be relatively rapidly cured.

If a case of traumatic hysteria is to receive compensation, some idea of actual disability is necessary. A traumatic hysteria is curable. It does not produce any permanent disability. The severity of the injury has no relation to the type of severity of the hysteria. Severe symptoms have no relation to the duration of the disease nor are they any indication of a lasting disability. A paralysis of all four extremities may be cured in ten minutes, a slight spasm of the eyelids may last a long time. Harrowing experiences and extremes of horror or fright bear no relation to the severity of the illness. A complete paralysis may follow a slight sprain from stumbling and a Messina earthquake produce merely the winking of an eyelid. Whatever the symptoms, a neurosis is neu-

rosis and one case can be cured as rapidly as the others. However, differing in detail, all accidents produce the same type of disability if they produce a hysteria.

Obviously, if compensation is one of the causes, it must either be dispensed with or it must be given in an innocuous form. As an indication of this mention may be made of the conclusion reached at a joint meeting of the Neurological Society of Paris and the Chiefs of Military, Neurological and Psychiatric Centers. It was voted that for hysteria, neither dismissal from service nor gratuities were to be given. It has already been shown that early lump sum settlement tends practically to eliminate the long duration of these conditions. If existing laws are such as prevent such a settlement refuge may be taken in arrangements between counsels for apparently such a settlement in the ignorance of the patient. Unfortunately, owing to the frailties of human nature this is frequently unsuccessful. Prolonged litigation must be discouraged. After all, the important thing is to get the patient well.

A corporation lawyer remarked to me relative to this statement, "Perhaps from the medical standpoint, but not from mine." He was decidedly wrong. As soon as it is recognized that immediate final settlement cures a hysteria, it will be found that the amount of expense, otherwise prolonged, will be reduced. The quicker the patient recovers, whatever the initial cost, the less, in my opinion, will be the expense. Certainly, an early and final settlement is the only just procedure for such a case. In addition to this several essential features in the handling of such a case stand out; an early and correct diagnosis by competent observers, avoidance of careless examinations and ignorant diagnosis and avoidance of prolonged litigation and its ensuing chances for sugges-

tions and fixation, particularly when the patient is an observer of the trial of his case, and a quick return to some form of work.

The necessity for early return to occupation cannot be overemphasized. Facilities should exist whereby a patient may be inducted slowly into normal competition. Under existing conditions many disabled individuals fear to attempt resumption of labor not only because of physical or mental incapacity but because their compensation would be reduced and if then they were unable to continue their work their economic condition would suffer. What is true of spontaneous illness is doubly true of traumatic illness.

The problem of dealing with accidents of industry should be concerned more with the recovery of the patient than the doling out of compensation, awarding, as it were, the patient for continuous disability.

The compensation feature should be overshadowed by that of treatment. It is necessary to provide rehabilitation centers with proper facilities for diagnosis by competent physicians, medical and surgical treatment, physiotherapy and occupational treatment. Workshops under the direction of trained supervisors are necessary. Here the patient may be gradually inducted into normal competition; at first put upon simple tasks for a short time, he gradually becomes reassured and trained to resume his own occupation, knowing that being under kindly and intelligent medical supervision no harm can come to him. By such methods patients may recognize that industries and the corporations employing them are as eager to produce in them a recovery as are they themselves. That they are more concerned with a repair of certain forces, as essential to them as inanimate machinery, than they are to avoid the payment of continued compensation.

THURSDAY LUNCHEON SESSION

October 10, 1940

This luncheon session was called to order by Mrs. Christian Seabrook, R.N., Local Field Supervisor, Metropolitan Life Insurance Company, Chicago, and President, Chicago Industrial Nurses Association, who presided. Chairman Seabrook commented briefly upon the importance of the activities

of industrial nurses, and then introduced Dr. E. W. Williamson, Associate Director, American College of Surgeons, Chicago, who, in the absence of Dr. Malcolm T. MacEachern, read the prepared paper of Dr. MacEachern.

The Industrial Nurse's Perspective

By MALCOLM T. MacEACHERN, M.D.

Associate Director, American College of Surgeons, Chicago

The trained nurse in industry has the same motive as any other nurse—service to sick and injured humanity. Her position as an employee of an industrial concern does not alter that primary purpose, although she enjoys with the public health nurse more possibilities for preventing illness and accident than the nurse who works in a hospital. Also, a financial evaluation is placed on her services that adds to them a direct economic aspect.

In a recent issue of *Factory Management* an article bore a headline in large type reading "Small Plant Hires Nurse—Saves." It continued: "Lost time was cut 90 per cent when this 300-man plant gave up its haphazard first-aid practice, acquired a resident nurse, set up a regular first-aid department. Lost time due to injuries or sickness totaled 23 weeks in the year previous, compared with two weeks in the first year following the acquiring of a resident nurse in the Bull Dog Electric Products Company in Detroit. And this didn't tell the whole story because workers' efficiency was improved by prompt treatment for colds and other minor ailments."

The trend toward appreciation of their value to industry in dollars and cents should remove the feeling that some doctors and nurses might have of being aliens in business, of constantly having to try to justify their presence in the industrial scene. They belong, and are an important aid in gearing industry to maximum efficiency under the demands of periods of national emergency such as we are in at the present time.

Nurses have helped to transform our hospitals from gloomy havens for the sick and dying to cheerful houses of recovery. Chester S. Johnson of the Quaker Oats Company, in a talk at the Safety Congress two years ago said:

"Management of industry believes that the industrial nurse more than justifies herself in the saving of money which results from proper care and treatment of people who are injured or sick. These savings accrue, not only to the employer, but to the employee as well. The industrial nurse's opportunity to take the initiative in carry-

ing on a program of health conservation is unlimited. Management also believes that the nurse has a real function to perform in the modern program of industrial relations. She is important in establishing and maintaining good will toward the employer."

The Nurse's Part

Only in recent years has relationship between management and workers reached the point of systematic organization and planning. Service in this field is a byproduct of the nurse's regular work, but apparently it is a main consideration to the industrial relations department, for someone in outlining an industrial relations program recently listed eight divisions—employment, education, health, safety, welfare, sanitation, recreation and rehabilitation—and the nurse was a prominent figure in every one of them!

In industry it is extremely important how the nurse treats the patient, for the employer-employee relationship is affected by her manner, her receptivity to confidences, her ability to allay fear and to give helpful advice, her skill in teaching, and her general exhibition of interest in everything that promises to promote the employee's welfare.

In a talk on the industrial nurse and personnel work at the first annual Symposium for Industrial Nurses, sponsored by the Illinois State Department of Public Health, Mr. George B. Hallett, chief of the hospital department of the Western Electric Company told of experiments with improved lighting. With better light, production rose. But when bulbs were changed with no change in voltage, production rose anyway. The experimenters were forced to the conclusion that the very fact of being experimented upon was the stepping-up influence. There was improved attitude by employees when interested observation was introduced.

This discovery led the company to inaugurate a systematic interviewing system. Trained interviewers encourage employees to discuss their grievances and problems. The interviewing process itself—the relief it affords—is significant in their opinion. Grievances seem to shrink in importance

when communication throws a more objective light on them.

Since the nurse is dealing constantly with people who have some complaint, mental, emotional, or physical, which may either be caused by or be the cause of maladjustment to a work situation, they believe her capable of making an important contribution if she acquires good interviewing technique. Mr. Hallett said:

"Nurses are particularly well placed in the industrial structure to do this because of their professional standing, their non-authoritative relationship with employees and supervisors, and their neutral mediatory position in the complex industrial structure."

That statement leads a doctor to lay greater stress than he otherwise would upon the industrial relations aspect of nursing in industry. The natural inclination of a doctor would be to deprecate the trend toward the nurse scattering her energies by acting as a personnel adviser on all sorts of problems. He might contend that industry hires nurses because they want nurses, and nursing is what the nurse is peculiarly fitted to do. But it may be conceded that her very training as a nurse, and the position in which it places her in industry, should peculiarly fit her for this broader field. Certainly if she can help to relieve employees' mental and emotional, as well as physical, distress, she is thereby also improving their health, and is therefore still within the nursing sphere. We are simply making that sphere more comprehensive.

Specific Functions

Within the scope of the industrial nurse's work, consequently, are functions that directly and indirectly bear on health and safety:

1. Helping the physician in making pre-employment and periodic physical examinations.
2. Rendering first aid and subsequent care of industrial injuries and occupational diseases as directed and supervised by the physician in charge.
3. Rendering reasonable first aid and advice to employees, suffering from non-industrial injuries and illnesses while on duty according to the policies and standing orders for such service. For further professional service employees should be referred to their private physicians.

4. Cooperating with the safety department by

- (a) Reiterating safety principles to employees at the time of dispensary visits.
- (b) Re-explaining and re-emphasizing to employees the program in plant sanitation when indicated.
- (c) Reporting all accidental injuries and occupational diseases that should be investigated from the standpoint of casual relationship and prevention.
- (d) Reporting to the physician for examination, and also to the safety director, those employees who are accident repeaters or who seem to be accident prone on account of mental or physical defects.

5. Cooperating in promulgating an acceptable program in health preservation and health education by:

- (a) Giving appropriate advice to individual employees.
- (b) Giving talks to groups on proper nursing subjects.
- (c) Distributing literature on health subjects.
- (d) Encouraging workers to have periodic physical examinations where such examinations are not already being made.
- (e) Assisting in developing adequate recreational programs and facilities.
- (f) Assisting in maintaining certain phases of the sanitation program by inspecting the plant cafeteria and kitchen and other places where sanitation is an important factor.
- (g) Cooperating with private physicians and with local health and welfare agencies in activities designed to benefit the health of the worker and of the community as a whole.

6. Keeping adequate records by:

- (a) Recording all industrial injuries and occupational diseases.
- (b) Recording all employee visits to the dispensary for non-industrial injuries and illnesses.
- (c) Maintaining physical examination records as confidential information.
- (d) Compiling statistical summaries, at intervals, of the injury and illness experience, and reporting it to the indicated officials.
- (e) Computing or obtaining annually the injury frequency and severity rate.

In this list of functions is indicated the limits beyond which the nurse should not go in rendering medical service. It is also indicated that her opportunities are limitless in improving industrial relations, and even public relations, through her health and safety efforts. The public relations possibilities may be realized through the function that involves "cooperating with private physicians and with local health and welfare agencies in activities designed to benefit the health of the worker and of the community as a whole."

The duties of the industrial nurse vary considerably with the size of the industry and the type of community in which it is situated. Some larger plants have nurses exclusively for home calls. In the small plant, these may come under the functions of the same nurse who assists with first aid and other work. In making home calls, it is sometimes possible to aid in improving conditions and attitudes, thus rendering social service.

Qualifications

What qualifications should the nurse have to be successful in industrial nursing? We at the American College of Surgeons have a strong predilection for minimum standards. There should be a minimum standard for nursing in industry, to supplement the minimum standard for medical service in industry. This suggested minimum standard for nursing service in industry is based upon qualifications formulated a year or so ago by the executive and education divisions of the National Organization for Public Health Nursing:

1. Graduation from an accredited school of nursing, as a prerequisite to employment in an industrial medical department.
2. Instruction and experience in surgical nursing, including operating room and first aid, or supplementary instruction in these types of nursing if thorough preparation was not included in the basic nursing education period.
3. At least one year of experience under qualified nursing supervision in a public health nursing service, to succeed an academic year of study in public health nursing in one of the colleges or universities whose program is approved by the National Organization for Public Health Nursing.

4. Registration under the laws governing trained nursing service in the state.

5. For the nurse in a supervisory position, successful experience in industrial nursing, part of which is preferably in the type of industrial work in which the nurse is to act as supervisor.

6. A working knowledge of the principles of teaching, social case work, community organization and resources, public health administration, industrial relations, personnel administration, industrial hazards, nutrition, communicable diseases, mental hygiene, and personal hygiene, as they affect the individual and his family.

7. An interest in and ability to work with all kinds of people; good physical health and emotional stability; initiative; good judgment; resourcefulness.

8. Qualities of leadership, executive and teaching ability, vision and imagination for the supervisor of other nurses.

In addition, a special attribute the industrial nurse needs is responsiveness to the stimulation of industrial activity. Not every nurse would have this. Some feel more responsive to surroundings that reflect the attitudes and ideals of medical science, such as we find in the hospital. Perhaps only by trial could it be discovered whether the reaction to the industrial situation promised to bring out the best that was in a person. And certainly a nurse and every individual should seek a sphere of activity that challenges her or him to supreme effort.

The Organization for Public Health Nursing declares that the number of nurses who through education and experience can meet all of the desirable qualifications is limited. A door of opportunity is therefore open in this field for many who seek a career of service. Replies to a recent questionnaire sent out by the National Safety Council showed that 213 member plants had 565 full time nurses and 58 part time nurses. The Hawthorne Plant of the Western Electric Company, employing some 13,000 people, recently reported a staff of ten full time nurses, two technicians and three clerks, in addition to nine doctors.

Opportunities

Graduation from an accredited nursing school is essential. The next step is special training in the subject, and the National

Organization for Public Health Nursing has approved the programs in certain colleges or universities for courses of study in public health nursing, of which industrial nursing is considered one division. Doubtless some of these courses are so arranged that they can be taken as postgraduate work in spare time without interfering with employment. There has also been some talk of holding institutes for industrial health personnel. Last fall, in Chicago, under the sponsorship of the Illinois State Department of Health, a symposium, the first of its kind, for industrial nurses, was held, and nurses from seven or eight states attended.

Nurses should attend as many of the conferences on medical service in industry as they can. They should attend sessions of national and local industrial nursing organizations, or those of sections of nursing and medical associations that concentrate on industrial problems. Knowledge may also be acquired through reading and through cultivation of acquaintance with others doing similar work. Of course, knowledge of industry in general, and of the particular industry and company, will be valuable.

"Who's Too Small for Health Program?" is the name of a pamphlet issued this year by the Committee on Healthful Working Conditions of the National Association of Manufacturers. The implication for the nurse is clear in the statement that the question, "Can we afford a health program?" should be rephrased by the small plant to say, "Can we afford *not* to have a health program?" They have it figured out that even in the smallest plants, a nurse could be afforded by utilizing her part time in other departments where she would still be available in case of emergency. Her "salary

would be offset by lower compensation costs and higher production."

Of course, the danger in such a situation is that the nurse may be expected to perform service for which she is neither by training nor by law equipped or authorized. That is a danger against which she must guard, and always be sure to have medical advice before she undertakes any but nursing procedures and ordinary first aid.

Advances in Industry

The industrial nurse's perspective and her prospects depend, however, upon the outlook for medical service in industry as a whole. In 1915—only twenty-five years ago—the average expenditure for medical work in industry was 88 cents per capita. Now it is over \$6.00 per capita.

With the impetus of the new committee which Mr. Beaver heads, the formation this year of the Air Hygiene Foundation, the increasing efforts of the American Association of Industrial Physicians and Surgeons and the National Organization for Public Health Nursing, the continuing cooperation of the National Safety Council and the influence exerted by the many special and local organizations in the field, there is little question but that the next twenty-five years will see even more advance than the past in industrial medicine.

Especially when figures like those given by the United States Public Health Service can be produced which demonstrate that the expenditure by a company of \$8.00 per man per year on a health program will yield a \$12, or 150 per cent, return per year to that company. Industry gives ear to that kind of argument—all of us do in this practical age.

THURSDAY AFTERNOON SESSION

October 10, 1940

The session was called to order by Mrs. Christian Seabrook, R.N., Local Field Supervisor, Metropolitan Life Insurance Co., Chicago, and President, Chicago Industrial Nurses Association, who presided. Chairman Seabrook introduced Dr. Theodore R. Van-

Dellan, Instructor of Medicine, Northwestern University Medical School, Chicago, who, in the absence of Dr. J. Roscoe Miller, read his prepared paper before the delegates.

The Heart and Heart Disease in Industry

By J. ROSCOE MILLER, M.S., M.D.

Chicago, Illinois

Heart disease leads all others as a cause of death in the United States. Its morbidity rate can only be estimated but it is, of course, enormous. Cardiac ailments account not only for days lost from industry but also considerable curtailment of activity. The 300,000 deaths recorded each year from heart disease in this country represent countless days of partial or complete inactivity for a much greater number.

These facts are quoted to point out that we are not discussing a rare or unimportant entity but the foremost problem facing medicine today. Despite this dark picture there is a bright side and the cardiac should not be looked upon as a burden on himself, industry or society. We are rapidly learning more about the prevention and management of heart disease and the regulation of those who are so afflicted.

The main reason for the ascendancy of heart trouble in our mortality statistics, is that medicine has not yet understood, and therefore has not conquered the degenerative diseases. We have learned much about their care and methods of prolonging useful life but until we understand the underlying causes we will be unable to prevent them. It is all well and good to say everyone must grow old, but there is a reason why some people age faster than others and why this aging process is more frequently seen in one organ or set of organs than in another. Why do these things occur? The answer is the biggest challenge to medicine today. When it is answered we may again take the ceiling off the life expectancy in man.

A child born a hundred or more years ago had to run the gauntlet of the diseases common to infancy; namely the dysenteries, food and vitamin deficiencies, and the acute infections. Then came childhood with its diphtheria, small pox and meningitis. Successfully through these, the young adult could expect typhoid fever and pneumonia. Only after surviving these and many other acute infections would he enter the degenerative period where heart disease takes such a heavy toll.

Today many of these infectious diseases are either partially or completely controlled. The control of typhoid fever has become an important measure in every community's sanitation program. An enlightened people no longer must fear small pox or diphtheria, and the death rate from pneumonia has fallen to a level undreamed of by our fathers. The result is that people are living to an age where arteriosclerosis and its attending complications are our chief problem.

The causes of heart disease are many and for the sake of continuity it might be well to discuss them from the standpoint of the age at onset. This necessarily makes us begin with congenital heart disease. This phase can be passed over rather rapidly because of the fact that it is relatively uncommon and it does not offer a serious problem to industry. Since the heart is such a complicated structure it is little wonder that defects in development do occur. The wonder is rather that they occur so seldom. If the defect is slight, such as incomplete closure in the septum between the two auricles it may go unnoticed and present no particular problem. If on the other hand the defect is great it is incompatible with life and the child does not survive. Diagnosis is usually easy and is made early. Its treatment can be dismissed from a discussion such as this.

The second large classification which cannot be dismissed is heart disease which results from infection. Since the heart is called upon to propel all the blood circulating through the body it naturally follows that it is particularly susceptible to infections which enter the blood stream, in fact this is practically the only way bacteria may enter the heart. Accidents resulting in penetrating wounds of the chest and spreading infections from the lungs and pleura may and do occur but they are uncommon. Heart infections are usually blood borne, and upper respiratory infections, tonsillitis, bronchitis, and rheumatic fever are the common offenders. Their effect is usually insidious and chronic. The valves separating the chambers of the heart, or the heart and

great vessels, become involved, and the body sets about to heal the damaged member. This it does admirably by forming a scar, much as a scar is formed on the skin after a cut.

This may lead to other difficulties, however. First of all the heart and its lining are thereafter more liable to subsequent infections and secondly a puckering takes place much as it does in scars elsewhere and as a result the valves no longer come tightly together when they close and a condition commonly known as "leakage of the heart" results. In addition the valve no longer is soft and pliable but becomes rigid and consequently the inflowing blood is obstructed. That this obstruction puts an abnormal strain on the heart musculature is obvious. The heart responds to the extra work by dilating and increasing the strength of its muscular walls. This process can continue to be effective only to a certain point, however, and when the time is reached when the muscle can no longer stand the strain, it dilates, often suddenly, and heart failure results.

Now a heart so affected naturally has its reserve diminished, and a patient so afflicted can compare the status of his heart with his bank account. Each day his heart builds up a certain reserve and each day he adds his earning to his account. If his salary is cut the amount he adds to his account decreases and if his heart is damaged his cardiac reserve is likewise diminished. If he lives within his means he will be able to continue a happy existence but if he overdraws, bankruptcy ensues. In a similar sense the patient with heart disease can continue a useful life as long as he does not overtax his heart, but lack of care in this regard will result in heart failure. The treatment then amounts to no more than building up the reserve. The recuperative power of the heart is enormous if it is given half a chance, and if a patient's activities are curtailed and stimulating drugs, such as digitalis, are given an effective heart action can again be obtained.

Now to apply these facts to the workman in industry. There are several ways in which industry can influence the prevention of heart disease due to infection. First by working conditions which help to prevent acute infections and secondly by examination of employees before and during employment. Discovery of hidden or unrecognized

infections at the time of employment may prevent serious consequences later. In the same manner, their discovery by periodic examinations may prevent subsequent cardiac complications.

When a person is found to have valvular heart disease there is no reason why he or she cannot lead a full and useful life, remembering always that the cardiac reserve is diminished and that the heart should not be asked to carry heavy burdens. A sedentary occupation is certainly more desirable for these people, even though they are having no trouble with their heart at the time of examination. Already handicapped, it will perform better and last longer if called upon to do no more than is absolutely necessary. Sudden failure of such hearts is unusual and there is no reason why employees with valvular heart disease cannot be placed in positions of responsibility, even where they are responsible for the welfare of others.

Such is not the case with heart disease due to arteriosclerosis. This form should be differentiated from the foregoing in that its cause and effect are different. It is of course seen in an older age group, usually appearing toward the end of the fourth decade. As has been said the heart's responsibility is the propulsion of blood throughout the body but at the same time it requires a blood supply of its own. This is supplied through a system known as the coronary arteries. Unfortunately in arteriosclerosis, or hardening of the arteries, these coronary arteries are often the first vessels in the body to be affected. If the walls of the vessels become sufficiently hardened the flow of blood to the heart muscle is lessened. Pain is the result. This pain is characterized by sudden onset and is usually located under the breast bone. If it radiates it is usually to the left shoulder and arm. It usually comes as the result of unusual exertion and goes away with rest. This is angina pectoris. It is the heart's way of telling us that it is not getting enough nourishment to carry on the work we are asking of it and when we feel it is time to stop and take stock.

This type of heart disease usually occurs in (1) men who are working under tension and (2) those who are overweight. Therefore a readjustment in their work and mode of living is necessary. The prevention of arteriosclerosis is one of the strongest talk-

ing points for vacations. Freedom from work and worry for a short period of time is a fine prophylactic measure. The most important exercise for these patients is one which is performed three times each day and consists in pushing themselves away from the dinner table some time before they have eaten all they can hold. Reduction of weight is essential and since the heart sufferer should not perform strenuous exercise there is only one way to obtain this reduction and that is by diet.

Now suppose this condition does develop in an individual, does it mean that he is no longer useful in industry?

Certainly not! If he is placed in the proper position he will be useful to industry and himself alike. But his position should not require heavy exertion and he should be under the care of his family physician. In case he is indispensable to his business others must be trained to replace him allowing the patient necessary vacations for proper rest. Lastly, it is unwise to put the physical welfare of others in his hands, since too often this form of heart disease results in sudden failure. If his job is one which requires his constant attention and where any lapse would endanger his life or that of other employees he should be transferred to other work.

Symptoms of coronary heart disease vary and they might resemble symptoms referable to other organs of the body. When a coronary vessel becomes completely plugged it is known as coronary thrombosis. Typically there is severe oppressive pain in the chest, frequently radiating down the left arm. This does not go away with rest and is accompanied by a fall in blood pressure and signs of shock. This is the usual but by no means the invariable picture presented. Often the symptoms seem to come from the stomach, particularly in mild attacks, or the sufferer may think he has "bronchitis" or gall bladder disease. One must be cautious of the man over 40 who complains of a sudden unusual pain in his stomach. It may be his stomach, but again it may be his heart. An exaggeration which makes this point is the statement that heart disease in young men is usually stomach trouble while stomach trouble in old men is usually heart disease. Overdrawn, of course, but it contains enough truth to make it worth remembering.

What applies to heart disease which is the result of hardening of the arteries is also applicable to that resulting from elevated blood pressure. It occurs in essentially the same age group and its management is essentially the same. The undamaged heart can long withstand moderate elevations of blood pressure unless a sudden undue burden is placed upon it. However if the pressure is sustained for a sufficient period of time and if it reaches an unusually high level the heart may no longer be able to push against this added load, and failure results. What has been said about hardening of the arteries may be said also about hypertension. It is compatible with long and useful life, but it does require some curtailment of activity.

As to the type of heart disease resulting from toxins only a few words need be said, as these are more often internal than external. Thyrotoxicosis may result in heart disease but as a rule it is a temporary reaction. As soon as the thyroid is controlled the heart returns to its former state. Drug and chemical injuries to the heart are unusual and present such a rare problem that they need not concern us at this time.

With our modern methods of diagnosis the recognition of the various forms of heart disease important to industry is usually comparatively easy. Despite all the additions to our diagnostic armamentarium there is still nothing to replace a careful history and physical examination. The size and shape of the heart as determined by percussion and the x-ray will in itself give valuable clues as to whether there is any abnormality and what the underlying cause is. Thus rheumatic heart disease with a mitral stenosis will result in a different contour from that seen in hypertension. The recent increase in x-ray examination of the chest for occupational lung diseases should result in the recognition of more abnormal hearts. The pulse rate itself is often a good guide to the heart's condition.

It can be stated as a general rule that a slow heart is better than a fast one or, to put it another way, when the heart beats 70 times per minute it is working $\frac{1}{2}$ of the time and resting $\frac{1}{2}$ of the time in between beats. When it beats 100 times per minute it can rest only half of the time, and when it increases to 130 it gets only half as much rest as when it beats normally at 70 per

minute. In thyrotoxicosis, one of the cardinal signs is a rapid pulse, and an increased pulse rate when at rest is one of the early signs of heart failure. Palpitation of the pulse will also reveal irregularities. Some of these may be harmless, but they should all be investigated and evaluated.

Examination with a stethoscope may be all that is necessary to determine the presence of a valvular lesion, its location and extent. The electrocardiogram, on the other hand, is of particular value in deciding whether degenerative heart changes have taken place and how far they have progressed. This valuable aid is often discredited unjustly by those who expect more information than it is possible for it to give. To understand and evaluate the electrocardiogram it is necessary to review briefly the conduction mechanism of the heart. This has been likened to a telegraphic system, through which pass electrical impulses which initiate the heart beat. The electrocardiogram measures the amount of this current, the time it takes to pass through the heart and the route it follows. It is at once obvious that it is of inestimable value in such conditions as coronary thrombosis and hypertension where the conduction system may be damaged, but that it might lend little aid in valvular heart disease where the conduction system is intact. It is not an expensive procedure and should be used more extensively in older employees, particularly where heart disease is suspected.

Another procedure of value in making a heart examination is the response of the pulse rate and blood pressure to exercise. It is simply and easily performed. The pulse rate and blood pressure are taken while the patient is in a resting state and then he is required to do a standard exercise, one of the most common being 25 hops on each foot. Immediately after this exertion the pulse and blood pressure are again taken; both should rise, the former 20 to 40 per cent and the latter from 12 to 30 points. At the end of three minutes' rest, however, both should have returned to or below their previous level. In some instances stairs of certain height are used, or the patient is told to blow through an aperture for a given length of time. No matter what method is used it gives valuable information in little time and with very little apparatus. Vital

capacities and circulation times are also used but while of value to the cardiologist they are not as well adapted to routine examinations.

There is a place in industry for those having heart disease. In fact those having an old, healed infection may well be as good risk as their more fortunate colleague. However it is important that the heart ailment be recognized and properly evaluated; and secondly that the sufferer be put at tasks for which he is fitted but which do not put undue stress on the damaged organ. They should never engage in occupations where there is a possibility of lung involvement such as may come from silicon particles, because a heart already damaged will certainly react poorly if the lungs too are affected. Likewise his job should be chosen with regard to the amount of exertion incident to it. And finally periodic examinations of these employees are particularly desirable.

Lastly I want to say a word about the management of acute heart attacks while the patient is at work. These attacks are usually of sudden onset, and whether due to a failing rheumatic heart or a coronary occlusion, the treatment is essentially the same. The first principle is rest, and this means in bed. Strange as it may seem, many patients with an acute failure or a coronary thrombosis are afraid to lie down for fear they will not be able to get their breath. The head should be propped up on two or more pillows for the patient's comfort. Morphine should be administered to these patients, since it stops the pain and relieves restlessness. If an apparatus is available for the administration of oxygen it should by all means be given as it may save the patient's life. Do not under any circumstance allow the patient to walk to the car or ambulance which is to convey him to the hospital or his home. That extra exertion may be more than the failing heart can stand. And as has been mentioned earlier, be on the constant lookout for heart disease masquerading under bizarre symptoms.

Early recognition of heart failure and institution of proper measures of control may save weeks and months of invalidism which result if the underlying condition is allowed to go unrecognized.

Nutrition for Industrial Workers

By MARY I. BARBER

Director of Home Economics, Kellogg Company, Battle Creek, Mich.

An observant personnel manager sizes up applicants at the first glance. Subconsciously his mind registers the presence or absence of good posture, straight legs, skilful hands, bright eyes, white teeth. The lack of any of these qualities may be caused by malnutrition and the reason for it may date back many years. Nothing can be done to correct past mistakes or ignorances, but something can be done to improve them in the future.

The physical examination given to new employees and the periodic check-up will disclose such obvious things as imperfect eyesight, dental caries, goitre or anemia. Many physicians send employees to the dentist or family doctor; but possibly neither may give advice on the improvement in food habits which will mean better nutrition. The nurse has a splendid opportunity to find out about the kind of menus served in the homes which she visits, or if she does not make home calls, she can get this information by talking with the people who come to her office.

People have an instinctive confidence in a nurse. They do not fear her as they do the doctor—he may find out that they need their tonsils out and recommend a painful operation. The nurse does not prescribe. She listens sympathetically. If she is alert she finds out much which is significant and which can guide the doctor in his diagnosis. A patient may be shy about talking to the doctor about being overweight—but not to the nurse. An overweight condition may be a contributing factor to less than 100 per cent efficiency on the job.

Occasionally we find a factory where a nutritionist is employed. She, the nurse and the doctor are a combination ideal for carrying on a nutrition program. One large manufacturing plant has such a set-up. The nutritionist has conferences with employees who have asked for this service or have been referred by doctors or nurses. She directs certain experiments such as the administration of cod liver oil or vitamin tablets to certain groups, comparing their lack of colds to those of other groups not having vitamin therapy. The nutritionist gives special courses for the nurses and helps them

with employees' problems. She acts as adviser to the cafeteria director.

Here is a letter to employees typical of a nutrition program explanation:

To the Vitamin Group

"Our tablets this winter contain vitamins A, B, D, and G instead of the usual A and D of former years.

"Why serve a tablet which contains vitamin B and vitamin G? Because recent studies show that these vitamins, in right amount, help to make us physically fit by keeping the digestive tract healthier, appetite keener, and nerves steadier.

"There are foods rich in these vitamins, but people do not always get the right amount in their food. To make certain that the members of the Vitamin Group are adequately supplied, we include small amounts of them in the tablets.

"We could get the rest from our food. Isn't it fortunate that we can turn to the common foods like milk, green leafy and yellow vegetables, potatoes, oranges, tomatoes, eggs, beef, liver, and whole grain cereals to furnish these vitamins? At the same time, we shall be richly supplied with vitamins A and C, and the best proteins and minerals.

"If your menus for the day include in approximately the quantities suggested the following foods with butter, whole grain cereals, and breadstuffs, you may rest assured you will have better health and greater vigor.

Milk, whole.....1 pint
Egg1
Broccoli (or any green leaf vegetable)1 cup, steamed
Carrots (or any yellow vegetable) 2 or 3 small
Potato, medium size.....1
Orange juice (or 2 cups tomato juice) ½ cup
Liver, or beef, or pork well cooked, 1 serving

"There would be no harm in doubling the amounts of the items.

"If there is any question you wish to ask about your diet, the Medical Department will gladly discuss it with you.

"Cordially yours
Nutrition Adviser
Plant Nurse."

It is desirable to have a milk dispenser or snack bar available to all employees. This assures food served and eaten in a sanitary way. Nothing looks worse than people eating while working. Crumbs have no place in a factory work room. One factory which used to have a soft drink dispenser was persuaded to sell bottled milk also, so a refrigerator was purchased. Immediately the workers began to buy white and chocolate milk. Soon the refrigerator (a very large one) was inadequate, so a snack bar was established. This particular plant runs 24 hours a day—4 shifts—with about 1,800 employees. Here are the sales figures for June 1940 on milk products alone:

1,700 to 2,000 persons are served per day.
Milk.....1,200 half pint bottles
2,400 pint bottles
Ice Cream.....1,700 gallons
Chocolate Milk.....1,800 half pint bottles
Buttermilk.....180 gallons

Coffee, sandwiches and doughnuts are also available but observation shows that the dairy products are the best sellers. In our own factory the snack bar carries individual packages of our own cereals and interestingly enough, a fairly large number of people who are working with them day after day buy them.

Some public school cafeterias serve a combination of individual ready-to-eat cereal with a one-half pint bottle of milk for five cents. If a whole grain cereal is chosen this is as good value for the money as any combination possible on a counter. Many children eat this as dessert.

I have watched industrial workers go along the line in a cafeteria and often am astonished by the poorly balanced meals they choose—and sometimes pleasantly surprised at wise choices. Perhaps the solution is a combination or plate meal to be played up and made so attractive and priced so reasonably that it will be a voluntary choice. A well trained food service director can see that wholesome, nutritious meals are offered.

Industry feels its responsibility to its em-

ployees and has proved this by providing such things as sanitary working conditions, medical service, recreational facilities, etc., but for the most part a constructive nutrition program has been omitted. Can it be ignored any longer if manufacturers wish to cooperate with government agencies and promote the American Way of living? The strongest argument I can give in urging industry to include nutrition in its thinking for 1941 is to quote Miss Harriet Elliott, Consumer Commissioner, National Defense Advisory Commission:

"We have a job to do. You, and I, and everyone. Our job is this: To make America strong.

"We have our lands to hold, our waters to protect, our skies to guard. We have these, but we have more. We have people.

"We are rich in people. People who love and cherish our lands. People who know how and want to work. People who have deep faith that here we have the greatest chance for life, and liberty, and the pursuit of happiness. People who know the fight for these is never won until it is won for everybody.

"Defense is planes and guns. It is equipping an army to man our military weapons. It is this, and more. It is building the health, the physical fitness, the social well-being of all our people, and doing it the democratic way. Hungry people, undernourished people, ill people, do not make for strong defense.

"This, then, is our job, not all of it, but a vital part: Let us make every American strong, stronger than ever before, sturdier in body, steadier in nerves, surer in living."

Out of 130 million people, 45 million live below the safety line because we do not get the food we need. The reasons are because the income is too low; because of ignorance of how to buy, plan and prepare meals; because our interest has not been roused.

Below the safety line means:

Bodies that tire too easily.
Bodies with minds that are slow to think.
Bodies too weak to fight disease.

On or above the safety line means:

Strong, straight bodies that can carry the load of a hard day's work; eyes that are sharp and sure; nerves that are steady, firm and unafraid.

You can help to build a food route to safety by an educational program in your

organization. This can be under the personnel, medical, nursing or home economics department—or better, with the cooperation of all of them. Optimum nutrition for every worker; helps for his family by setting up a food clinic to which problems can be brought; distribution of leaflets which give practical advice on spending money and getting nutritional value for each food dollar; encouraging home gardens, home canning or cold locker-storage of surplus fruits and vegetables; setting up displays of adequate menus for a day; posting on bulletin boards items to stimulate interest in nutrition.

There is some dietitian in every city who will gladly help you with a nutrition program (I am sure that I can speak for members of the American Dietetic Association). The Food and National Defense Issue of Consumers Guide lists city, county, state and government agencies ready to give service on this "Food for Safety" program.

Again let me quote from this same magazine:

"AMERICA can dream that want will disappear. America can hope and live in hope that none will lack the food he needs. We can dream and hope, but we must also work.

"We can work.

"With our lands, and hands, and machines we have built greatly. We have raised from the earth buildings that soar a thousand

feet. We have dammed gigantic rivers and made their waters do the work of millions. We have created cities and highways, factories and machines that are the marvel of the world.

"We have worked at many things. We must do more.

"We must work at this job of getting everybody a chance to earn a livelihood that includes the food he needs. We must make sure that our farmers, the most abundant producers on earth, will have the help they need to keep on raising food and saving soil. We must make our dollars buy the best and safest meals for all.

"This means work.

"We can start in our own homes. Make food do all the job it can do. Make certain each member of the family gets the food that keeps him strong and well.

"We can look at our own communities, discover where meals are poor, why they are poor, how they must be enriched.

"We can banish low incomes and waste, and abolish monopoly that chokes the flow of foods from farms to homes.

"We have the talent to do all this vigorously, persistently, and in the ways of a democratic people.

"We can make America strong by making Americans stronger."

ADJOURNMENT

Maintaining Interest in Safety

THURSDAY MORNING SESSION

October 10, 1940

Management Interest

The session convened with the Chairman, H. R. Bixler, Assistant to the Manager, Industrial Relations, Union Carbide & Carbon Corporation, New York City, presiding. The program had been planned as a Panel Discussion of devices and methods of maintaining the interest of employees in active accident prevention cooperative work.

Chairman Bixler introduced the members of the Panel as follows:

Harry W. Darr, Safety Supervisor, Bethlehem Steel Company, Cambria Plant, Johnstown, Pa.

Robert F. Ferguson, Manager of Safety, Republic Steel Corporation, Cleveland, O.

Everett A. Roberts, District Engineering Manager, American Mutual Liability Insurance Company, Atlanta, Ga.

Roy L. Rollins, Director of Safety, A. E. Staley Manufacturing Company, Decatur, Ill.

Harold F. Webb, General Safety Director, American Water Works & Electric System, Pittsburgh, Pa.

The Chairman also called attention to a group of suggested problems, as outlined in the program, to be discussed as selected, which will appear as the discussions progress below.

CHAIRMAN BIXLER: While it is not the intention of members of this Panel to do much more than "keep the ball rolling" in this discussion, they are here to pitch in when needed. The proper place for discussion is on the floor. The first of the questions selected for discussion is, "Methods of Maintaining the Interest of Management and Employees." How can we get and hold the interest of management? That is a very broad question. I shall ask Mr. H. W. Darr to begin the discussion of it.

H. W. DARR: Mr. Chairman, this question is a most important one and it could very well be discussed here all morning. But I will only throw out a few suggestions. The first thing I want to say is, that unless you have the wholehearted attention and interest and backing of the management of your company, you might as well stop all your safety efforts until you do get it.

The next thing I want to say is this: If you want to approach the general manager or president of your corporation and get his interest, you have got to forget first of all that he is an unapproachable lord of all; he is just a common ordinary human being, the same as the rest of us.

In the next place, you must invite his participation in safety activities, bearing this one thing in mind, that he cannot enter into a thing and express his interest in it unless he is a part of it.

The next, keep him posted on accident frequency, severity and costs. We often talk about accident prevention work on the basis of a humanitarian issue only; but let us not kid ourselves into believing that management never looks at the cost sheet where accidents are concerned. He is vitally interested in costs. So it is necessary for us to keep him posted regularly on the frequency, severity and costs of accidents.

The next thing, have certain routine work pass over his desk, and have that pass over daily; not much of it, but just enough to keep it fresh in his mind that you have a safety organization that is functioning.

Last of all, I think it is necessary (and this is for you fellows to determine) to bring the general manager down to the level of the workingman and bring the

workingman up to the level of the general manager so they can discuss their accident prevention problems on an equal basis.

CHAIRMAN BIXLER: Are there any questions which should be asked Mr. Darr in relation to the points he has covered? He has opened this subject on a broad basis. If not, let us proceed to the next question.

This, I think, is a more pointed one. "If you could have but one interest, which would you cover first in developing a safety program, that of the management or the men?" I will ask Mr. R. F. Ferguson to speak on that.

ROBERT F. FERGUSON: Just briefly, Mr. Chairman, if I were to take one interest—and I am a little bit surprised that some of the fellows didn't pop up and ask Harry Darr a few more questions on that point because it is one that is always a sticker—my first job would be to sell my management to the hilt. I would do a sales job. I would present that information to my manager in such a way that it would create an interest; it would be so easy for him to see that picture that he couldn't help but go along with the things I am talking about.

If I can sell that manager I will take that stuff down to the man in the plant. I will take it down through my supervision, if I have his support.

CHAIRMAN BIXLER: Any further comment on that statement? It is a starting point which many people wonder about in developing a program or selling a local management.

W. W. WILLIAMS (The Detroit Edison Company, Detroit, Mich.): In the event you can't sell management, what are you going to do?

MR. FERGUSON: If I can't sell my management, I don't deserve to hold my job. It is absolutely essential. You can't tell me that any management would have a safety man on the job if that man didn't have the ability to put safety information across. I thought somebody would ask Harry Darr here how some of these things are put across with men. What is the best technique, what is the best method?

I agree that certain safety information should be put across daily, but it should be so brief and concise so that he will get the picture quickly. Mr. Darr is quite right; management will look at the cost figure;

but don't carry that information down too far to the supervision. I am talking about a big corporation like the one I happen to represent.

CRYMES PITTMAN (United Gas Pipe Line Co., Shreveport, La.): Why wouldn't you carry the cost down to the foreman? Each man is responsible for the cost.

Foremen Interest in Costs

MR. FERGUSON: Please don't misunderstand me. Naturally the foreman is interested in his costs. But I am thinking of information being carried down in such a way that the man on the job gets the idea. "Well, hell, all the management is interested in is bringing down the cost. They are not interested in preventing accidents to us, or from the humanitarian standpoint. All they are interested in is costs." That is a thing that you have to watch. If you get too much cost information out, you get this other side of the picture. It is a thing the safety man must balance carefully.

PAUL F. STEINBICKER (Libbey-Owens-Ford, Charleston, W. Va.): I wonder if the gentlemen on the panel would suggest some way, some objective method by which we could know, as safety men, that management is sold.

MR. FERGUSON: I happen to be extremely fortunate in the fact that my management is sold to the hilt. I think my particular boss did the job on that seven or eight years ago. I can't take the credit for that, although we have to keep going on.

My management tries, not only tries but my management actually does keep two jumps ahead of me. They want accident statistics. They want to know where we stand in comparison with other companies. They are right on top of this information all the time.

I have one assistant vice-president who insists on knowing whenever a lost-time accident occurs any place in the subsidiary operations. That information is relayed to him immediately, and he immediately is in touch with the district manager of that particular plant, regardless of where it is in the United States. Management is alert, if the story is presented to them right, if the information is made interesting and brief so they can get it. You must remem-

ber they have many, many other things on their minds; but safety to us must come first.

CHAIRMAN BIXLER: I would like to ask Mr. Rollins to pitch in on this, too.

ROY L. ROLLINS: I suggest, in order to tell whether your management is sold or not, that you keep some record of your batting average. If you have made ten recommendations and only one of them has been accepted, then you are not doing so well. But if you have made ten and nine have been accepted, you have some idea that you are getting your story across. I don't think there ever will be any doubt in anyone's mind as to whether he is having his recommendations complied with or not. If you are, your management is very probably sold on the job you are doing.

R. L. SCHMITT (Louisville Car Wheel Railway & Supply Co.): A lot of safety work is started in this manner. The insurance company man comes around and tells the boss he is having a terrible accident record, and somebody in a similar line of business is doing much better. The boss says to somebody in his organization, "Well, you see what you can do about preventing accidents."

When Bob Ferguson was hired on the job, his company was already sold. That is why they hired him. But a lot of people, and I imagine a lot of men in this audience, have gone on the job cold, didn't know anything about it, and the boss didn't know anything about it. Mr. E. A. Roberts knows; he has had a lot of experience along that line. I would like to hear him say something about how a man ought to sell this safety job.

E. A. ROBERTS: Of course, I am a professional safety man. We find that our batting average is higher, that we are successful more times in a green field which hasn't been cultivated, in presenting to management an economic reason for undertaking accident prevention work.

I think it can be taken for granted that no management has a lack of feeling for the human suffering involved. I know of no cases where you could ever elicit from any manager a statement that he wasn't concerned in the welfare of his employees; but that concern too often is represented merely by a fatherly interest and not by an urge to look into the causes of that suffer-

ing. He reserves his emotions for feeling sorry after the accident has occurred. Consequently, to stimulate the initial interest, the one thing which will put management's thoughts away from his daily problems is to place safety in the category of one of those daily problems.

Consequently, in our initial efforts, we invariably try to present the picture to the management on an economic basis, show him the direct costs involved and the hidden costs involved, and go through the whole list of economic features in that fashion.

Once his interest has been engaged by that particular thing which he is working on from day to day, then his interest can be translated into operating practices which will accomplish the end desired.

Interest by Employees

CHAIRMAN BIXLER: Let us move on to another question in this relationship, concerning the maintenance of interest of employees. I would like to ask Mr. Webb this question which has been submitted: "Should educational material be general or specific in nature?"

H. F. WEBB: Mr. Chairman, I think educational material, for the most part, should be very specific. The more you tell your men about the hazards of their own particular job, the more interest will be aroused in the use of your bulletin boards.

I found from experience that it is a good plan (this is old stuff; everybody here recognizes it as being quite old and established) to change the bulletin board frequently.

Another question that occurs to me and a question that comes to your mind, perhaps, is how worthwhile are bulletin boards. I ask the question, how worthwhile is a show window to a shopkeeper? He has something to display. You men are safety salesmen and are trying to sell a commodity that no one really wants, that is, they don't want it very much until they have to have it pretty badly or wish they had it, rather. So, if you will experiment a bit with your bulletin board, you will find it quite effective. Use your specific posters. Make many of them yourselves. That is always a good thing. Take some photographs of conditions in the plant. It is always a good plan to intersperse general posters occasionally

with a splash of color because, when you do that, those men who feel they have seen what is already on the bulletin board, instead of dashing by without having looked, will note that some change has taken place on that bulletin board and, as a consequence, will stop to see what it is all about.

I think, from my experience, that specific posters are very valuable in getting across to the men your own problem. The bulletin board plays a very important part in any safety program. It is a valuable asset to the safety man, and it can be used in a multitude of ways, using all kinds of novel ideas in conjunction with your posters, to get people to see them.

You know when your bulletin board is not getting over. When it is not getting over, you know that it needs pepping up. Certainly your own fertile minds will develop some manner of drawing or attracting attention to these bulletin boards. For instance, by "soaping" the bulletin board, leaving a peep-hole, you will be surprised how many people, especially some of the male sex—well, we won't go into that, but curiosity is one thing that will attract.

That is one of the many ways to bring men over to the bulletin board, to your show window. You have something definite and very important to sell. If you can get them over there, and if your board is sufficiently attractive, and if it points out very specific hazards, then you are going to sell an idea to your men.

MR. SMITH: I am wondering about using the bulletin board to point out home accidents and traffic accidents and tying them up because of the human appeal.

MR. WEBB: Yes, very definitely. When a man is injured at home, he is of no use to an employer if he can't return to work.

Safety Committees

CHAIRMAN BIXLER: We would now like to take up the general subject of safety committees. On the subject of safety committees, we have this to start out with: "Is it ever a good policy to have a safety committee of workmen without the leadership of a foreman?" I will ask Mr. Darr to talk about that.

H. W. DARR: A committee discussing matters of safety, without the leadership of a foreman in modern day industrial activity, I think is a very dangerous thing

to undertake. In the first place, you can waste a lot of time discussing anything if you leave it to a group of men without supervision. That takes the men away from production. If you have the men do this work on their own time, then you are up against another proposition. When men get together without proper supervision, there is a tendency for their minds to wander away to story-telling and telling of experiences and dates and one thing and another, and they forget the real purpose of their meeting.

We have a lot of group meetings in our plant. We find that it is dangerous, unproductive, and a complete waste of time to have the men congregate to discuss safety matters without the leadership of some supervisor, their foreman preferably.

CHAIRMAN BIXLER: That would seem to offer room for some difference of opinion.

E. F. DILLINGHAM (Southern Indiana Gas & Electric Co., Evansville, Ind.): Lots of foremen are not sold on safety, while their employees are. Lots of times in our safety meetings, men who investigate the accidents convince the foremen they have done things they should not do. So, I don't believe the argument would hold good in all cases.

C. A. KELSO (Actna Casualty & Surety Co., St. Louis): What is your reaction in regard to having the safety committee composed entirely of foremen?

MR. DARR: Well that is an entirely different matter, but I do not think it is good policy at any time to have a safety committee for general purpose work composed of all foremen. We must have the ideas and the expressions of men who are doing the work and those who are supervising the work.

CHARLES H. ABEL (Kimberly-Clark Corp., Neenah, Wis.): What part does labor union representation play in the formulation of a safety committee? Has any of the board experienced that?

CHAIRMAN BIXLER: Mr. Ferguson, will you pitch in on that?

MR. FERGUSON: I assume I may speak from my own experience. Largely, we do not believe entirely in the matter of safety committees, particularly in our larger plants. I must agree with Mr. Darr in this respect. A foreman is held directly respon-

sible for his actions, and you can't pass inspection work or pass the investigation of accidents over to somebody else. We believe that safety work is primarily the responsibility of management. We do not believe that any of the other agencies have any part in that particular program except as to suggestions or recommendations or calling certain particular situations to the foremen's attention.

MR. FRANSOW (Philco Radio Company): We have a safety committee that we feel is functioning as a safety committee should. In addition to the management representative, the foreman, the state department of labor in Pennsylvania, our insurance carriers—in addition to all that, we also have represented the four unions that control our shop 100 per cent. Of course, that is a question open to controversy, but we have found it to be of great help. These representatives are, naturally, in the minority. However, they are in position to see and to hear and to take back to their group management's attitude, as far as safety is concerned. We therefore think it is a good and reasonable arrangement.

CHAIRMAN BIXLER: Thank you, sir, for that comment.

A. E. SMITH (State Industrial Department, Minnesota): I was a railroad man before I went with the State of Minnesota, and the railroads of the Northwest used shop committees one hundred per cent. They worked their first organizations twenty-five years ago. We are still using them a lot in Minnesota. We work jointly with management.

Safety Committee Personnel

B. MOAS (Cuba Electric Company, Havana, Cuba): I would like to have the panel make a recommendation on how often the safety committee personnel should be changed in the course of a year or two.

CHAIRMAN BIXLER: We already have that subject as a specific question to ask on our docket. Our question is worded this way: "How often should workmen's safety committees be changed, and, when they are changed, should they be changed wholly or in part?" I will ask Mr. Roberts to discuss that.

E. A. ROBERTS: Since the whole object of having plant safety committees is to disseminate information throughout the

personnel, it would be my thought that in the organization plans of the committee work, a definite procedure of changing the personnel should be set up. The rapidity of the change or the rate of change is, in my mind, in some degree dependent on the size of the plant. There are industries which are large enough to warrant the permanent retention of one or two individuals, such as the personnel manager and the vice president in charge of operations, if you please; someone reasonably high in management should be retained as a permanent member of the committee.

As to changing the others, it would be my thought that the tenure of office should be not less than three months. If the organization is large, probably you will achieve a more rapid dissemination of information through changing each three months. If the organization is smaller, I would suggest the tenure of office be six months.

Then, in the original set-up or in your reorganization, if that be necessary, I would suggest that the terms be staggered. If it is an original set-up and you are dealing with a five- or four-man committee, I would suggest that one member, preferably somebody you are going to utilize as a leader just to get the thing under way, be appointed for a six months' interval; the next best member for the yearly interval; and the next one for eighteen months; and the next one for two years; so that you would have a gradual infiltration of new members throughout the period of activity.

If it seems desirable to maintain a more rapid turnover, then you would have two terms for six months and two terms for a year; but it is always desirable to keep within the committee a leavening of men who have had experience in the work so that they can prevent useless and wasted effort on the part of the new members.

ROY L. ROLLINS: In answer to that question, part of the answer depends on what you want to do with your safety committee, or what job you want your safety committee to do. Some safety committees are set up to act directly on the ground, to make inspections and to help carry on education. I haven't been in this work long, and I remember when I first started I was pretty well bewildered and didn't know what was going on.

The same thing is true of your new com-

niteeman. If he is going to go out and make inspections and find hazards and attempt to correct them, the longer he stays in the committee, the better job he is going to do. But if your essential purpose in setting up a safety committee is to educate the personnel of the committee in the hope they will carry the education back to the men in the plant, then they should revolve rather rapidly. I think Mr. Roberts' suggestion of three or four months is a good thing. In that period you will have time to get over to them the ideas you want them to have.

Committee Authority

CHAIRMAN BIXLER: Here is another angle on this subject of safety committees that I think you would like to hear mentioned at least. "Should safety committees be given authority in the execution of safety suggestions?" I wonder if Mr. Darr would like to hit that one.

H. W. DARR: Mr. Chairman, that depends entirely on what the nature of the suggestion is. We must remember this: It is the general manager of the plant who keeps his fingers on the pulse string. He delegates his authority to his subordinates, in the form of superintendents and division managers or leaders, and they in turn delegate their power to the foreman, and the foreman has supervision over the workman.

If the committee is made up of all workmen and they make suggestions, I think their power to execute those suggestions should be limited to the expenditure of time only.

When it comes to the expenditure of money, I think they should look to higher authority before they go ahead.

G. SCHUMACHER (American Nickeloid Co., Peru, Ill.): We have a small plant. I think we have a marvelous set-up. First, we have a committee, consisting of a member of the management, a member of the group of foremen, a member of the union and a member of the employees. This is called our primary safety committee. This committee meets once a month. Through the plant we have what we call safety inspectors. These inspectors are members of each department. They report all hazardous machinery and so forth. At the end of each month these reports are presented to

the safety committee who acts upon the suggestions. Since we have a member of each department and management has its representation on there, they can make suggestions as far as expenditures are concerned. We find this to work out very well.

C. J. WETHERSTOW (Washburn-Crosby Company): Don't you think that conditions sometimes influence the set-up, and what will answer the purpose of one plant certainly won't answer for another?

In our particular organization we have two committees. One committee is made up of foremen and the supervisory staff. The other one is a union committee. We have no control as to the time when that personnel will be changed on that committee, and yet the plan seems to work very well, the proof of it being that over a period of years we have dropped our lost-time experience from 36 accidents in a year down to two or three. So, as I say, I think conditions influence the set-up.

MISS MARY LOU SCOTT (Jos. E. Seagram & Sons, Louisville, Ky.): I would like to ask you if you include your plant nurse on your safety committees. If not, why not?

CHAIRMAN BIXLER: We should have some comment on that point.

MR. DARR: I want to say first that this gentleman hit the nail on the head when he said that the different plants, locations, size, formations and so on should govern the type and kind of safety committees. That is absolutely true. For example, the company I represent has 15,000 men in a plant eight miles long, and it would be absolutely impossible to have a committee of four men cover that plant. We have about six or seven different committees and some of them have as many as 65 men. Whenever those fellows get lazy on the job, of course, we take them off. We have no set time, but we can always tell when interest begins to lag. When they know that is going to happen, they are not so anxious to be taken off the committee. They will keep on their toes.

Now, as to the nurse, we have a number of nurses in our plant. They are very good and efficient nurses. While they are not members of any of these committees, we invite the nurses into the meetings of these committees frequently and have them talk

to the committeemen on their side of the problem. They give the committeemen a great deal of light on the nurses' and the doctors' side of industrial work.

J. P. LEONARD (Blaw-Knox Company, Pittsburgh, Pa.): When a superintendent has charge of an entire plant, I would like to recommend a plan that has worked quite successfully for us. We have six plants, the smallest one approximately 100 employees and the largest around 1,200 or 1,300, the other four ranging in between.

Our safety committees are selected from the rank and file of employees from the various departments. The chairman of the committee is selected from that group. The secretary of the committee is the safety director of that plant, or the man in charge of safety. The superintendent of the plant sits in at every safety meeting. That is very important. He is able to answer a lot of questions that are brought up by the safety committee.

We also have our nurse or the first aid attendant as a member of that safety committee. In some of our plants we have nurses, and in others we have a first aid attendant. They are active members of the committees. Each one makes his or her report at the safety committee meeting.

In regard to changing the personnel of your safety committee: in addition to the size and condition of your plant, you must also take into consideration how long you have been carrying on a safety program, because much depends upon that. The farther you are advanced, the greater differences there will be in your set-up and the way you conduct your meetings and how you handle your committee. We have some committees we have been carrying along for a year, because we have not been in safety work very long, and they are making progress.

In other plants, when we find a fellow has failed to keep up interest, we change the committee. It is also a good thing to put on your safety committee (one or two is enough; one on a small committee and two on a larger committee) men out in the plant whom you know are not any too well sold on safety. Bring them into your safety committee and make them members of it. Give them something to do. They in turn will pay dividends to you.

Safety Rule Books

CHAIRMAN BIXLER: The next general subject is that of safety rule books. Our first question under that head is: "How and by whom should the subject matter of safety rule books be assembled? How much detail should there be in this selection?"

I will ask Mr. Rollins to lead off on this subject.

ROY L. ROLLINS: I am aware that there is a difference of opinion as to whether you should have a safety rule book or not. With your permission, I am going to assume that you do want to have a safety rule book and that you want to have a good one. So the question is, by whom should it be assembled? It is my feeling that in a democratic country, public opinion is the court of last resort. That being true, none of us is going to obey very well or very willingly any rule or law that we don't agree with or that we don't feel we have had a chance to be heard on. For those reasons, I believe that the more people who participate in the formation of a safety rule book, the better the rule book will be and the more nearly it will be obeyed.

In our own plant, about three years ago, we felt that we wanted to have a safety rule book. We had not had one before. The matter was discussed in our safety committee for three or four months, and we talked about it from every angle, what was good about it and what was bad about it. Finally, we formulated a tentative set of rules. We had those rules mimeographed and sent them out to all of our foremen and assistant foremen throughout the plant and asked them to put them on the bulletin board. We asked any employees who might have any suggestions or corrections or additions to submit them to us. As a result of that procedure, we got back some 85 ideas which were worth discussing.

Out of those 85 ideas we found about 16 that were good and really necessary in our rule book. I honestly feel that the method of formulation of your rule book is more important than the rules are themselves. If you feel that you had a hand in getting these rules together, you are going to be sympathetic with them. I don't think any one man, the safety director or safety engineer, no matter how well he may know his subject, can get across as good a set of rules as one that is gotten together by discussion.

and questions among your entire working force. I would like to emphasize that you especially ask your foreman and assistant foreman for suggestions on the basis that they are the men, after all, who are going to have to enforce these rules. If they are not sympathetic with the rules, certainly they won't be enforced.

CHAIRMAN BIXLER: How about some comment on this interesting subject?

W. T. CAMERON (U. S. Department of Labor, Washington, D. C.): I agree with Mr. Rollins. I think the democratic procedure is the only way that we can get acceptance of these rules. I would like to ask a question. How often should the old rule book be thrown out and begin the procedure over again, to again work out this same process that you admit is better than the actual rules themselves?

MR. ROLLINS: It is my feeling that that will be decided by conditions in your own plant. If conditions in your plant are just the same today in relation to labor, in relation to equipment and everything else, as they were when you made up your rules, if the rules were good in the first place, then continue with them. But conditions change in your plant; you have new equipment; you have new processes and new work methods. Maybe as you go along with your rules and attempt to enforce them, you will find that you have some "bugs" in them that should be straightened out.

So probably as a general answer to Mr. Cameron's question, we ought to be on the alert for those things all the time. I have a small file in my desk in which I keep notes on our daily safety code. I think sometime within the next six months we are going to revise our rules and incorporate a number of new ideas that have come along, and get rid of some of the difficulties we have found.

S. WARZALA (Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J.): I should like to ask Mr. Rollins, if he had to do it over again, would he employ the same method in the formulation of his safety code that he did?

MR. ROLLINS: I do have the feeling that we would probably do it much as we did before, that is discuss it in the safety committee and allow the safety committee to formulate a skeleton or plan of action

upon which everybody could work. There is more possibility of good suggestions when you have something to suggest. You say, "Here it is. Do you like it or do you not like it?" The men are going to have an opinion on that. If you ask a man point-blank, "What is a good safety rule?" he may be stumped. I believe I would do it as it was done before.

JAMES R. BYRUM (American Rolling Mill Co., Middletown, Ohio): Gentlemen, we do not have general rule books. In the formation of what we call our safe practices, we only consider the men involved, who would be interested in a particular practice. We don't think a man in the shipping department should be bothered to try to pick out of a rule book, which contains a lot of rules that pertain to an open hearth, rules with which he is concerned.

In the formation of our safe practices we began with our foremen and our safety department. We sat down with the man we thought should know all of the practices of his department. We took plenty of time. We tried to get all the "bugs" out of it that we possibly could. After we made a transcript, that in turn was taken by the foreman to his particular group of men. They tore this whole thing apart. Between the men who had to do the job and the man who had to supervise the job, we felt we had a pretty good cross-section as to the proper way to do that particular job. Finally, that was put into a graph, and we reviewed it again. It finally was made up into the form of a safe practice book, but it was not bound.

I think a lot of us make the mistake of binding rule books. We tried it once. Two weeks after we bound the book we found we made a mistake, with no chance to correct it at all unless we put out a new edition.

This book is made up of pages, any one of which can be taken out, thrown away, rewritten. We have made it very flexible. That has minimized the expense and trouble, and it has made our program very flexible.

JAMES A. DOWNEY, JR. (Sloss Sheffield Steel & Iron Co., Birmingham, Ala.): Maybe we are not all talking along the same line. As I understand it, a safety rule book is one thing; a safety code is another thing; safe practices is another thing. I wonder

how many in the audience have their own safety rule book?

CHAIRMAN BIXLER: Those who have company rule books, hold up your hands? (Majority.)

MR. DOWNEY: Well, we have, too. I think the gentleman who spoke of safe practices is on the right track. When you make a rule and say, "Don't ride the elevator" and then you ride it, it is like the fellow who came into our shop one time and wanted to see the superintendent. The sign said, "No admittance." He let him go in. He broke a rule right to start with. So, if you are going to make a rule, stick to it.

Violation of Rules

CHAIRMAN BIXLER: The last comment ties in very definitely with another question which I would like to have discussed. It is: "How should we cover possible violations of practices not specifically recorded in the rule book?"

I will ask Mr. Darr again to speak on that.

H. W. DARR: Mr. Chairman, I believe I was the instigator of that question. I put the question there to find out what to do. About three or four months ago I got hold of a rule book. I was looking through it. I think I counted up to seven or eight hundred, and then I stopped, but among other rules there was one like this: "Don't use a ladder with a broken rung," and "Don't take short cuts" and "Don't do this and don't do that." That was the sum and substance of the whole rule book. The fact of the matter is, in our plant we have no rule books, and I don't believe in them. I believe in getting the basic principles of safety in the minds of the men. Then you don't have to "do them" and "don't them" to death. When they violate the rules that are not in the rule book or in the alibi book, I would like to know how to deal with them.

CHAIRMAN BIXLER: Does someone have a further comment on whether there should or should not be safety rule books? How many do not have safety rules, as a matter of practice? (Show hands.) It appears to be about half and half.

MR. WARZALA: I should like to ask the board of participants to tell us just exactly how far should you go in your safe practices, in your safety code, or in your

rule books? What should you include in it?

We feel that if an individual is trained on the job, in the requirements of his job, the safety features, the safe practices must be used right there, must be interwoven in the instructions regarding job performance. I cannot see very well how you can separate safe practices from job performance. Or do you men who have these safety rules describe in that book of rules the different job performances which, of course, include safe practices?

CHAIRMAN BIXLER: Mr. Roberts has a comment he would like to make in that connection.

MR. ROBERTS: Naturally, I can't answer his inquiry from an operating viewpoint since I am not an operating man. However, as an adviser, it is my thought that probably we are a little bit loose in talking of rule books because in a lot of organizations the rule book is an operating book. I am sincerely in accord with his belief that to procure the performance of operations in a safe way, it is much better, if you must have a book, to make it a job analysis book, an operating book, and, in that fashion, include your safety admonitions in the description of the job to be done.

That is pretty well exemplified in the operating books of which we know the most, the railroad operating books, so-called rule books.

In propounding a question which we have for discussion here: "To what extent should workmen be invited to participate in the formation of plant rules?" I thought it might be interesting to have a brief explanation of a specific way in which a set of operating rules was developed, which has operated successfully over a period of three years and has resulted in a tremendous decrease in both accident severity and frequency rates.

The organization which I have in mind is not particularly a large one but rather a widespread one, in that it operated some eight or nine quarries over two states. Management having determined they were going to do something about the high accident frequency, inquiries were made as to what could be done. Observation of the operation of these eight or nine quarries revealed wide divergences in the fashion in which various jobs were done; and the operations are such that there should be no wide diver-

quences. Consequently, it was suggested to the management that, as an initial step in enlisting the interest of the employees, the formulation of operating rules be made sort of a contest.

Each employee was advised that the company desired to set up operating rules. Several prizes were set up covering various classifications of work, and it was announced that the individual who presented the set of operating rules for his particular operation which seemed best suited would receive a small prize. So, the thing was run through as a contest. Many sets of operating rules were received.

A committee consisting of management, a representative of the insurance carrier and, by fortunate circumstance, the state labor committee, reviewed these rules. An ex officio member, perhaps, was the state labor commissioner.

The prizes were awarded. Then management took all those rules and we went to work on them. From them we developed a rule book which seemed to incorporate the best rules which had been submitted in the contest. The thing was drawn up in a rough draft form.

It was then submitted to the quarry foreman, assistant superintendents and superintendents, to be passed on as to practicability. They made their comments. Then the close of that particular phase of the work was a direct question to each of the foremen, "If these rules were put into effect, would you be willing to enforce them? Do you know of any reason why they could not be enforced?"

Having eliminated a few more rules by reason of that test, they were drawn up, printed and sent out to the foremen in sufficient copies so that each foreman could hand a copy to each workman under his supervision with the direct statement, "You yourselves have said that these rules can be enforced. We shall expect you to observe them."

I am very happy to say that cases of infraction have been few and far between. To me, that is a logical, a sensible and a practical way to develop a set of operating rules.

S. T. SICKEL (Northwestern Public Service Company, Huron, S. D.): I would like to go back to the question of discipline for infractions of unwritten rules. What way can we justify discipline in connection

with union acts? Can we put a discipline on it so the unions will accept it?

W. T. CAMERON (United States Department of Labor, Washington, D. C.): I am just a plain safety adviser and consultant and not a member of any union. I don't know how authoritatively I can speak, but if the union representatives have a voice in the building up of these rules, in the formulation of the rules, and if penalty for violation is laid down at the time the rules are formulated, I think you will find by and large that your union committees will back up the management in the enforcement of the penalty that has been laid down for violation of the rules. Labor unions all over the country are getting more and more safety conscious. They are forming safety committees within their own locals. They are formulating safety rules. I think that you can get good cooperation wherever your union people sit in on the formulation of the rules and the penalties are laid down and agreed to beforehand.

Safety Contests

CHAIRMAN BIXLER: I think those remarks are a good closing to this particular subject. We will pass on to our next subject "Safety Contests."

The first question is: "Should safety contests be based on frequency or severity?" I will ask Mr. Webb to lead off on that.

H. F. WEBB: Obviously the severity rate is the yardstick by which we are able to make progress. We can determine cost trends, and that makes it a very valuable vehicle for promoting safety among your management.

However, I think severity is a very difficult factor for the rank and file to understand. In these years I have noticed that the workers themselves are more interested in knowing whether or not we had an accident, and if so, how many accidents we have had, rather than trying to wrestle with this severity rate.

I remember a number of years ago, we had a contest in a very large plant. I ran it somewhat after the manner of a baseball box score. That attracted the keen interest of the men, and they were able to tell, without trying to break down severity and know what it meant, whether or not they did have

an accident or whether or not they had several accidents. They immediately became interested in knowing who was hurt and what we were going to do about it.

I don't believe that contests should be short-termed. They should be long-termed contests. There we come upon the problem of how we can make contests equitable when hazardous and non-hazardous departments are working one against the other to win some coveted prize. That can best be done, I believe, by establishing an experience rate for each department; for instance, an average severity rate over a period of five years, yes, if you are able to have it, a period of ten years, and each department bucking its accident rate. The one, naturally, that makes the greatest percentage of reduction is tops in so far as the contest is concerned.

But in placing contests before men and in attempting to attract their interest, their keen interest in the project, many things, of course, have to be done to augment just plain contests. In other words, it soon sags, and it soon dies if there is nothing done to stimulate it.

Therefore, in any contest it seems quite essential to add some stimuli to make men work a little harder. For example, on one of our properties, (we don't necessarily call it a contest because we don't believe too much in contests, but, nevertheless, it is a comparative thing, and we do know that there is a contesting spirit among the various units) the thing sort of bogged down. We weren't making too much progress over the previous year. So we decided to stimulate that contest a little bit and see if we couldn't improve things.

We put out a simple letter, saying there would be an award to all groups who were able to work the months of October, November and December of this year without the occurrence of a lost-time accident.

On the strength of that, in this particular unit, I invested a certain sum of money in some 2,500 to 3,000 automatic pencils, and I hope I am able to give that many out with the compliments of the department.

A part of the rules for this award are, that all departments are broken up into groups, not too large and, certainly, not too small. For instance, a line crew composed of eight to ten men is a group. If one man in that group has a lost-time accident, then the group as a whole gets no part of

the reward. In other words, it is meant to promote group effort. When you promote group effort instead of individual effort, you are going to get, I think, better safety progress.

CHAIRMAN BIXLER: May we have further comment or suggestion?

Severity Vs. Frequency

C. J. WETHERSTOW: I wonder if I understood the speaker correctly when he said that severity was the yardstick to measure the success of a program but that the employees recognize frequency in a better way than they do severity? If that is what you mean, I for one take exception to that remark, and for this reason: I believe that severity is a matter of good luck. A man may have a very minor injury but there may be something following that injury that influences the result. I think the thing we are interested in is not the recovery of the man, because we put that in the doctor's hands; I think the thing we are interested in is to prevent recurrence. I really don't believe that severity has much place in contests. I imagine there will be some who will disagree, but I just couldn't sit down and swallow that.

C. L. HIGHTOWER (United Gas Pipe Line Company, Shreveport, La.): This question came up about three years ago before an A.P.I. committee at Tulsa, Oklahoma. It developed because there was some question as to which of two companies should be recognized for a good record. One company had a frequency rate of approximately 2 with one fatality; another company had a frequency rate of approximately 2.5 and had no fatalities. The question was whether the company with the lower frequency rate, yet with one fatality, had a better record than the other company with a slightly higher frequency rate and no fatality.

So, a committee was assigned to make a study in an effort to determine whether or not some index rate could be developed that would take into consideration both frequency and severity. It happened that I was assigned on that committee. We came out with what has since been known and used by some of the petroleum companies as an index rate, which takes into consideration both the frequency and the severity. We used the ordinary frequency rate, the num-

ber of lost-time accidents per million man-hours worked. Then, we figured the number of days lost per 10,000 man-hours worked. Then we added the two and had an index rate. We are adding apples and bananas and coming out with fruit salad, but at the same time we are getting into that figure both the frequency and severity of accidents. We have been using that as the determining factor in our own company contests for the last four years, and it has proved highly successful.

MR. WEBB: I am afraid I didn't make myself entirely clear. In so far as these contests, I think severity is the proper basis for competition where there is an inter-company contest. Where the contest is within the portals of a single, individual company, perhaps frequency rate is the best thing to use because, as I say, it is broken down into perhaps more simple language; then all men can understand it.

The index system has also been used in Western Pennsylvania, but instead of adding the two factors, the severity was multiplied by frequency to establish the rate.

M. L. WURMAN (Bayuk Cigars, Inc., Philadelphia, Pa.): How can you use severity in a contest if you haven't had a lost-time accident for eighteen months?

MR. WEBB: You can't very well do it, of course.

MR. WURMAN: Therefore, you have to have frequency.

MR. WEBB: That is quite true.

MR. BYRUM: The thing that interests me very much is the fact that our men are driving accidents down. We are having to refine our approach as to how we are going to determine how good or how bad we are. However, I think when we sum it all up, what we are interested in is knowing whether we are better this year than we were last year. Whether you call it frequency plus severity or something else—call it what you will—we are interested in the fact that we are on the right road. We finally have come in our own plant to the place where we have to determine the position of any group by minor accident frequency, not the major accident nor the severity.

CHAIRMAN BIXLER: Mr. Roberts has a ready thought he would like to add to this.

E. A. ROBERTS: Since the question seems to be what is the most satisfactory way in which credibility can be given to both frequency and severity, I asked the Chairman if I could present a thought which came out in my Textile Section Tuesday afternoon, a method of scoring a plant contest. I thought the idea was good. This plant is located in a state which has considerable interest in baseball. They decided to pick out teams in the mill and give them the names of the contesting teams in the baseball league. There being eight teams in the league, and it being a small plant, the name of every individual in the plant was thrown in a hat, drawn out and put into eight piles, so we had eight teams.

The method of scoring interested me. Incidentally, the contest was a daily one, following from day to day, and culminating in the end of the league. It paralleled the league's activities, so that each day you had two teams opposing each other.

Should an accident occur to a member of one team, an accident requiring first aid attention only, that counted as one point against them; in other words, the opposing team scored one run. Should an accident occur which required a doctor's attention but no further lost time, that counted as two runs against them. Should an accident occur which involved both doctor's attention and some lost time, that counted as three runs against them. Should one of the members of any team, or any member of any team incur a minor injury which should have had first aid attention, and it was found out, they didn't get away with it; that counted as four runs against their team.

At the end of the period the runs were added up. In that fashion the standing of the various teams was ascertained; at the end of the season, the team standing was ascertained. Then the batting average of the whole league, or the run average of the whole league was added up, and that gave them an index to be used in the next contest.

As you see, this does go a little bit into the matter of severity, in that an accident involving lost time meant one more run. To my mind, the beautiful part of the thing was the penalty which was attached to not reporting a minor injury requiring first aid attention.

Suggestion Systems

CHAIRMAN BIXLER: Our next subject involves suggestion systems, and this question which has been proposed: "How do you dispose of suggestions of no special merit in a suggestion system?" Mr. Darr.

H. W. DARR: Mr. Chairman, some years ago we had a suggestion system in our steel plant. We invited the workmen, foremen and everybody to write out their suggestions and deposit them at a certain place, after which they were gathered up, gone over by a committee of superintendents, and a cash prize awarded to the best suggestion, with other minor cash prizes down the line, possibly eight or ten of them.

After a few years that system petered out; then we began inviting suggestions on a non-remunerative basis. At first we didn't get any; but gradually it began growing when the men in the plant began to realize they were doing something for their own good and not for cash.

Now, the question is, when suggestions come in and they are found to be worthless, what to do with them? Practically all our suggestions are made in meetings with the superintendent, foreman and other workmen assembled in what we call a safety meeting.

I will give you two actual occurrences in my own steel plant, and you can judge for yourself which is a better way to handle it. A group of about 40 men, with the superintendent, assistant, and several foremen were discussing various safety matters. One of the workmen made a suggestion pertaining to his particular job, something that would lighten his work. It didn't appeal to the superintendent who was chairman of the meeting. He said, "I wish you would keep your mouth shut. You talk too damn much."

That fellow told me later that if he lived and worked in that plant for another hundred years, he would never make another suggestion.

Now, we have another superintendent who, when a suggestion is made, and it has no merit, and he knows it has no merit, takes it on this basis: He considers that the man believed he was doing something that he thought was for the benefit of the company and himself. Whether or not it has any merit, it has to be treated in the same

way. In this particular case, this superintendent will take that suggestion and tell the man, in the presence of the other fellows, "We will take this under advisement. We will consider it, and we will let you know." Possibly the next day, or that afternoon, he calls that man into his office, pats him on the back and gives him credit for at least taking part in the meeting, but tells him in a diplomatic way that the suggestion was no good, it was not practical; but he should look around and maybe some day he will get something that is all right and, when he does, bring it in.

Here is what I am trying to get at: Every suggestion that is made by every workman in the plant has to be treated in a courteous and diplomatic manner because, when you once turn down a man and belittle him in the presence of his fellow workmen, you have ruined a good worker.

CHAIRMAN BIXLER: We will have to close the discussion on this particular subject. Mr. Darr's remarks have covered it rather well. However, will you hold up your hands, those who have safety suggestion systems now in effect? Now, those who do not have them, please hold up your hands. There is a slight majority of those who have suggestion systems. I would like to ask one final question concerning the section in our program relating to special activities.

Quite often the question is asked: "What effect do such things as credit unions, mutual sickness benefit plans, hospitalization plans, and the like, have on safety?" I will ask Mr. Rollins to express a thought on that point.

Employee Welfare Systems

ROY L. ROLLINS: On the matter of credit unions, in the first place I would like to tell you an experience that we had in 1933. We hired about 80 men. Those men had been out of work all the way from three months to two years. We were aware, very shortly after we hired them, that they owed a number of bills. We had some garnishments served on us shortly after they went to work. We had wage assignments served on us, and one thing or another. It looked like a bad situation. We got each one of those men individually into the credit union office and talked to him about his financial situation in a friendly way. We

found that those 80 men had an average debt of \$450, they had come to us with that debt. Men with families, working on a laborer's job, naturally went into the lowest paid jobs in our organization, and a \$450 debt was pretty big for them.

We worked it out this way: After they had been with us a short time and we determined that they were the type of men we would want to keep, we got the men and said: Now, let us see what your bills are; \$50 to the doctor; \$35 to the grocer; so much for rent, one thing and another. So we got hold of those various creditors who had leaped on them as soon as they went to work and wanted their money and said, "Here is the situation. This man owes \$450, and he probably is not going to live long enough to pay it off. If you force him too hard, he is going into bankruptcy. Can't we compromise these debts and get you something for your money and get the worry off this man's mind?"

In many cases we were able to do that successfully; say, we compromised the \$450 worth of debts for something like \$300 total. We gave that man a \$300 loan from our credit union. I have had the experience of filling out some of those loan applications, sitting there and figuring with the man who is going to get how much money. You get all the compromises arranged, and when the deal is finally completed and you put through the loan and these bills are paid off, he gets up from the desk and stands off and you can see trouble slide off his shoulder, and he says, "Thanks." Well, you have done that man a favor but, certainly, you have done yourself just as great a favor because you have taken something off his mind that was bound to handicap him at his work. He is worrying all day about the debts he owes, and he is worrying about what will happen if his check is garnished and what is going to happen to his family. He is worrying about what is going to happen about his job. Will his employer get tired of this business and fire him rather than fool with the bills? But you aid him

to pay off those bills, you have taken a big load of worry off that man's mind.

I don't think it is necessary for me to argue with you that worry certainly plays a very important part in accidents. I am not able to tell you how many accidents those men would have had if we had not taken care of their financial difficulties. But I think we not only did a job for them but a very big job for our safety program at the same time, by getting rid of their financial worries.

I feel that the credit union is almost an integral part of our safety program.

This business of hospitalization and sickness benefits works out in about the same way. If you have a man working in your plant on a fairly low rate job, he is not making a great deal of money and has a number of family responsibilities. His doctor says, "John, you are going to have to have your tonsils taken out." The doctor's bill for that is going to be \$25, \$50 or possibly more. Maybe he is going to have to be off work for two weeks, and there will be a hospital bill to pay there. That is a pretty tough load.

If John knows that during the time he is off he is going to receive a definite sickness benefit, if he knows he is going to receive hospitalization benefit, he is a lot more apt to be willing to go ahead and have the tonsils taken out; and, again, he has done both himself a favor and you a favor by correcting his physical condition.

So, I believe both of them do play a part and help out the safety program.

CHAIRMAN BIXLER: Ladies and Gentlemen: Your continued interest this morning, I know, is of sufficient satisfaction to the members of this panel that the Chairman need do no more than to turn to them and say "thanks" on behalf of the Program Committee. We are glad that there has been as much, if not more discussion from the floor as from this panel.

Please remember that a good part of the discussion this morning will be published in the Congress report.

ADJOURNMENT

Occupational Disease

WEDNESDAY MORNING SESSION

October 9, 1940

The meeting on Occupational Disease, planned as a Panel Discussion, was called to order by the Chairman, Walter S. Paine,

Manager, Engineering Department, Aetna Casualty & Surety Company, Hartford, Conn., who presided.

Panel Discussion

CHAIRMAN PAINE: At every meeting that I have attended in this Congress someone has raised the question of industrial disease. This is a subject which has been maligned in some cases and has been a fantasy on the part of others. This, however, should not in any way destroy the realities that are back of the industrial disease problem.

In the discussion of this broad problem, we have asked the medical profession and the law to help us this morning. Each phase of the problem will be discussed on an orderly basis. We have assigned as the first speaker for each of these subjects one of the men on this platform. After he has finished his preamble, we will ask the members on the floor to present any question they may have on the subject.

We have the following subjects to be discussed: "Health Hazards in Spray Painting." Dr. Eugene Walsh, Associate Supervisor of Medical Service, International Harvester Company, Chicago, will open this subject.

"Fatigue and Its Relation to Occupational Disease." This subject will be taken up by Dr. Norbert Enzer, Director of Laboratories, Mount Sinai Hospital, Milwaukee.

"The Toxic Limits of Common Solvents." This subject will be opened up by Dr. Elston L. Belknap, of Milwaukee.

"Lead in Industrial Processes." Dr. Belknap will also handle this subject.

"Skin Affections." This will be handled by Dr. M. J. Reuter, Dermatologist and Syphilologist, of Milwaukee, Wis.

The last, but one of the most important, will be "Should Occupational Diseases Be

Considered as Industrial Injuries?" This will be handled by H. A. Nelson, Director of Workmen's Compensation Department, Wisconsin Industrial Commission of Madison.

We all regret that severe illness keeps Dr. Paul Brehm, Supervisor of Industrial Hygiene Unit of Wisconsin State Board of Health at Madison, from being present.

The panel will be opened on "Health Hazards in Spray Painting." Dr. Walsh.

Spray Painting

DR. EUGENE WALSH: Painting is a topic that has received considerable attention. There has been an increasing number of hazards imported into the trade. Most of these have received wide attention, particularly in the past few years. It has been incident to the wide use of the spray gun and of the lacquers, particularly. Many of the solvents and products used in the paint industry have known toxicities. Others are in the experimental stage, so far as use and so far as their hazards to health are concerned.

In the old days of brush or dip or flow painting, still widely used, solvents of rather low volatility were employed, and the hazards associated therewith were not as great. However, when we come to the spray gun, particularly in its use in the recently developed lacquers, we come into a host of new solvents.

The quantities used per year in lacquers and solvents in the paint industry in the United States reach astronomical proportions. Many, many tons are used.

In the paints we have the following hazards: first, the pigments. There has been a growing trend definitely away from lead-bearing pigments toward non-lead pigments. Many of the non-lead pigments have their peculiar hazards. Many of them are relatively innocuous and can be used with relative immunity.

So far as the fluid constituents of paints are concerned, in the order of volatility in general, we have, first, the solvents which are, largely, for paints; the paraffins, oils and varnish; varnish with some turpentine or some spirits of various and sundry types. The lower the volatility, of course, if it is a toxic product, the greater the toxicity.

The ordinary paints and lacquers can be considered together because the problem of the solvents, largely, is what we wish to deal with. The solvents used are relatively low boiling products which volatilize readily, such as acetone, ethyl acetate, butyl acetate, amyl acetate, and so forth.

Next, the paint must have a diluent. In the ordinary paints—oils, turpentine or spirits may be used. In the lacquers—alcohol, toluol, xylol, mineral spirits have been used. In the past, benzol was used. We are glad to say that there is a growing trend away from the use of benzol, which has cumulative actions in the human individual, resulting in the low grade chronic toxicities due to a depression of the blood-forming organs. There is a definite trend toward less toxic diluents.

The next essential part of the lacquers includes the driers, such as ethyl lactate or cellulose, monomethyl ethers and various other chemical products of known and unknown toxicities. Also, there must be a flexibilizer or a substance giving flow to the plastic. These are relatively high-boiling low-volatility products, triphenylphosphate, castor oil, camphor and others, again of known and unknown toxicity.

The toxicities of the various individual products are often known. It is not the toxicity of the pure product, however, that we are often concerned with. It is the product which is used commercially. It is often the impurities in minute quantities that add to the toxicity. For example, we may say there is, in the case of xylol, some question as to its inherent toxicity. However, since benzol is so frequently a contaminant, we do have some benzol toxicity to be consid-

ered when xylol is used. Also, when we have two substances which are used to make a paint or lacquer fluid, its toxicity, resulting from the combination of the two substances is not usually that of a summation of the individual toxicities of the two. That is, if we have two products (A and B), A of one-plus toxicity, if we wish to use that terminology, and B of one-plus toxicity, we may get a resulting toxicity of three-plus, or something of that nature—just to use an arbitrary form.

The methods of control are: First, the substitution of non-toxic products such as we mentioned in getting away from lead-bearing pigments in paints. We are fortunate to have alert chemists in the paint industry who are alive to this problem. They are constantly striving and working with the industrial hygienists and the physicians in developing non-toxic products, so far as both pigments and solvents are concerned.

Another factor that has been considered and is of importance today in reducing toxicity is the mechanical development of the spray gun. Many years ago, in its infancy, no precautions were taken. The engineers weren't particularly interested in it. A man would spray with one or another, spreading the toxic substances about. Today, however, with the development of lower pressure spray guns, with the development of engineering methods of control of vapors and fumes and dusts incident to the process, we have less toxicity.

If an individual corporation is alert in observing and controlling the hazards present; very little toxicity need be encountered in most processes. This includes, of course, the precautionary methods for the individual, when I speak of the industrial hygienist and the engineer's phase of the problem. If an individual is working in a place where engineering methods are not feasible to control the vapors and toxic products, then the individual must have his respiratory protection to prevent inhalation. Most of the solvents which are used have a narcotic action, and their action is by way of absorption through the respiratory tract. Taking away the fumes is the way of control.

I have very briefly outlined some of the major points. Do you choose to pursue this question?

CHAIRMAN PAINE: Discussion will be carried on from the floor and also from

the viewpoint of the panel. May we proceed on this subject, namely health hazards in spray painting?

EDWARD SMITH (Jewell Alloy & Malleable Co., Buffalo, N. Y.): No mention was made about spraying whitewash.

DR. WALSH: Spraying with whitewash is a common procedure. As whitewash is largely calcium, it is a relatively innocuous substance. It is irritating to the respiratory tree and may be followed by a chronic cough. Not infrequently there are contaminants in whitewash which may have toxic products in them but, ordinarily, whitewashing is a matter that is done today, next week, and perhaps a month hence. It isn't done in most industries day after day. The exposure is relatively infrequent and the hazards are not great.

Likewise, most of the whitewashing procedures are done in large, open, airy rooms. That isn't true of some tunnels, of course. If it is done in closed rooms, tunnels and places with poor aeration, it is advisable, if the process is to consume any length of time, to have the individual protected in some manner. Just a simple draft of air or a mechanical dust type respirator probably would be usable if the exposure is to be of any length of time.

X-Ray Examinations

DR. ROBERT M. BURNS (Minnesota State Medical Assn., St. Paul, Minn.): Are there methods by x-ray examination from time to time or from year to year that will show progress of bronchial trouble as a result of these paint inhalations?

DR. WALSH: There are those that would answer your question in the affirmative. Most roentgenologists, however, rather scoff at the idea of making a diagnosis of bronchiectasis by x-ray. The shadows which we see in the x-ray are largely those of the blood vessels and fibrous structures of the lung. It is true, however, if an individual is using some paints which bear silica—and one point that I did not mention is that used in the porcelain industry, silica-bearing paint—that is another problem. If you are using a silica-bearing paint, you will get the characteristic changes of silicosis.

However, for the ordinary pigment, so little is absorbed, so few of them produce progressive changes in the lung, they rarely

show on the x-ray. Most of them are stopped by the mechanical aids in the nose and upper respiratory tract, that is the hairs, the cilia on the lining of the respiratory tract and, as such, are coughed up, rather than persisting in the respiratory tract.

However, if one is using paints over a long period of time, it is conceivable that a chronic bronchitis might result. However, here one is on thin ice. There are many other factors incident to the causation of chronic bronchitis that are equally as, or more, important than the products used in the paints, either the pigments or the solvents.

MR. CARR (Eastman-Kodak Company): In spray painting in rooms, using lead-free gasoline as a solvent, we have noticed as much as 450 parts per million of aromatics, and we find that many lead-free gasolines now sold contain a large proportion of benzol, xylol and toluol. I wonder if much attention has been given to that fact?

DR. WALSH: That is a problem, it is true. Certain fields of oil, particularly those bearing the naphthenic acid oils do, in their cracking processes, result in benzol in considerable portions, in some instances, in the gasoline. The straight paraffin oils may result in some benzol but not so much. It is a factor to be considered. It depends largely upon the amount of benzol present. In some instances it has been said to run as high as 10 per cent in certain gasolines. That is not usually true.

There is one factor to be considered in gasolines, and that is the difference between benzol, which is the ring-structure and benzene, which is a straight hydrocarbon, and relatively innocuous. It has some toxic properties, but they are transitory, largely.

Benzol has developed a chronic toxicity. This particular subject is receiving attention now, but very little has been produced to indicate that benzol is a definite toxic agent in the gasolines produced. But if the aromatics were up to about 450 parts per million, you certainly are on the borderline of toxicity. I think it should be reduced, if it is at all possible, by ordinary methods. At least the men should be watched very carefully for blood changes, so far as benzol exposure is concerned.

MR. CARR: In that connection, it has been necessary for us to go to a respira-

tory protection of the supplied air type, supplied also with a charcoal canister at the man's waist, so that when he breaks the connection temporarily to go back in the room, he still has the protection of the charcoal canister. The connection, when broken, automatically shuts off both the air supply and also the air connection, so that he cannot breathe the room air.

MR. WALSH: That certainly is a fine arrangement.

DR. ALICE HAMILTON (Division of Labor Standards, U. S. Department of Labor, Washington, D. C.): In the Division of Labor Standards in Washington some two or three years ago, when I was visiting automobile plants, I was told they were making a change in their coatings. I wonder whether that has proved to be true? They told me they were substituting synthetic resins for nitrocellulose and as a solvent were using hydrogenated petroleum products which had very low volatility. It seemed as if that were going to be a revolution in coating in automobile factories. I should like very much to know whether that change has been made.

CHAIRMAN PAINE: Can anyone answer the question of Dr. Hamilton?

DR. WALSH: I would like to say to Dr. Hamilton concerning the substitution of synthetic resins for nitrocellulose products in the automotive industry particularly, most of us receive all of our information concerning the newer development of hazards from no person other than Alice Hamilton. If anyone in the room can answer the question, I am sure that she can. She beautifully reviewed the entire literature in a publication that she produced in 1936 called "Recent Changes in the Painter's Trade" which is Bulletin No. 7 of the U. S. Department of Labor. It is a beautiful presentation, and it is worth while for any of you interested in the paint industry to read it.

Concerning the question at hand, I know of no particular changes at the moment that have been instituted in the industries that I have been acquainted with. I do know that such things are in progress. As Dr. Hamilton suggests, I think that they are changes in the right direction, in many instances.

DR. A. L. BROOKS (Fisher Body Division, General Motors Corp.): We do quite a lot of spray painting. I believe there has been no radical change in the solvents and

diluents used in the lacquers which we are now employing. The process is very much the same.

There has been some change in the length of time required to dry these lacquers, but the constituents are the same as they were.

W. H. KRAUSE (Allis-Chalmers Mfg. Company, West Allis, Wis.): There have been recent changes in regard to the diluents used in paint. Quite a few of the larger oil companies are now producing hydrogenated naphtha. These do contain considerable quantities of benzol and toluol. I wonder if there had been any experiments made with regard to the toxicities?

Benzol Frowned Upon

DR. WALSH: I should have mentioned, when we were speaking of toxicities of solvents, that the medical profession frowns upon the use of benzol as a solvent or diluent in any proportion. We just don't like benzol, regardless of its percentage, because it is so easy to get out of hand, and the chronic effects of its poisoning come on so slowly and so innocuously, they creep up on you before you know it. It requires rather close observation wherever there is any benzol or toluol.

So far as the hydrogenated naphthas are concerned, it has been said that the hydrogenation does not change the chemical structure of the naphtha, and it does not increase, particularly, its toxicity. If it is in relatively large quantities, 400 to 500 parts per million, then there is the problem of the toxicities inherent to the hydrogenated naphtha itself. But we would much prefer not to see benzol at all.

CHAIRMAN PAINE: Dr. Hamilton, did you wish to say anything else on the subject?

DR. HAMILTON: I think not. My study of the subject is four years old. I thought perhaps very important things had come to light since then. Apparently benzol is still a lurking danger which arises in all sorts of unexpected ways, especially as we use more cracked gasoline than we did before. I quite agree that it is something that should be avoided.

We always advise the substitution of toluol, when possible, for benzol, but I don't think any industrial physician would be willing to give a clean bill of health to toluol.

We are beginning to look upon it with more suspicion. Dr. Gammon of the du Pont Company believes it is much more harmful than we have thought hitherto. I hope he will, as the years go on, accumulate more accurate knowledge about it so that we may perhaps encourage its disuse, also. I think that probably would be in the right direction.

MR. GUMMAR (Barrett Company): I would like to offer one minor observation. Commercial toluol, as sold in this country, does not contain any measurable amount of benzol.

CHAIRMAN PAINE: We will have to pass on to the next subject: "Fatigue and Its Relation to Occupational Disease." This subject will be opened by Dr. Norbert Enzer, Director of Laboratories, Mount Sinai Hospital, Milwaukee.

Fatigue and Occupational Disease

DR. NORBERT ENZER: At ten-thirty in the morning I generally have a very low level of activity and suffer from fatigue. Fatigue is a state of bodily ill health, of transient character. It is evanescent, as we understand it and as the term is commonly used but, so far as industry is concerned, fatigue is that state of the individual at work which makes it impossible for him to perform what may be considered an average good output.

It is characterized by certain symptoms. It is characterized under ideal conditions of investigation by certain objective findings which I will elaborate in a moment.

In the strictest sense of the term, I suppose an occupational disease is that condition which can be directly traced to some agent or circumstance in employment which can be labeled as the causative factor of the disease. But as our horizon widens and our concept of disease becomes broader, and as we interpret the word "disease" as it was originally used in the Greek sense, a state of variation from health, or dis-ease, then we must regard an occupational disease as any state of ill health which has been contributed to by circumstances of employment.

Under that definition there is hardly a disease which, under some imaginable state of affairs, couldn't be related to what the man is doing. Those are the two extreme

definitions of the term "occupational disease."

Now, any disease will produce fatigue. It is almost synonymous that disease limits the output or the capacity for work of the individual who has been affected. What we must recognize today is that fatigue may also constitute a state of disease. In other words, that we recognize fatigue as a functional disorder which must be treated, which must be recognized and corrected, and its causes eliminated.

The mechanism of fatigue is grounded in a very complex explanation which is not yet clear, and probably won't be clarified until a great deal of investigative work has been done. But in the past few years a considerable amount of investigation has been done, most notably at the Harvard School of Industrial Hygiene under Dr. Dill; and in Europe, up to recent times, a great deal of work has been done, particularly in Germany and latterly in Russia; the object being, in the European investigations, to find out what circumstances of employment contributed to fatigue, to correct those circumstances of employment to prevent fatigue and, hence, to increase the output of the individual in terms of his occupation, without sacrificing any quality of his health.

Now, the thing that we lack at present, so far as its applicability to the practice of industrial medicine is concerned, is a yardstick of fatigue. A number of investigations are going on in that direction, and I think before long something will come of it.

Broadly speaking, two main channels of investigation are being carried on. One is a state of fatigue relative to the muscular capacity of the individual. In other words, we relate muscle strength to the load. The other is a form of fatigue which I think is going to be more important as time goes on, and is related to the nervous system. That arises out of the fact that fatigue is produced by agencies which impair the ability of the brain to send impulses to the peripheral muscles so that work may be performed.

Now, monotony of work may be the greatest contributor to fatigue. I use that as an illustration. For example, we found out, in one small investigation, that individuals employed at work which called for dexterity and nimbleness and a high degree of mental alertness fatigued in less than a twenty-

four-hour period. In other words, if a certain standard of measurement was applied in the morning before work began, the same standard applied at the end of the day, we could demonstrate in almost all individuals so tested that they had experienced fatigue, and that that experience was definitely related to the ability of their nervous system to regulate their muscular activity in coordination.

Now, in jobs which call for a stationary position, manipulation of instruments, or monotony of exercise, that kind of fatigue must be recognized by the industrial physician.

The occupational disease, conversely, may produce a fatigue which may not be recognized unless the individuals are subjected to critical examination. For example, we have noted that individuals with a mild type of hypertension, increased blood pressure, have in many instances a lower fatigue threshold than individuals whose blood pressures are normal. Or an enlarged heart, due to valvular disease, a leaky valve, will produce the same phenomenon; or individuals with diabetes or individuals that have a low basal metabolic rate, because of a thyroid gland disturbance, or individuals who are abnormally obese will all show variations in their fatigue thresholds.

The only way that aspect of the subject can properly be investigated is to approach it from the medical point of view first. Examination of the individual becomes the important thing. It is important to apply critical standards of evaluation, then to attempt to correct them by medical program.

The industrial factor of fatigue, which I mentioned first, calls for a recognition that certain kinds of work can produce fatigue, and then to apply methods which will relieve it. I want to illustrate just two:

If we recognize that a certain occupation produces fatigue, we have discovered things which will relieve the fatigue. A man whose job calls for standing at a bench, in more or less one position, doing the same job over and over again, will have fatigue which can be relieved if he can periodically sit down, because his oxygen consumption in the sitting position is greatly reduced over the standing position, and he performs virtually less work within himself. Consequently he has available greater reserves of energy for his performance.

It has been pointed out, and we have been able to show in some small investigations, that if it could be arranged that this job could be done in the sitting position, the output would be increased and the individual would suffer less fatigue.

It has been shown that, in jobs which call for a to-and-fro movement between more or less fixed positions, without much opportunity to rest, if the period is broken hourly or at hour and one-half intervals, and simple freedom of motion allowed to get out of the range of what he was doing, rest is instituted and fatigue is relieved.

We have been able to show that the application of bathing, in certain kinds of industries, will produce a diminution of fatigue and raise the capacity of the individual to resist his industry or his job. Those are some of the features of the occupational aspects of disease, or the industrial aspect of fatigue, rather. With that casual introduction we can go on and attempt to answer some questions.

Tests of Fatigue

CHAIRMAN PAINE: Are there any questions from the floor? This is an interesting subject.

DR. WALSH: I should like to ask a question in relation to various tests of fatigue. The psychologists have all had people putting round pegs in square holes and all that sort of thing, rapidity of processes. That is one method that is not my concept of the way to measure fatigue, but it brings up one point; namely, the relation of fatigue to the mental status of the individual. Again, the psychological yardstick may be applied. What is the relationship of the intelligence quotient of the individual to fatigue? Does the person using his mind in his work fatigue more readily than one doing physical activity in which no mental effort is required?

DR. ENZER: If I may restate the question, I think Dr. Walsh really wants to find out whether individuals of low I.Q., so to speak, experience the same phenomenon of fatigue under the same circumstances as an individual of high I.Q.

DR. WALSH: That is right.

DR. ENZER: I would say he does, although that is not generally recognized.

BEN JOHANEK (Connor Lumber Co., Wakefield, Mich.): Do you not think a lot of this is caused through improper food?

DR. ENZER: We are now recognizing that nutrition plays an important part in nervous fatigue because we know there are certain elements in food that are important for the integrity of the central nervous system. But we have been able to show in some preliminary experiments and from some surveys that, in a general way, food intake, except in an extreme instance, is not important, but in acute instances it is. What do I mean by that? An individual who has been deprived of food for longer than he is normally accustomed, in other words, if his meals are separated by too long a period of time, fatigue will be produced. We showed that on ourselves. We took no food from early morning until late at night and were able to show increasing fatigue.

We were also able to show—and this is well known, of course—that there are certain kinds of food which give some temporary relief from fatigue, most notably the sugars, carbohydrates, and a good deal has been done on the proteins of diet. But in the sense that I have tried to lay the subject this morning, diet is a factor in fatigue because it becomes a disease state, and a disease state induces fatigue. Diet will produce a state of fatigue if we have some acute disturbance in the habits of diet.

Factor of Noise

MISS MARY LOU SCOTT (Joa. E. Seagram & Son, Louisville, Ky.): I would like to know the effect of factory noise in regard to fatigue.

DR. ENZER: Noise is a factor in fatigue. We demonstrated that objectively in a scientific way in a laboratory, in this manner: We tested individuals for the flicker phenomenon rate which, as I said, constitutes our base line. Afterwards, we stimulated their ear with a sound of a regular intensity, rhythm and rate, the object being to see whether we could fatigue one center of the brain and in that way effect fatigue in another center of the brain, or whether we could distract one center from the other.

We found that this investigation brought to light two rather interesting things, or I would say three, perhaps. One is that there are, constitutionally, individuals who are

sensitive to sound, because we could pick out from a group of individuals people whose flicker phenomenon was greatly depressed when their ears were stimulated; which suggests, perhaps, that such individuals work best in a quiet atmosphere. That is a speculation.

Another type of individual constitutionally wasn't affected at all. His flicker phenomenon was exactly the same rate.

The third individual had his flicker phenomenon raised; in other words, he was stimulated by sound. I think casual examination amongst yourselves will probably bring to light illustrations of the individual who can concentrate on reading a book while the radio is going on and understand both of them perfectly satisfactorily.

Now, when we fatigued these individuals by their routine work—in other words, we conducted the same test in the morning and got a certain base line value; then they did their day's work, and we tested them at the end of the day—we found that fatigue accentuated the direction of their natural constitutional tendency. In other words, the individual to whom stimulation of the ear depressed the flicker phenomenon found that depression increased at the end of a day's work.

PAUL M. HARRIS (Western Austin Co., Aurora, Ill.): Does the human system have the ability in any way to build resistance to this monotony, so it doesn't affect fatigue other than the infusion of glucose or the increasing of the oxygenation?

DR. ENZER: That is a phenomenon known as adaptation in a physiological sense and, in the social sense, it is a question of getting used to your job; but the unfortunate part about getting used to your job is you are not the same today as you were five years ago. In other words, the individual today can't get used to the things he was used to five years ago. Age is an important factor in that direction. The longer the individual is at a fatigue-producing job, sooner or later there will come a time when his fatigue becomes manifest.

We have found that our so-called fatigue testing standards showed no important factors, so far as age was concerned; but the older individuals had a lower threshold to the thing that produced the fatigue than the younger individuals. In other words, it is

not entirely true that experience with a job is a guarantee against fatigue.

CHAIRMAN PAINE: In order that you may not be fatigued, I am going to change the subject. I am asking Dr. Belknap to take the two next subjects, 3 and 4: "The Toxic Limits of Common Solvents" and "Lead in Industrial Processes," and dwell on those subjects as one.

Toxic Limits of Solvents

DR. ELSTON L. BELKNAP: Mr. Chairman, I know there may be several distinguished guests but I am sure that we in the medical profession always feel peculiarly honored when Dr. Hamilton is in the audience. If there has been anyone who has been responsible for bringing to the attention of American industry and the medical profession the importance of toxicology in industry, I think it is Dr. Hamilton.

I will emphasize a few of the toxic limits of the common solvents, so-called thresholds. While these limits have been more or less agreed upon by authorities in this field, particularly such as Doctors Drinker, Haggard and Hamilton, there is no threshold that is arbitrarily perfect, and the actual decision of whether or not the solvent has been toxic is the observation of the patient who has been exposed to that solvent, by a physician who must determine whether or not there has been a temporary intoxication and whether or not there has been a residual.

Dr. Walsh has really very ably covered the subject of the hazards of spray painting, and solvents which are the chief hazards of spray painting, but I will mention a few of which I have grouped in increasing order of toxicity.

As an example of probably the least toxic solvent—I say least toxic because no solvent is not potentially toxic; in fact, some go so far as to say that all good solvents are toxic—there is gasoline. It has been stated that 1,000 parts per million is a safe limit for continued exposure. The matter of contamination by other substances such as benzol in 5 to 10 per cent in certain gasolines, certainly would alter that safe threshold.

The next group of solvents which are slightly more toxic, are the amyl and butyl acetates and ether which are allowable in 400 parts per million. Some authorities still state that they belong in the 1,000-part-per-

million class. The most recent report classes them as 400.

The third group of 200 parts per million, include the following: Methanol or wood alcohol which, as you know, may have a serious effect on vision and cause blindness; toluol and xylol, tetrachlorethylene, trichlorethylene and turpentine.

The fourth group, which has dropped to 100 parts per million, include carbon tetrachloride and ethylene dichloride.

Then the fifth group of 75 parts per million, benzene and dichlorobenzene; and finally nitrobenzene, which we, fortunately, actually use very rarely as a solvent, is 5 parts per million.

I think it is important to remember that these solvents, if in sufficient concentration, may kill. This is in contradiction to the other subject that I have been given, which is lead, which very rarely kills. These solvents kill, first of all, by simple suffocation, if they are used in an enclosed space, such as in a vat. But the sinister element of the solvent, of the toxic solvent, is the fact that it affects the central nervous system because, as you know, these solvents are fat solvents, and our nervous system is largely made up of fatty tissue or lipid tissue, so the nervous system is very easily affected. We have involvement, therefore, of the eye, one of the most highly developed nervous structures. Then we have central nervous system involvement, paralysis, inability to walk. Also, we must realize that some of these solvents actually damage the liver and the kidney, causing an acute Bright's disease. It is thought that some of them may cause cirrhosis of the liver.

Fortunately, one of the best solvents and one of the most dangerous is not included in the list at all now, the tetrachlorethylene group used in the airplane industry in the past. That had the peculiar ability to attack every part in the body, including the heart muscle. That, too, is said to be a contaminant of some of our other solvents. It has been mentioned that possibly the former contamination in trichlorethylene was really the reason why trichlorethylene had originally had a rather bad name.

I think one of the most important things to remember in dealing with the control of a good solvent is that we are dealing with a potentially dangerous substance and not make any effort to conceal that fact from

anyone in the factory. We of the medical profession have always felt that we like to put our cards on the table. We know that it is a great deal simpler to follow the ancient axiom and tell the truth. So that I admire, for instance, the benzol company which puts on its barrels, the word "Poison." I am not in a position to know whether they more or less did that because they were told to, but I know they do it.

I think there are many other companies that should put the same label on their products. In this connection I would like to tell of a case that I was asked to see, where a young boy, in the middle of the summer, working in a shop which made motors, suddenly became very sick, had severe headache, was dizzy, and had to stop work. He was working with a substance which he regarded as harmless.

When I first heard of the case I insisted I would want to see the process and see the plant and get my information firsthand rather than attempt to talk to some foreman by telephone. (The medical profession as a whole is learning that it can only fulfill its responsibility by demanding the right to know all about the exposure of the patients that come into their hands.)

When I went into the shop I found that this worker was using a large paint brush, dipping it into a large bowl of liquid, which he then slapped on the motor to get the grease off. On this particular hot day he evolved the idea of setting a fan, which ordinarily, perhaps, blew the fumes away from him, directly opposite the bowl of material and blew the fumes directly in his face. He got cooled, and then he got sick.

I asked the foreman what was in that material, and he said he didn't know exactly; it was stock material, perfectly safe, as far as he knew. I said, "Well, I would like to know what it is." So there was considerable upsetting of routine. We finally went out into a shed in the yard, completely dark; we finally got a flashlight, and we found a barrel of benzol marked "Poison."

Now, no one in that shop knew what they were doing. There were a dozen other workers each doing the same thing but who, fortunately, had not gotten this brilliant idea of the fan.

The curious thing about this particular shop was that in another department, not

more than thirty feet away, they were doing spray painting, and they were doing it properly. Instead of exhausting the spray overhead and bringing it right back in the worker's nose, they had their suction underneath the objects to be sprayed and took advantage of draft as well as suction. They had good engineering equipment and staff, but they simply didn't know what they were using in this particular instance.

I had another experience with a man who was a so-called neurotic. I think most of you can spot the neurotic, if you have had any shop experience. This man certainly was. He had been to half a dozen doctors. One told him he was going to die, and another one said there was nothing the matter with him.

Again I demanded to see the shop. We found he was spraying an aluminum paint with a harmless solvent, a diluent, with good suction and a good spray gun. However, on further talking with him and confirmation from the foreman, I found he was the one man in the shop who was delegated to clean the spray guns at the end of the working day. He would sit down and squirt material, which he called chloride, in and out of the spray guns, and lean over the vat he was working with. Finally, he noticed he began to get happy and whistle and sing, and he began to look forward to the experience at the end of every day. However, finally he noticed he was getting weak, he was dragging one leg, and his heart was going very fast.

Well, this illustrates one other sample. This was a large corporation. Yes, they were using chloride. Finally, after great difficulty and having to go to the treasurer of the organization and going into the files we found that this was a material which they had bought from a supply house in another city, and they did not know what was in it. We finally found out it was ethylene dichloride.

The course of that individual is interesting, in that we put him in the hospital. It eventually cost that company quite a lot of money. I was in this to find out all I could learn about the action of that particular substance. I put the man in the hospital three or four weeks and did a number of delicate tests on him.

Well, he came through, and interestingly we found that he had an opportunity to de-

velop a cold once or twice. Every time he did, he developed jaundice. Then, of course, we did liver function tests and found reduction of that. We found he had a weakening of the heart muscle. We found a definite loss of the reflex in one ankle-joint, showing a definite involvement of the central nervous system.

We were able to get all the physicians to agree that this man was considerably disabled, that it was due to his occupation. You will understand, I was seeing him not for himself but for the company. I think a good many of them thought I had been a little generous to this malingering. This man went ahead and got a large settlement. I don't know anything further about the case except that I did hear that the man died and that the death certificate said "cirrhosis of the liver and heart failure." Unfortunately, we didn't have an autopsy to confirm it.

In my opinion, the toxic solvent is one of the most dangerous substances and it may seriously disable and kill.

Lead in Industry

As a preface to the subject of lead in industry I would like to say that I am not specializing entirely in industrial medicine. I am one of that increasing group who feel that industrial medicine is not a specialty in itself but is merely a division of internal medicine or diagnosis, the large field of medicine which in private practice corresponds to or is correlated with the field of general surgery. I am glad that a large proportion of my practice is still private practice. I am also consulting medical director to one of our industrial concerns in Milwaukee, with branches over the country, so that I have an opportunity to see lead and other toxic materials.

When you see a man who has said, "I have lead poisoning," do not forget he may have some other disabilities and diseases, such as acute appendicitis, gallbladder, kidney colic and so forth. In my private practice my interest has been sharpened so that I always make an effort to take a very careful occupational history on a patient, even though he may come to me purely as a heart case, lung case or what-have-you.

In this particular plant in Milwaukee, which began by having and still has, as a large proportion of its work, storage battery

plants, when I came there about ten years ago we were having an incidence of about 24 lead cases per 100 employees per year, which corresponds pretty well with the percentage of 15 to 16 reported by the Public Health Service in work about that time.

In five years, by cooperation with the medical department, the engineering department and management, we dropped that to an incidence of 2 per 100, and for the past five years we have had no cases of lead poisoning at all. We are still handling lead, and we are still handling it in large amounts.

I think that in the storage battery industry, probably, men are exposed potentially, at least, to the greatest concentration of lead for absorption directly into their bodies than in any other industry. I am glad to report that, having followed this particular group of workers of about 80 for this period, at the end of ten years they are certainly just as healthy and, in many respects, I think healthier than the general run of the population. Of course, we have reduced their lead absorption, but at times it will break down the physical resistance and respiratory protection. They occasionally have large doses of lead. Many of these workers were persons who had had lead poisoning or serious lead absorption in the period of observation.

Lead is one of the most widely used so-called poisons in well over 200 industries. I think there is no doubt but in the large industry the hazard is well controlled. First of all, it is recognized and then every effort is given. No expense is spared to study the men and to reduce the continuance of any exposure. However, in the small industry, which is the major portion of industry in this country, lead is continually cropping up, and even silicosis, which got the center of the stage in recent years, certainly in Wisconsin, has now taken a back step, and lead has come back into its own, together with the ever increasing use of solvents.

I would like to stress again the danger here is one of non-recognition, that we have our trouble in the small plant, not in the large plant. I will rapidly run through the types of industry where I have seen lead poisoning occur and in which it is an important factor.

The most important is the storage battery industry. Then the streamlining of our automobiles and trucks where, after welding, of

course, as many of you know, they were at first smoothed off by lead paste which, after it cooled, was then ground by machine grinder and produced a great amount of finely divided, inhalable dust. This brings up the fact that the most important hazard in any lead industry is the point of inhalation. Remember that lead dust inhaled is much more dangerous than swallowed, and that very rarely are lead compounds absorbed through the skin, perhaps with the one exception of tetrachloride fluid which is an organic and fat soluble substance.

It is rather amusing that many plants, smaller plants, particularly, have had to give up machine grinding of welded joints. Here is a return of modern industry to the horse-and-buggy stage. They are going back to hand filing where, of course, the particles are heavy and are too large to be inhaled. The problem can be licked, however, even by machine grinding, if one uses respirators.

It has always been said that lead poisoning was very common in painting. My experience in ordinary painting nowadays is it is very rare, particularly on inside painting where lead has been substituted by other substances, such as titanium, zinc and so forth, which are harmless. On the outside, however, lead is still used, in many instances, because it is the one substance that will stand the weather.

Here we come again to the question of finely divided, inhalable dust where men burn off old paint in private homes; not in the large installations, of course, or sand, either by machine sanding or by hand sanding. There we have the question of finely divided dust which is inhaled. You must remember that dust when inhaled passes directly into the system and immediately circulates throughout the entire body.

I make a recommendation, therefore, that any worker that has gotten his lead by burning off or sanding, be given a respirator for that purpose, even though he is an outside worker.

In the wrecking of old buildings and old ships, of course, there is the constant presence of lead absorption when the steel has been coated with several coats. It ideally forms a fume which is so fine as to be almost invisible and is absorbed directly into the system. The only way that a worker doing that can really protect himself, in my opinion, is to use an air-line respirator. I

have seen a great many men in one particular type of ship industry, cutting up old ships outdoors in mid-winter, and I have never seen men leaded up so rapidly. Of course, this is an old story. The Navy found this out twenty years ago when they scrapped many of the old ships. Unfortunately, some people in industry, as well as doctors, are not very good on keeping up on their own work, by reading, and experiments have to be made again.

In the smelting of lead or zinc ore and scrap metal, lead poisoning occurs. In pottery making where a glazed mixer is used, one most usually is exposed to lead. In the printing industry we have heard a great deal of lead poisoning.

I had an opportunity recently to make a survey of a group of printers with the Wisconsin Industrial Hygiene Unit. They went into an analysis of the air, and I examined the men. To be sure, our list was not large, some 30 men in fourteen different printing establishments, but it was striking that all of these men were in excellent health and, as far as I could see, there had been no great deal of turnover.

However, there are one or two spots in the printing industry that are danger spots; that is, of course, the man who remelts the old type metal or who saws it, if he uses a machine saw. I think it is interesting, going through our records of printers in the State of Wisconsin, for a great number of years past, we have had only three cases, one of which was really a serious case, and that man was one who remelted—he was the forgotten man, worked down in the basement on a kettle, where nobody paid any attention to him, and there was no protection.

In passing, I will simply name soldering, and that occurs very frequently even in the evaporated milk industry out in the country; tempering of metals, brass foundries, ink making, insecticides. This potentially may occur in leaded steel when it is scrapped. Then I would class as the final one, the risk which says they have no lead hazard. That is the place you should look particularly.

As I said, the important portal of entry is through the nose. If we bear that in mind, the problem of control of lead poisoning is really not difficult. If, of course, your engineers reduce the exposure to 1.5 milligrams, I don't think you will have a case of

lead poisoning. However, as a matter of practical interest, I think it is very difficult to get there in ordinary industry, and I would more or less formulate 3 as a safe level. I think it has also been found by other workers. However, if you get over 3 you certainly have the possibility of serious lead absorption.

I want to emphasize that mere lead absorption does not mean the man has lead poisoning. He may have a lead line, may have lead in the urine, .08 milligrams per liter, but that does not make lead poisoning. That is merely evidence of absorption. He must have, in addition, clinical symptoms of one of the three types of lead absorption.

As a final word in regard to the role of the medical profession in its cooperation in industry, it seems to me that the medical man should first of all be responsible to the highest man in authority in the plant, so that he can go direct to him with any problems that arise, and before any new procedure is used or any new chemical, have a conference with the physician to see whether there is any possible danger, whether there are volatile solvents or lead, so that the danger to the men may be prevented before it happens.

I am not making a plea for absolute substitution for and avoidance of the use of lead. I think industry cannot get along without the use of lead, cannot get along without the use of a number of these solvents; but if industry is forewarned, and if the worker is informed correctly so he will cooperate in the use of protective devices and, finally, the medical profession is allowed to see the patient as often as they see fit, perhaps every two or three weeks, then there need occur no occupational disease in industry.

CHAIRMAN PAINE: Are there any questions on either one of these subjects that you would like to ask?

MR. HUTTER: What is the effect of the smell of kerosene on the worker? Is that a permanent effect or just temporary?

DR. BELKNAP: As far as I know, there is no ill effect from the inhalation of kerosene.

R. S. SKYRM (Employers Liability Assurance Corporation, Boston): Would Dr. Belknap recommend the direct venting of lead pots on linotype machines where the pots are electrically heated and thermo-

statically controlled so the temperature of the lead does not exceed 500 degrees?

DR. BELKNAP: That is a good practical question. As we know, lead melts at a much lower temperature when volatilized. In my experience, lead does not really volatilize until around 1,000 or 1,100 degrees.

In this group of workers that I am following, some years ago, large lead pots, two or three feet in diameter, were unhooded because of certain changes in technical procedure, and the plant never got around to the hood. I disapproved of that and repeatedly said they would have cases of lead poisoning there if they didn't hood. They said they would just as soon as it was practical. It has never been practicable, and I am here to say we have had no lead cases develop to the point of disability, and we have had very little lead absorption result from that. The same men have worked there for ten years, dipping lead out of the pot, incidentally, at temperatures ranging usually from 850 to 950 degrees. In this group of linotype workers we found no evidence of lead absorption in some of the shops where they had no suction. I would not say in my own experience that hooding is necessary at 500 degrees.

MR. CARR: I wonder if there is any evidence to indicate the toxic limit for butyl alcohol could be raised above that given? We had experience over some twenty years with the same group of men, working in concentrations from 200 to 400 parts per million, and under careful examination they have shown no indication of trouble.

One other question is whether much work has been done on toxic limits of dioxene?

DR. BELKNAP: I think Dr. Hamilton will have to state if she recalls whether we have toxic limits established for dioxene.

DR. HAMILTON: Dioxene is the trade name for diethylene chloride. No toxic limit has been established for that. We considered it a fairly safe solvent until some very disastrous cases occurred in England from over-exposure, causing five deaths. Since then we have looked upon it with a good deal more suspicion. There has not been enough work done on it to establish any maximum allowable concentrations.

DR. BELKNAP: In regard to butyl alcohol, the butyl radical acetate is much less toxic than ethyl or methyl, particularly. So I would be interested in your point of view.

I think probably it could be made at safe limits.

MR. GUMMAR: I want to endorse completely the principle of maximum clearances of safety standards in engineering, but they should be based on factual data. As regards toluene, there have been enormous quantities used in the lacquer industry since spray painting came into use. It is sprayed into the air as fine mist, and even though it evaporates at a slower rate than benzol, if you inhale the mist, you get severe effects, if it is toxic.

I have employers in four states, New York State, New Jersey, Ohio and Connecticut, who for the past sixteen years have not had any reported cases of chronic toluene poisoning; yet Ohio in the past sixteen years has had over 69 cases of poisoning from gasoline in the petroleum industry.

As to the experimental results, I can find no experimental data indicating the toxicity should be such a low value. Some of the confusion arises from the failure to distinguish between chronic and acute poisoning. It is a fact that in extremely high concentrations, toluene and xylene are more toxic than benzol; that is, if you go into a chamber where there are 20,000 parts per million, you would be unconscious quicker from toluene and xylene than you would with benzene, but that is an entirely separate phenomenon from the slow chronic poisoning.

CHAIRMAN PAINE: The next topic will be "Skin Affections" and that will be handled by Dr. M. J. Reuter.

Skin Affections

DR. M. J. REUTER: When we consider to what extent the skin of the worker is exposed to injuries, the action of chemical irritants and the various infectious agents, it is not surprising that occupational skin diseases are a major problem in industry. The United States Public Health Service estimates 69 per cent of occupational diseases are skin diseases. They carried out a study in 100,000 workers and found, in the course of a year, that one per cent of these workers were affected with some skin disease as a result of their work. This did not include burns, splashes of acids and alkalis, and the ordinary pus infections of scratches or abrasions.

The problem confronting the physician is to determine the relationship between the skin disease and the occupational environment, to discover the nature of the offending agent and to adopt measures designed to cure the condition and prevent its occurrence.

There are many predisposing causes of occupational dermatosis, such as uncleanness of workrooms, of clothes and of person. Previous skin diseases as, for example, eczema, are potent factors, because individuals with eczema react seven times more frequently to external irritants than non-eczematous individuals. The skin of the young and old is more susceptible to irritation and infection than the skin of persons in middle life. Dry skin is more vulnerable to irritants than oily skin.

The skin of certain parts of the body is especially sensitive, for instance, that of the eyelids and genitalia. Anything which lowers the normal threshold of resistance of the skin may act as a predisposing factor in the production of dermatitis and of infectious lesions. These factors include bruises, marked sweating and maceration, prolonged exposure of the skin to water and especially to alkalis and repeated scrubbing of the skin. These agents tend to remove the normal protective coats of the skin, that is the outer horny layer, and thus expose the sensitive epidermal cells directly to irritating material. A point fairly recently emphasized is that individuals with common athlete's foot are much more prone to occupational dermatitis of the hands. Apparently this infection of the feet acts as a sensitizing factor.

The actual causes of occupational dermatoses are mechanical, physical and biologic agents and chemical irritants. Mechanical agents produce bruises and lacerations, as well as friction and pressure resulting in various inflammations and thickenings of the skin.

The physical agents which may produce an occupational dermatosis are heat and cold, either dry or wet, electricity, ultraviolet rays, either from the sun or artificial, and x-rays or radium.

The biologic agents are the common bacteria, fungi and parasites.

For the most part, however, occupational affections of the skin are the result of contact with irritants of a chemical nature,

usually acids or alkalis producing simple inflammation of the skin.

As a subject for discussion, I might say that probably cleansing agents used by the workers are one of the most potent factors in the causation of occupational dermatitis.

CHAIRMAN PAINE: This is a subject in which there are a number of men interested. Will you expedite your questions?

DR. ENZER: I would like to ask Dr. Reuter to say a word about skin cancer in occupational exposures.

Skin Cancer

DR. REUTER: Ewing has set forth five postulates which must be fulfilled before accepting trauma as the cause of given cancer. Ewing states: "First, the authenticity and adequacy of injury must be established." That is, the patient's statement regarding injury must be substantiated, and there must be actual tissue damage.

"Second, the previous integrity of the wounded part before the injury must be established.

"Third, the cancer or tumor must arise at the point of injury.

"Fourth, there must be a reasonable time limit between injury and the development of the tumor." That is, if the tumor develops within two or three days after the injury, it isn't reasonable that in that short a time a tumor could have developed.

"Fifth, the positive diagnosis must establish that there is an actual tumor present and the nature of the particular tumor."

CHAIRMAN PAINE: Dr. Enzer, do you want to speak to the point?

DR. ENZER: I thought Dr. Reuter might say a word about the increasing attention now being given to highly complex chemical agents which have the property of inducing cancer in the experimental animal. We know of certain agents which have that property in the human. The commonly known one is tar cancer. We know also of certain aniline products which would produce cancer of the skin, of the urinary bladder, and so on. I think that subject is highly complex, but I think it should be brought to your attention that in the dermatology of today we deal not only with dermatitis but also deal with tumors.

DR. REUTER: I have had very little occasion to pass on a question of cancer of the skin arising from alleged contact with some carcinogenic agent.

C. T. DENSMORE (Koppers Co., St. Paul, Minn.): I would like to hear a little about the effects of coal tar and creosote oils in relation to cancer and what-not, and also the inhalation of the creosote vapors.

DR. REUTER: Regarding the development of cancer from coal tar and creosote, I have had no experience. We do know that coal tar is the nearest to the skin and does produce an inflammation about the hair follicles called folliculitis. It is undoubtedly due to the plugging of the follicles with the tar and perhaps some stimulation of the epidermal layers of the skin from the tar, which sets up this inflammatory reaction around the hair follicles. I think the same is true with creosote. But, regarding the actual development of hypertrophic lesions of the skin, particularly cancer, I have had no experience.

DR. BELKNAP: As for creosote, I have had no actual cases brought to my attention. As far as I know, the fumes would be no more irritating, possibly, than causing an irritative cough. I know of no cases, really, of acute chronic bronchitis or other carcinogenic results.

CHAIRMAN PAINE: We will leave any other questions to the end of the session and hear Mr. H. A. Nelson, Industrial Commission of Wisconsin, on the question: "Should occupational diseases be considered as industrial injuries?"

Disease Vs. Injury

H. A. NELSON: Mr. Chairman: The question which I have been assigned is susceptible of treatment in several ways. We can treat it in a highly technical way and quibble about the court construction of the word "injury" or we can treat it in a general way and ask whether occupational diseases should be compensated. That is the real crux of the question today.

It sometimes astonishes me that thirty years after the passage of compensation acts we are still disputing this question of whether we shall compensate a condition which may cause disability and which arises

out of industry just as clearly as does an accidental injury. There are various ways of meeting the problem. One, of course, is to do nothing about it and that is what about eighteen states in the Union are doing. They are not compensating occupational diseases at all. Out of the other states there are a few which are compensating all occupational diseases, and some of them are compensating by schedule.

Now, schedules are usually designed so that there are a great many diseases which are named, but very generally you will find that they leave out the one occupational disease which causes the most disability. For example, silicosis is left out of a great many of the state laws which have schedules. Therefore, silicosis, which is a serious occupational disease is not compensated.

When we go back to the prime principles of workmen's compensation, we wonder why the compensation fathers didn't face the question at the time the compensation acts were passed. That was the time to do it. Either through inadvertence or, in some cases, through design, occupational diseases were left out of the laws pretty generally, but accidental injuries were to be compensated. I think that was largely because of the rather violent split from the old common law system and leaving out of consideration the question of negligence. It was a rather violent split, but it is surprising that in all of these years occupational diseases still remain uncompensated in so many states.

When we consider the nature of an occupational disease, which is usually a slow, insidious process, over which the man himself, the employee, has no control, but over which the employer, as these physicians have told you this morning, has the entire power of control, there seems to be one hundred times more reason why the employee who cannot protect himself in any possible way should be compensated for occupational disease rather than for accidental injury.

I suppose there is no question but that the real crux of the matter is that of expense to the employer, and that comes because of the so stated accrued liability. Here has been an accrual of dosage which finally eventuates in disease, and this accrual is such that the disease may come at a given moment.

If the employer has a large number of

employees who have this accrual of dosage, it may be that in periods of depression the expense to him will be rather great for the time being, and that must be met in various ways. Employers are humanitarian. Most of them would like to do these things but they are also in competition with each other, and that means there must be laws and regulations for the compensating of occupational disease if the job is to be done in a satisfactory way.

Another reason that is often given is that industrial commissions and accident boards are unable to decide the question of occupational disease, as to causation, between the process and the final condition which results in disability. I think that is a rather fatuous objection, in view of the development which has been made in medical science within the last few years.

I think those questions are no more difficult to decide than the questions of aggravation of pre-existing conditions which are clearly under the law, if we may ascribe them to accidents, and also to the obscure conditions which are ascribed to accidents and as to which compensation boards and commissions have to make decisions every day.

Can Stamp Out Disease

But the most glorious thing that has been accomplished by occupational disease laws is the fact that employers have become conscious of the fact that they can stamp out occupational disease. I am glad to say that in Wisconsin we have practically stamped out silicosis, that in a few years more it is going to be practically a negligible thing. Dr. Belknap has shown you how lead poisoning can be almost entirely eradicated. That is the glorious thing which we have achieved through the passage of occupational disease laws. I want to give a very few figures showing the drop in silicosis in the State of Wisconsin since 1933 to 1939. These figures are the percentages of compensation which were paid in silicosis cases as compared with the total. In 1933 the figure was 9.4; 1934, 8.8; 1935, 7.9; then 5 and 2 and .9 per cent, and, in the year 1939, 1.3 per cent which we figure is getting about on a level.

I think there is no question but that the public is demanding that occupational dis-

ease be compensated. The trend is coming on. I believe that industry and society will be gratified when the problem has been solved by whatever methods may be adopted and suited to the different states.

CHAIRMAN PAINE: Are there any questions you want to ask Mr. Nelson before we go into the general discussion?

ADOLF AMRAM (Hamlin & Co., New York City): We passed a compensation law in New York State some two or three years ago. Perhaps you recall that first we passed a most illogical law, the all-inclusive act which acted most disastrously not only to industry itself but to the workmen. You are familiar with the history and the recall of that act. I dare say in a number of states it is absolutely right and proper the compensation act should include silicosis, but it should include silicosis on a schedule basis, as I think is the case in Illinois.

MR. NELSON: All states are not as fortunate as some other states. I think we are showing generally throughout all of the states that the problem can be solved.

Protection for Welders

CHAIRMAN PAINE: We have a few minutes. Anyone in the audience has the privilege of asking this panel of doctors any questions they want to raise on these main subjects.

I. S. GREEN (Edgewater Steel Co., Oakmont, Pa.): I would like to ask to what extent an ordinary welder in a small plant should be protected? Once in a while there will be a hardening material which has poisonous results. Other times there will be flame cutting of paint on a product which will raise some noxious poison. To what extent would a welder or a cutter have to be protected?

CHAIRMAN PAINE: The question is, how are we going to protect, and what is the exposure to welders on new material or on old material that has been painted? I will ask Dr. Walsh to answer that question.

DR. WALSH: Within the past couple of years we have had occasion to go over a group of about 1,000 welders. Of that group some 300 have been welding for ten or more years. They were gone over from the clinical point of view. X-rays of the chest were

taken. Disability due to sickness over the ten-year period was calculated and seen for each individual man. There certainly was no marked difference in sickness rates and in disability rates in the welders as compared to the general run of employees working at their side in the same plant and in the same economic situation.

When you are considering welders who are cutting painted materials, lead-bearing paints, or who are welding in confined spaces, you have a different problem; but for the ordinary welding group, working in a large, airy room, with ordinary precautions and ventilation, their health is just as good as any other group of workers. If they are cutting paint or toxic coatings of any kind or lead-bearing steel, or if they are working in a confined space, then additional respiratory protection is necessary.

So far as the question that was rampant a few years ago, that is the development of so-called fibrosis of the lungs due to welding, we have not found this to be the case. Dr. Enzer and Dr. Sander at Milwaukee have had occasion to examine at postmortem a few of these individuals who have been welding for long periods of time in confined spaces, usually. They did find there was an increase of iron in the lung but no fibrosis causing harm.

Recently, we also have examined another group of welders, that is a variant of the welding trade, scarfers, in the continuous production of steel. These scarfers use a long torch and blow out the defects in the billets rather than chiseling them out. This group also, while it is an infant in the group of welders, apparently have no health hazards of any consequence in their trade. In other words, I think if ordinary precautions, so far as ventilation and so forth are concerned, we need not be concerned other than if we are using lead or chromium or some of the toxic materials.

CHAIRMAN PAINE: Dr. Enzer will speak for a minute on the subject and then Dr. Belknap will follow him right up.

DR. ENZER: I want to seize the opportunity to make some comments relative to the general attitude of this panel discussion. It is most important that in any approach to the problem of industrial health we remember that a statistical analysis of groups is not a true criterion of the health of the individual. In other words, just like the sur-

geon who might boast of a 99½ per cent recovery rate from a specific operation, the individual who happened to belong to that ½ per cent constitutes 100 per cent mortality for the individual. There is a very sharp contrast there.

Now, when we talk about safe limits of toxic solvents, safe limits of toxic agents, safe limits of an industry, we must remember that the problem is not going to be solved by a blanket generalization of a problem, but by a careful and meticulous analysis and study of the individuals exposed to the industry. I know of no other way that this can be done except that industry realize that the profession of medicine forms the keystone to the solution of these problems.

DR. BELKNAP: I simply wanted to amplify what has already been mentioned, and that is when a welder or cutter works on material that has been painted or coated with lead, he, of course, probably will acquire lead absorption in a serious fashion about as quickly as, if not quicker than, in any other way.

It is very simple now, with the respirators we have available, for a shop welder, whenever he is doing that type of work, to use such a respirator. In my own particular series of cases one of our cases of lead absorption was a welder who had been repairing some ovens containing a large amount of lead.

Also, I had occasion recently to see half a dozen cases of cutters who were cutting up tanks in a large chemical plant. These steel tanks had been lined with lead. They could not understand why the men were getting lead. They went through the lead with a torch 3000 or 4000 degrees and they absorbed lead exceedingly rapidly. It is not a difficult question to solve at all but it is a matter of having perfect confidence in what the work is for and preparing for it.

MR. CARR: In connection with welding, we have had instances of zinc chills from work on galvanized iron. We have also had nitrous fume poisoning from the use of coated electrodes.

I would also like to call attention to a relatively new development, that of the flame cleaning of metals before painting, by the use of a special oxy-acetylene torch. That includes previously painted metals as well

as those which simply have mill scale on them.

R. J. WOODHOUSE (Continental Casualty Company, New York City): I had a case a short time ago that I was called upon to investigate. The man worked in a small printing plant where he was assumed to have contracted lead poisoning. After making impinger tests which proved negative, an award was given by the commission to the widow in the amount of \$13,000. The lead was melted around 650 to 700 degrees and the experts proved that toxic fumes were not liberated.

I wonder what yardstick the referees used to measure those cases, in the face of such expert testimony.

MR. SKYRM: I would like to know the relation of hemlock poisoning and poison ivy to skin disease.

DR. REUTER: Poison ivy, of course, is the most common plant that causes dermatitis. Hemlock is occasionally the cause. Poison ivy is an intense irritant to most people's skin. It is a question of whether in itself it is not an irritant to all people's skin.

We used to think we knew the cause of poison ivy dermatitis, but more recent work has tended rather to disprove that we do know the actual cause of what it is in the plant that produces dermatitis. Apparently it is a water-soluble fraction rather than an oil.

Its relation to occupational disease depends on what the individual is doing. If he is exposed to it in his occupation, for example, as a farmer, WPA worker, lumberman or any occupation that keeps an individual out-of-doors, and he contacts poison ivy, it certainly would be an occupational disease. Poison ivy dermatitis is apt to be a much more violent dermatitis than that from hemlock.

CHAIRMAN PAINE: Mr. Gumaer, will you repeat your question?

P. W. GUMAER: The question was, what is the basis of the comparatively low maximum concentration of toluol in the absence of any reported occupational disease cases, and are there any experimental data to warrant such a low concentration where such experimental data deals with chronic poisoning and not with acute poisoning?

DR. BELKNAP: The question is, whether toluol is really as toxic as I intimated it might be, being permissible in only 200 parts per million. Is that right, Mr. Gumaer?

MR. GUMAER: Yes.

DR. BELKNAP: As far as the official authority of that is concerned, it is taken from the code for safe concentrations of certain toxic substances used in industries, whose authors are Bowditch, Drinker, Haggard and Alice Hamilton which appeared in the June 1940 issue of the *Journal of Industrial Hygiene and Toxicology*.

I do not know whether there is any practical experimental work backing that up, but inasmuch as toluol and xylol are very closely related to benzol, I assume that the authors felt that it as yet could not be given an entirely safe record, for instance, compared to gasoline.

I will say, among a group of workers who have been working with adequate protection for several years with toluol solvents, I have seen no general reaction.

DR. HAMILTON: May I speak to that for just a moment? That presentation to which Dr. Belknap refers was got out simply because a small group of us felt that we might as well let the public know what was our best guess at the present moment with regard to maximum allowable concentrations of the most commonly used solvents. It is founded very largely on guess-work.

The quantity of 1,000 parts per million for gasoline is guess, and so is 200 parts of toluene. We are hoping that we shall be able to give more accurate figures presently.

The American Standards Association has a committee at work in this field, with a small subcommittee. We have just finished dealing with two gases and two volatile solvents, carbon monoxide and benzol and carbon disulphide and hydrogen sulphide. There we have been able to get pretty accurate figures because we have data to go on.

We are now trying to deal with twelve others which are going to be increasingly important in the munitions industry. We hope to be able to give out more accurate figures then. But it is a very difficult problem. You see the only way we can get any accurate figure is by having a combined inquiry made by the physicians, the chemists and the ventilation engineers, because we have to know how many cases developed in a given workroom at a given concentration, and also at what concentration do no cases come.

We could do that with the four I have mentioned, but it means, as you see, a great deal of careful study in the factory and in the physicians' examining room. Bringing those two together, we can do it with regard to lead; we can do it pretty well with regard to mercury, and we have pretty good data with regard to zinc oxide fumes in galvanizing iron and brass foundries and zinc smelting; but the rest of the substances still are more or less in the realm of guess-work.

CHAIRMAN PAINE: May I, in your behalf and in behalf of the National Safety Council, thank the gentlemen on the platform who have so kindly led us in this discussion? Will you express that thanks by giving them a rising vote?

... The audience arose and applauded.

ADJOURNMENT

Off-the-Job Accidents

WEDNESDAY MORNING SESSION

October 9, 1940

The Panel Discussion on Off-the-Job Accidents was called to order by the Chairman, Julien H. Harvey, Managing Director, The National Conservation Bureau, New York City, who presided.

CHAIRMAN HARVEY: It is a pleasure to welcome you here this morning. By way of introduction, I simply want to make clear just what the National Safety Council has in mind by the phrase "Off-the-Job Accidents." All too frequently in previous sessions of this kind there has been a feeling that we were thinking in terms of "community" safety work. In one sense we are thinking of safety work on a community basis, but in another definite sense we are thinking of a program whereby an individual industry or company will consider the problem of accidents which occur to its employees during the hours when they are away from work. This movement had its inception some seven or eight years ago, following several surveys which showed that a very great preponderance of accidents occurred to employees after they had left the job, as compared to those which occurred while they were at work.

I recall one illustration in the East, where a well known national organization with many thousands of employees was doing a good job of safety work in its plants. Despite that fact, during a five-year period, 37 of their employees had been killed while at work, but during the same period 204 of their employees had been killed "after the whistle blew."

We found that situation repeated in many instances. Proceeding on the theory that industry is closer to its workers than other organizations can be, and that industry has been able to do a good job of accident prevention within the walls of its own plants, we felt that it might be possible for it, through a special program, to energize its employees and do something to extend the hours of safety beyond the plant.

In our program this morning, we intend to take up certain problems, which will

appear as they are developed by our Panel of Safety and Industrial leaders before you. This will, however, be an open meeting, and we expect to have many excellent suggestions presented by persons in the audience, who will also ask the panel questions. The panel members are as follows:

Mrs. James E. Sime, Past State Chairman, American Home Department, Illinois Federation of Women's Clubs, Joliet, Ill.

Leslie J. Sorenson, City Traffic Engineer, City of Chicago.

Harry E. Bolt, District Commercial Superintendent, Indiana Bell Telephone Company, South Bend, Ind., and President of the South Bend Civic Safety Council.

Ralph W. Pendleton, Assistant General Manager, Massachusetts Safety Council, Boston.

Edward P. Durfee, Assistant Manager, Insurance Department, Consolidated Edison Company of New York, Inc., New York City.

A. G. Bungenstock, Director of Safety, Western Electric Company, Kearny, N. J.

R. H. Balensiefer, Safety Engineering Manager, Hardware Mutual Casualty Company, Stevens Point, Wis.

We will now proceed with the discussions. The first of the specific problems to be discussed will be: "The Value of 'Off-Duty' Safety Programs." I will ask Mr. Durfee to give us his ideas on that subject.

Value of the Program

E. P. DURFEE: Mr. Chairman, I don't know how the title "off-the-job accidents" originated, but I do know that our present company program has what we consider real value. It dates back about four or five years when our general surgeon, one day, was laying his troubles on my shoulder. He told me that the chairman of the board was after him because our sickness payroll was approximately 3 per cent of our total annual payroll, which is \$80,000,000. The thought

struck me that it wasn't fair for the general surgeon, in taking the toll of absenteeism to say that employees were absent always because they were sick.

We started to find out, from that day on, exactly why our people were off duty. It was amazing to learn that in most of our plants, if a fellow fell off a chair or fell off a ladder at home, his wife would go to the phone, call up, talk to the superintendent, tell him that John was sick, and then the timekeeper would mark him down as being sick. And thus it was that 3 per cent of our total payroll was being charged up to sickness.

The first thing we did was this: We took our payroll sheets and right in the center we put, "If absenteeism has been caused by an accident off the job, answer the following questions: Where? When? How?" It was amazing to find out, after a period of twelve months had elapsed, that among 22,000 employees we had had 478 lost-time accidents in the plant and 610 accidents while off duty.

I can't stress sufficiently the importance of promoting what I call off-the-job safety work. Of course, I know that many of us in the safety field feel that if our industrial technique is successful, we will give our employees enough training while at work to enable them to carry on over the rest of the day; but apparently it is not working out that way. The only pitfall that I can see in the program is that we must not become what we might call over-paternalistic—we must not create the idea in the individual's mind that we are trying to tell him what to do while he is off duty.

Therefore, I can't urge and advocate too strongly tying in your off-the-job accidents with your industrial program. Within the next year we hope to take these accident reports which we have now, bring them right into the plant, and discuss them with the foremen and superintendents in exactly the same way we discuss our industrial accidents.

CHAIRMAN HARVEY: I failed to mention that we will have a discussion from the floor following each specific problem presented. I would now like to hear either from members of the panel or from any one in the audience: Is there any question anyone would like to ask Mr. Durfee based on what he has had to say to you?

MRS. JAMES SIME: May I ask Mr. Durfee what it is that a company gains by spreading safety among employees' families?

MR. DURFEE: In my opinion, they gain more from an economic standpoint than they do from our industrial safety program. In the first place, it helps to build up morale among your employees; and secondly, I am inclined to believe that it has a considerable economical value. In many companies in case of accident not only does the man stay off the job, which no one can figure in dollars and cents, but he is paid while he is off work; and in a good many cases he is paid more while he is off as a result of sickness or accident off the job than while he is off as a result of an injury received while at work.

Voluntary Information

W. R. TUTHILL (American Seating Co., Grand Rapids, Mich.): We employ about 1,300 people. Do I understand that you get the information voluntarily from these employees, including all the details as to how the accident happened and why?

MR. DURFEE: That is true.

MR. TUTHILL: There is, then, no reluctance on their part nor any disciplinary measures used in securing information to the effect that it was an accident, even though it might sound foolish?

MR. DURFEE: That is right. The responsibility is placed on the shoulders of the timekeeper. That is his job.

ERIC W. STUBBS (Illinois Bell Telephone Co., Chicago): What was the percentage of your sickness disability due to off-time accidents?

MR. DURFEE: I would say that about one per cent of our absenteeism is due to off-the-job accidents and two per cent is due to sickness. So you see, you have a two-fold function there: you can not only help your medical department but you can help your own safety record too.

L. J. SORENSON: You say that in the middle of the payroll sheet you have a certain form which asks the questions, How? and Where? and Why?

MR. DURFEE: Yes, just three questions—How, and Where? and Why?

MR. SORENSON: And the employee furnishes that information when he returns to work, I suppose. When you get that, what do you do with it?

MR. DURFEE: We haven't gone that far yet. What I hope to do eventually is to bring that information right back into the plant and talk to the foreman. Don't forget this: Your workmen's compensation laws are going to be broadened, and we are going to be charged with absenteeism in the future which today is strictly sickness, so we might just as well recognize that fact and develop our program so that will take care of these cases now. I hope we can do that with the proper technique without getting them sore—I hope we will be able to discuss the matter with the foreman just exactly the same way in which we discuss an industrial accident with him.

QUESTION: I would like to ask what is so unusual about the fact that there are more accidents off the job than while at work? The average workman works 1,960 hours a year, sleeps 2,800 hours a year, and has about 3,800 hours a year without restraining safety influences such as he has on the job. So why shouldn't he have more accidents outside?

CHAIRMAN HARVEY: Let me answer that question. There is no reason why there shouldn't be more accidents off the job, but it is a challenge to us to see what we can do to bring that ratio down. There is no particular obligation on the part of a concern to guide the employee during the hours he is away from work. But from another standpoint, isn't it worth our while if we can do something to reduce the number of those outside accidents? We know that for many years we have been hammering away and hammering away about home accidents, and street and highway accidents; but if industry, which has carried the original torch for safety in this country and has done such a wonderful job in its plants, can do something to improve accident conditions among its people after they have left work, that is surely something worth while.

SAME QUESTIONER: I happen to live in a community where they are more or less idle in the winter time; we have a lot of people who like to go skiing. The result is that each winter we have 10 to 15 people with broken legs. What can you do about that? It's a sport accident.

CHAIRMAN HARVEY: We will agree that we are going to have sport accidents, and of course, we don't want sport stopped. I think before the morning is over you will probably hear a number of testimonials from those who have done work along this line and who have accomplished some worth while results.

MR. DAVIS: Is there any specific thing Mr. Durfee does to avoid the impression of a paternalistic attitude on the part of the management?

Employee Teamwork

MR. DURFEE: We don't do anything specific. But there is, as I have said, the real pitfall in this intensified program that you may develop. You have got to keep in mind the fact that we have got socialized legislation today we didn't have ten years ago; we've got employees organized on a union basis; and when you begin to develop this program, you've got to avoid this pitfall.

As to just how you are going to do that, well, that depends upon how you set up your program. In the first place, you have to get hold of your supervisors and start your program and tell them what this thing is all about and then have them create the impression among the employees that you are just as much interested in their safety while they are off the job so long as they are on your payroll.

CHAIRMAN HARVEY: I think, too, that one of the surest ways to do that is to bring your employees into the program by having them serve on committees to carry on the campaign. In that way you make it not a management program so much as it is one in which the employees are all joining together in an effort to accomplish something.

MEMBER: One gentleman has said that he thought that we couldn't do much about off-the-job accidents because of the fact that the restraining influence stops at the gate. I don't think it does. We have been hammering away at this thing for more than 20 years in order to form safety habits in the minds of our employees. Therefore, don't you think that they take these safety habits along with them beyond the gate?

CHAIRMAN HARVEY: Any other questions? If not, let us pass on to the second topic of discussion, "How to Promote and Conduct Contests," and coupled with that is still another subject, "Cooperation with Safety Councils, Chambers of Commerce and the Like."

On these two more or less joined problems I am going to ask Mr. Bolt, who has lived with this particular phase of the problem for years in South Bend, Indiana, to give us his ideas.

Contests and Cooperation

HARRY E. BOLT: The technique of organized safety is to get people to do what is good for them and to make them like it.

Well-intentioned persons sometimes make the mistake of acting on the theory that people naturally want to do what is good for them. Of course, if this were true, think of the many amusements, such as the distilleries and the breweries and the manufacturers of women's shoes, that would have to go out of business! But the theory also that you have to beat people over the head to make them act safely—that theory doesn't work either.

Americans like to take chances. That's what built this country. That's what keeps the Stock Exchange and the Kentucky Derby and some of the poolrooms going. Tell the average American that he should act safely, and he'll say, "I'm no pantywaist." Tell him something is against the law, and he'll break his neck to violate the law just to prove that he is a man. But tell this same American that unsafe driving is unsportsmanlike, appeal to his sense of chivalry about women and children—now we're getting some place.

We've got to make people like safety—perhaps not safety for its own sake but courtesies that result in safety. We've got to create new customs, new patterns of social behavior. Etiquette is more powerful than a policeman's club. The man who breaks every speed law on his way to the office wouldn't dream of going to work without a necktie.

Now, the only way you can set a new style is to give it lots of "oomph." You can't do it by preaching, but you can do it by the same means that a new brand of cigarettes is sold—in the newspapers, over

the radio, from billboards. You haven't the money to buy this space and time. You have to chisel it. That means that you have to be on darn good terms with the newspaper publisher, the radio station operator and the owner of the billboards.

Also, since you can't expect them to give you both their space or time and do the work besides, you have to hire your own publicity man; only if you have a safety council, you will call him an executive secretary. Of course, he will have other chores to do, but publicity is the most important, for you have to change the public mind.

As an example, South Bend has just finished a traffic safety contest with Salt Lake City. During the 62 days of the contest, we got publicity of various kinds that would have cost us almost \$7,000. For one thing, we got fifteen and one-half full newspaper pages of stories, pictures, editorials and cartoons. We got people interested in safety. They didn't care so much about how many people were killed as they did about beating Salt Lake City!

But publicity alone won't do the job. The Safety Council must depend on the police—on the traffic engineer—on the school system, including the PTA—on various civic and luncheon clubs, such as the Elks, American Legion, Rotary, Kiwanis, Chamber of Commerce, traffic commission, motor club, churches and industrial, financial and retail organizations. In short, it must make connections with virtually every organization in town.

In conclusion, in talking about the Safety Council through which organization we carry on most of our activities in South Bend, its main job is to create a public demand for safety; to coordinate its work with other organizations. These jobs are too big to accomplish without a permanent, cohesive organization. Our Safety Division of the Association of Commerce includes a Commercial Vehicle Section, the South Bend Safe Driver's League, the Industrial Safety Section, a section devoted to special projects, such as contests and campaigns, and we are also planning on the creation of a Home Safety Section.

CHAIRMAN HARVEY: Mr. Bolt, I would like to ask you this: You speak of the Safe Driver's League with which industry is cooperating from the standpoint of off-the-job accidents. Would you tell us

something about how that works? Do you work it with the individual industries, who in turn work with the drivers in their own plants? I don't mean drivers for their company but those who drive automobiles in a personal capacity.

MR. BOLT: That is closely related to the first subject and one or two questions concerning paternalism. Some two or three years ago we got about 24 of South Bend's leading industries to have each and every one of their employees who was a driver of a private motor vehicle sign a so-called ten-point pledge to drive safely. These were the workers, not the drivers of commercial vehicles, who belonged to those industrial organizations.

Through the police department we received a record of all traffic violations, such as failure to stop at a stop sign and so forth. When any one of these employees was arrested for any traffic violation, he received a letter from the president of the corporation. The president would say that he was very sorry to hear that he had been arrested for a driving violation and that he hoped it wouldn't occur again. Some of the firms go so far as to call the man in and talk to him privately.

We had a meeting the other day of these various industries and we asked them if that was causing any difficulty with their employees, and every one of them said that it had not caused any difficulty at all.

CHAIRMAN HARVEY: I think the experience along this line in South Bend has been outstanding and is of quite general interest. Do these individual industries of your group who have employees entered in this contest carry on any campaign by way of bulletins or posters on the subject in their plants?

MR. BOLT: We furnish each industry each month with a record of the standing of that industry for the month, in which the number of arrests for violations is set against the total number of employees who have signed the pledge. This record is posted on the bulletin boards in all departments of that industry. Some of these firms employ as many as 7,000 people.

MR. BALENSIEFER: How did you convince your Association of Commerce that safety is a worthwhile project for an Association of Commerce?

MR. BOLT: Well, there is a lot of history that goes into that, you know, in most any city you can find several individuals who have a lot of weight by virtue of their standing in the community and by virtue of their standing in the Association of Commerce. In our case we happen to have Mr. Paul G. Hoffman, President of the Studebaker Corporation, and frankly we just sold the idea to him or he sold the idea to us, and then he along with a few others in South Bend sold the idea to the Association of Commerce. In fact, I believe that he personally financed the Safety Council for about three months, and after that we reorganized our Association of Commerce and included the Safety Council as a division of the Association of Commerce. Of course, once it is in, you just prepare your budget accordingly every year and keep going along and doing a good job so that you will be able to pay for your salt.

MR. PENDLETON: Do you really think, Mr. Bolt, that it is essential to have a Safety Council? Do you think it has a place in community life?

MR. BOLT: Yes, I do think so. You have your tuberculosis association and a lot of other activities which go in for the reduction of deaths along other lines; and if you are having 20 to 35 deaths in your city from automobile accidents and perhaps only 15 deaths from tuberculosis, it seems to me that a safety program is just as well worth while over a long period of time as an anti-tuberculosis association would be. It seems to me that any city of 100,000 population or over should have some kind of a Safety Council that should be a part of the Association of Commerce to insure a continuation of support by the civic budget and the retention of a permanent secretary, because you can't get along without a permanent secretary.

Safety Lectures

CHAIRMAN HARVEY: Another problem that we feel will be of interest to you folks is that of "The Value of After-Work Safety Lectures." I shall ask Mr. Ralph Pendleton to speak on that subject.

RALPH W. PENDLETON: I assume that you mean lectures dealing with accidents to our employees after working hours and lectures which are held after working hours.

You know and I know that when school is out there is a general feeling of whoopee among the youngsters and they no longer feel any restraint; I think that our working people are simply grown-up children. Also, it can be said without argument, I believe, that about 25 per cent of our population are employed by industry. As regards our employees, have you ever noticed, when the whistle blows, the mad stampede for the clock? It seems that they just can't get out fast enough. And I believe there is the feeling among them, "Well, we no longer have to do as they tell us." As one of the speakers said yesterday afternoon, "Every individual likes to feel that he has an opportunity of self-expression, and he treasures that feeling more jealously than he does the feeling of protecting his security."

Also, we must take into consideration the fact that less than 25 per cent of our people are receiving the benefits of safety instruction in our plants—I even question whether all of these people are actually receiving safety instruction—and we must realize that these people are associating with the other 75 per cent who perhaps know nothing about safety, never heard of it probably, and have the general idea, "Well, I'm in my own home now and I'm going to do just as I please here." Perhaps they know nothing about safety engineering, etc.

So now we are getting right down to brass tacks. How can we sponsor and what can we sponsor in the way of safety lectures after working hours? Last night and the night before the National Safety Congress sponsored an after-work safety lecture. If you were there, you will agree with me that they were both wonderful lectures and very helpful. Yet less than 3 per cent of the delegates of this convention attended those two lectures. Is it any wonder that we have difficulty, then, in sponsoring after-work safety lectures in our plants? And if we do, I sometimes wonder if we spend enough time as advance agents in building up the attractiveness of such a program?

Now, there are a number of media by which to present after-work safety lectures. However, I know of no better medium than that sponsored jointly by a safety council or by a first aid division of an industrial plant and the Red Cross or the Bureau of Mines. We know that the frequency of accidents in plants which carry on an intensive program of first-aid training

is in direct proportion to the number of people trained in our plants, and we know that they take safety a lot more seriously when they learn about it that way than they do by just listening to sporadic safety lectures as such.

In Massachusetts we are sponsoring a number of courses of foremen training—training foremen to become better safety leaders, conference leaders, training instructors and so forth—so that they can go back to their plants and teach safety and certainly work in a program of off-the-job accidents. I think the weakness is that so many times we fail to come down to specific cases and fail to make use of specific cases in our own communities. We are missing a wonderful bet when we let those things pass, because then we are not talking generalities, we are talking about something that everybody knows something about.

I believe that we must teach safety teachers, and we can do that in a number of ways. Courses of instruction on industrial safety are becoming available more and more in universities, and upon other phases of safety work, that make these safety teachers better informed and better qualified to go back and do the job in their own plants that they see being done in such a plant as Mr. Bolt has outlined here this morning.

I think that that is about all I can say, except to add that now, more than ever, we must realize the violent necessity of carrying this kind of a program in view of our desire to conserve manpower for national defense.

MR. DURFEE: How would you go about developing a program to get the worker's family out to these lectures?

MR. PENDLETON: Well, that is a tough one because in some communities, such as in Massachusetts, employees are not centrally located to plants, as a rule. There are very few instances where employees live within an easy radius of the plant. But such a program is a desirable thing to cultivate and I think that it has to be set up by working the safety features in very subtly. It must primarily be entertainment because there must be some bait to get them out. The program must be attractive but the safety man in charge of such a program must not lose a golden opportunity like that by failing to bring right down to such a

group the importance of off-the-job accidents, although he must be careful not to try to do too much at one meeting. I think that such a meeting is desirable once a year, if it is possible.

CHAIRMAN HARVEY: If there are no other questions, we will pass on to our next topic, which has to do with the subject of "Parking Facilities and Car Inspections." I will ask Mr. Balensiefer to discuss that problem.

Parking Lots—Inspections

R. H. BALENSIEFER: Mr. Chairman: Any consideration of the "off-the-job accident" problem would be incomplete if we failed to take into consideration the portion of each working day which an employee must devote to finding a place for his car near his place of employment, and to leaving this parking place at the close of the work day.

Closely related to these problems is the question of the condition of the vehicle he drives, and what is done to insure its safe operation from a mechanical as well as from a personal standpoint.

Much has been written and much has been said on these subjects at previous Congresses and in safety publications, but new viewpoints are always beneficial, and the problem is certainly one of increasing importance. The tendency of industries to seek less crowded sections with better expansion possibilities, lower rents, and lower taxes has encouraged and necessitated the added use of automobiles in getting to and from work. If any considerable number of employees are concerned, then an immediate parking problem presents itself, and even small groups can hardly expect to park safely or for long periods of time on the streets or roadways near places of employment.

There are many advantages in company-owned parking lots, both to employer and employee.

1. There is less possibility of lost time due to parking accidents.

2. It will provide a means of supervision for that parked vehicle, thus resulting in less chance of fire or theft. If the windows have been left down and it should start to rain, they can be closed. If inadvertently the lights on the car have been left burning,

they can be turned off by the man who has charge of the parking lot.

3. It gives employees peace of mind while they are at work because they know that their cars are safely provided for.

4. It avoids the rush for parking spaces at the beginning of each shift.

5. It provides parking facilities close to the plant or place of business.

6. It avoids the necessity of parking charges. It also avoids the possibility of getting arrest tickets, etc.

7. It permits the control of traffic for safety when arriving at or leaving work.

8. It helps in the enforcement of local traffic ordinances relating to parking areas, parking time, etc.

9. It facilitates traffic safety education through the use of regularly changed safety posters, bulletin boards, and so forth.

10. It permits the use of a marked or fenced-off walkway from the car stalls to the plants or offices so that employees need not buck general traffic after cars are parked.

11. They can be lighted during evening and at night to discourage thefts.

Too often this phase of employee relations is neglected, and our meeting today, if it does nothing else, should serve to call attention to the possibilities that adequate parking facilities offer for the control of off-the-job accidents.

Periodic car inspections are required in many cities and states. Where the results of such inspections have been published, they show that many vehicles are rejected at first inspection. It is difficult to determine how soon after an inspection approval a vehicle again develops faulty mechanical equipment, and surely inspection alone will not eliminate "mechanical failures" as a cause of traffic accidents. Inspection programs which are compulsory, periodic and continuous will help, but too often inspections are not required or are voluntary. Where inspections are compulsory employees can insist that their cars bear the required inspection stickers. Where not compulsory but where provided by state or local authorities for voluntary use, the same requirement can be made if employers provide parking facilities. If no such compulsory or voluntary inspection service is available,

then employers can still assist by one of three different methods:

(1) They can provide the equipment and do the inspection work at no charge or at a nominal charge; or

(2) They might rent inspection equipment and do the work free or at a nominal charge; or

(3) They might cooperate with state or local authorities in securing the necessary testing equipment.

In the insurance business we sometimes think that these inspections do not go far enough. Car inspections should always include a check of the following items:

1. Wheel alignment
2. Steering mechanism
3. Tires
4. Wheels and rims
5. Window and windshield glass
6. Windshield wipers
7. Heater
8. Window or vision obstructions
9. Rear-view mirror
10. Lights and spare bulbs
11. Hand and foot brakes
12. Turn indicator, where required
13. Warning signal
14. Floor boards, floor covering
15. Wiring and engine cleanliness
16. Tightness of exhaust system
17. Defrosting apparatus

Some companies with large garages and repair facilities, which must be maintained for their own vehicles, have arranged to have minor car repairs made for employees at nominal costs, but such arrangements are unusual. However, I think we will all agree that any employer who provides adequate supervised parking facilities for his employees and who makes car inspections a requirement for the employee to use these facilities, has contributed much to the reduction of off-the-job accidents.

CHAIRMAN HARVEY: What Mr. Balensiefer has had to say about the topic he discussed struck very much to my own heart because of the organization I represent. We have been a joint sponsor, together with the American Association of Motor Vehicle Administrators, of a motor vehicle inspection code, and have recently

completed a Motor Vehicle Inspection Manual which is a guide to cities and municipalities carrying on inspection work. We all know that mechanical defects play a part in accident causation but it is pretty difficult to always determine whether something mechanically wrong was responsible for an accident. However, it is reasonable to suppose that the condition of an automobile plays an important part in the greater or lesser frequency of accidents.

As Mr. Balensiefer pointed out, a car may be inspected and found all right one day, and yet a month later it may not be in good condition. The thing that must go along with inspection is the building up in the mind of the individual car owner and driver of responsibility that he should keep his car in proper condition.

I recall an experience we had with one of these "After-The-Whistle-Blows" campaigns in New York City some years ago when we developed a simple little car inspection blank. Those blanks in quantity were distributed to every plant participating in the "After-The-Whistle-Blows" program. Employers took those 6x9 pink slips and passed them out to the employees, merely suggesting, in case they had their cars in the parking lots, if perhaps they would like to make an inspection of their cars. The superintendents of those plants told us that during the noon hour they would find these men hurrying through their lunch and going out to their cars with the pink slip in hand and checking each question carefully and answering it correctly. That, to my mind, is an excellent way of making a driver inspection conscious.

V. I. CALKIN (American Seating Co., Grand Rapids, Mich.): We have been getting along pretty well as far as the condition of our automobiles is concerned. But one of the problems which we haven't been able even to begin to lick and which causes ill-feeling among the men is where some individual hits or damages the car of one of his fellow workers and doesn't report the fact. That always causes ill-feeling and disturbance, but thus far we haven't been able to fashion any appeal that gets across. I would like to ask the speaker if he has any idea of any kind of an appeal or system which would get some results in that respect?

MR. BALENSIEFER: That is a tough one. We have a parking lot back of our

home office, and we are confronted with the same problem. I think that one of the answers to that would be to have your parking lot supervised, to have somebody out there when the employees are coming to and leaving work who might spot such things or who could regulate traffic at that time.

MR. CALKIN: Yes, if he catches the man, we can take care of it all right, and we have done so on a number of occasions. But there are several shifts and the men go in and out at different times and we don't have a supervisor there all the time.

MR. BALENSIEFER: It seems to me that the best thing to do in such a case is to have a man out there at the time the shifts are changing and the men come and go.

MR. CALKIN: Well, suppose the supervisor is stationed at a certain end of the lot at which point the men are going to leave the place. At the other end, perhaps almost a block away, is a chap who is ready to leave. Seeing an opening behind him, he backs out in between two other cars and shoots out between them. However, in doing so, he hits somebody's rear fender. We haven't found any means whereby we could catch the fellow in a situation like that.

MR. BALENSIEFER: One of the answers to that is to have your cars arranged in such a way that there will be no backing up of any cars—in such a way that all they will have to do is to go ahead and out.

MR. BOLT: Mr. Balensiefer mentioned car inspections. We don't have them in South Bend, but I am wondering if he knows why it is that very few of the statistics put out by even the National Safety Council indicate that many accidents are caused by cars not in proper condition? Do you have anything on that—as to why it is that you seldom have anybody tell us that 20 per cent, let us say, of the accidents are caused by faulty brakes or faulty mechanism?

MR. BALENSIEFER: Chairman Harvey could answer that better than I could; although I have heard it said that the only accidents which are charged to mechanical failure are those where that was the sole cause of the accident. However, it is pretty difficult to attribute an accident simply to that cause because the human element is also concerned. Also, judgment and reaction time and all these other things enter into

the picture. Just purely mechanical causes will probably always be credited with only a small portion of automobile accidents.

CHAIRMAN HARVEY: The difficulty is that the methods by which accidents are investigated vary so in the different states and vary so in the cities within the states that it is impossible to get any very adequate notion of the exact state of affairs. You might find a percentage running from 3 per cent all the way up to 15 per cent, and we do not as yet have any definite conception of the real situation. However, as a practical proposition, it is quite obvious that cars wear out just like the human system does and just like everything else does. You and I have to go to the doctor every so often in order to get a checkup and see to it that we are in proper condition. The same thing should be done in the case of an automobile. I can see no reason why it shouldn't be. Even without statistics I think that it is reasonable to suppose that the imperfect mechanical condition of automobiles plays its part in this big over-all problem.

MR. PENDLETON: We all know that many employees driving to and from work, who are involved in accidents, aren't covered by workmen's compensation, but I wonder if an employee, such as a salesman, using a company car on his way to work, is covered by workmen's compensation?

Also, what about the company's liability on these company-managed parking lots? How does that work in the case of accidents that occur on the company's parking lot and what is the situation in that regard with respect to workmen's compensation?

MR. BALENSIEFER: Well, it is true that a large percentage of workers do not come to a particular place of employment every day. There are people who do outside installation work and there are salesmen and others of that type; and the usual interpretation of that is that when a man leaves home to go on the job, even though he is not required to be at a particular place every day, he is under the status of workmen's compensation from the moment he leaves his home until he arrives at his first call. Those who come to work at the same place every day come under the Workmen's Compensation Act when they step into company property and not before. At least, that is the usual interpretation of the law, although it varies a good deal in the various

states according to the interpretations made by their industrial commissions and their courts. I think that a safe rule to follow is this: that when a man finds himself upon company-owned property, he is taken out of the category of off-the-job accidents and placed in the category of on-the-job accidents.

MR. BUNGENSTOCK: I have an interesting variation on that. A fellow got into his car in a company parking lot one day but was unable to start it, and so he got out to see what the trouble was. As he did so, he slipped on the running board and hurt himself. The legal department ruled that to all intents and purposes he had left the company property and that, therefore, it was not a company liability.

L. J. SORENSON: I think a point was made regarding vehicle inspection that will never be borne out by statistics. When a man or a woman dies, a doctor by a post-mortem examination can fairly well tell you whether that individual's heart failed and why it failed and just what it was that caused his death; but when a car hits another car or some fixed object or rolls off the road, it is quite difficult to say, after the accident, whether or not the steering mechanism was in good shape, whether or not there was a loose wheel or something else was the matter with it. So if you were to examine the records made by very excellent accident investigation police officers, you would still be misled by the information, because after the accident has occurred the damage to the car will not tell whether or not that car may or may not have been perfect mechanically.

Home Safety Inspections

CHAIRMAN HARVEY: We will now leave the street and enter the home. We have with us today a representative of the Western Electric Company, an organization that has been quite farsighted in its desire to do something among its own employees as regards off-the-job accidents. I shall now call upon Mr. A. G. Bungenstock, who will speak to us on "Home Safety Inspections."

A. G. BUNGENSTOCK: The question of home safety inspections is a rather old one and I don't think we need to dwell much on the value of it. Those of you in industry know the value of inspection, whether it

is of a product or of anything else. I don't need to tell you what the conditions are in most homes with amateur electricians doing wiring in their spare time and with mother getting up on all sorts of chairs to hang up pictures and curtains, etc. The place is really a shambles when you look at it from a safety standpoint.

Now the question is, what can we do about it? I think that your home inspections can be encouraged in a number of ways. We have been rather successful in distributing home inspection blanks to our people and asking them to bring them back to us all filled out. Certainly we are going to get some value out of this thing if they actually see these hazards and see them well enough to write them down on a pad or even if they only have to check them.

Your schools are doing a good job. When you get a youngster bringing home a home safety inspection report, that acts as a pretty good prod to mother and dad. He wants to know why we accumulate newspapers down in the basement or up in the attic—why our electric cords aren't fixed up according to standard methods—why we have things lying on the stairs—so that we really feel that we are getting some very fine cooperation from these youngsters.

Now, this thing cannot be done overnight. It is a long, hard process, that of teaching people to check up on their homes. Also, there is one other value from a fire protection standpoint. In any community, if you will communicate with your fire department headquarters, they will be glad to send a fireman up to your house to look over the premises and see whether or not there are any dangers in it from a fire standpoint, whether or not there are any fire hazards. We just have to keep on plugging along at this thing, doing an educational job 24 hours a day, in order to see if we can't get results.

I read a little story the other day that nicely illustrates the point. A little youngster had an errand to do, and he lived on a farm some distance outside of town. It was evening and quite dark, so the father said to the boy, whom he was sending on an errand into town, "Take this old lantern along with you to light your way." "But it won't shine all the way into town," said the youngster. "No, that's true," said his dad, "but it will shine about three steps ahead of you. After you take those three

steps, it will shine the next three steps, and so you will light your way all the way into town."

Well, that's what I think we are going to have to do in our home safety program: keep working at it . . . take three steps at a time . . . and we are sure to see the light ahead of us for the next three steps.

CHAIRMAN HARVEY: Mr. Bungenstock, have you been able to evaluate the results of the work that you have done in this field in any way?

MR. BUNGENSTOCK: Yes, we have, to this extent: We are noticing a very definite drop in off-the-job accidents since we have been hammering away at this thing. It has been coming down very gradually.

There was a question raised a short while ago which, while it does not deal with home accidents, is closely allied to it, and that is the question of skiing accidents. In the winter time in New Jersey we have a lot of folks who like to ice skate, and we get quite a few broken arms or legs on the part of fellows who fall on the ice, men who haven't been on skates for the last 20 or 30 years and who suddenly become quite youthful. I think very definitely that we have to teach people to limit their activities to their age.

Now I don't want to detract from the enjoyment you may get from indulging in certain sports, but I think you are going to have to know when you can do certain things and when you can't do them. For instance, I can't go out and play football any more, although I used to do so. You see, I'm getting too old. In the same way you have to temper your activities, whether it be in the field of sports or in any other field, to your age.

MR. DUFFEE: What local agencies can you use to help you promote this home inspection plan?

MR. BUNGENSTOCK: I mentioned the fire department for your home inspections on fire hazards. I also mentioned the school children. I have spoken to a number of P.T.A. groups on this question of home safety and sometimes I get a few comebacks. In two particular instances, for example, after suggesting this idea of getting a representative of the fire department to come out to your home and look things over, I have found that the men from the fire department were nearly run ragged

trying to make these home inspections. They didn't think so much of that suggestion of mine. However, I still believe that it works out all right. Your women's clubs can also do a lot along this line. Get out and talk to them and tell them about these things. And if we get them all prodding each other, the mother against the dad and the children against both parents, we will really get somewhere.

CHAIRMAN HARVEY: We will pass on to our next topic which has to do with cooperation with public officials. Two members of our panel are going to discuss that subject, one a city official himself, the other a citizen who takes a keen interest in civic affairs.

I shall first call upon Mrs. James Sime. She is the Past State Chairman of the American Home Department of the Illinois Federation of Women's Clubs.

Cooperation with Public Officials

MRS. JAMES E. SIME: I am sorry that we haven't more women in the audience, because I feel that the women's clubs and the Illinois Congress of Parents and Teachers and all other state organizations of women's clubs have tried to carry on this program of home safety, pedestrian safety and now off-duty safety.

The General Federation of Women's Clubs, including those of the 48 states and the Illinois Federation of Women's Clubs, have cooperated together very closely in the same kind of a program to promote public welfare. The women's clubs are urging their members to be advised on the official traffic surveys in the community and the efforts that are being made for the prevention of accidents; to sponsor school safety contests; to organize junior safety councils; to support vehicle inspection campaigns, safe drivers' schools, uniform and sound traffic laws, courses in sportsman-like driving in high schools and safety teaching in elementary schools; to encourage the placing of suitable markers on thoroughfares for institutions and recreational centers; to study the following subjects pertaining to the seven-point highway safety program: (1) legislation; (2) motor vehicle administration; (3) enforcement; (4) engineering; (5) education; (6) training personnel; and (7) research.

It is only by concerted action that anything definite can be accomplished. The difficult task is to arouse the public to the gravity of the situation.

On Monday afternoon, when I was in the Traffic Engineers' Conference, I was quite surprised to hear Sidney Williams say, "Traffic accidents should concern us more than sabotage or fifth columnists." That statement is something for us to think about.

In my opinion the "Off-The-Job" Safety Committee should include representative women who are interested, and especially some of your women employed in your plants, for I'm sure that they will help wholeheartedly in trying to make their communities a safer place in which to live.

After you have organized and learned the real causes, eliminate the causes. We have heard that said so many times, but I don't believe that we can have it brought to our attention often enough. Don't have a safety campaign once a year or once a week or once a day. Drive hard day after day, month after month, year after year. To select outstanding people for a Safety Committee, choose one who desires to be of real service, who has imagination and the courage to do the right thing.

While I was walking down Michigan Boulevard this morning I saw a good many delegates to this convention (I could tell them by their badges), men who are supposed to be tops in safety work, walking across the street against the red light. Just think that over for a while.

I have a friend here in Chicago who said to me, "Hildegard, do you ever walk against a red light?" I said, "No, I don't, because I don't know what would happen to me if anything came along and struck me." To which she replied, "Well, I guess I'll walk right alongside of you all the time and then perhaps I'll be able to get across the street too."

CHAIRMAN HARVEY: Before calling for any questions on what Mrs. Sime has had to say, I am first going to introduce to you Mr. Leslie Sorenson, City Traffic Engineer of the City of Chicago.

L. J. SORENSON: You heard Mr. Durfee speak of the interest of industry in off-the-job accidents. Well, that subject could be elaborated on and we could go along for hours telling you about the value, not only

from a selfish standpoint but from a civic standpoint, of the prevention of off-the-job accidents. We could tell you of the relationship of the employee to his plant in respect to off-the-job accidents. It costs money for off-the-job accidents the same as it costs money for on-the-job accidents, and that money is passed on into the product and into the wages which the workmen receive, so that everybody has to take his share of that unnecessary overhead cost. However, I am not going to dwell upon that; I am going to talk to you about the other side, the public officials' interest in off-the-job accidents.

Viewpoint of Public Officials

Now we all think of public officials as individuals who are situated by office to regulate to some extent the acts and habits of men and women upon public thoroughfares. Have you ever stopped to think that the construction of your home was regulated by public officials, to see to it that the walls stood up and that the roof didn't cave in on you?—that the water connections were made in such a manner that you would have no contamination in your water supply?—that the sewage was inspected and so regulated that you had sanitation within your home?—that the wiring which went into your home had to meet certain specifications so that there would be no fire hazards?—that when you went to the theatre or into your office building the elevators on which you rode were built along certain lines and according to certain specifications so that the lifts wouldn't drop and kill any of the passengers? I could go on and on in that vein. Public officials have been into your homes, they have been into your factories and they have been on your streets, all because of this matter of safety. And I believe that public officials should likewise be concerned with off-the-job accidents; they should be concerned in the safety of a citizen whether he is at work, whether he is in his home, or whether he is walking along those public thoroughfares which are regulated by government.

I think that government's responsibility can never stop in the safeguarding of life and limb for all the 24 hours of the day. I am surprised at a lot of fine safety engineers in industrial management who seem

only concerned with traffic conditions just adjacent to their plants. In all my 26 years of work in my present position, during which I have perhaps received 25,000 or 30,000 letters and suggestions and complaints and criticisms, I have yet to receive more than a half-dozen communications from some industrial plant management wherein they show that they are concerned with safety on the public highways remote from their particular plant; and in most of those instances these men have been connected with the safety movement. We have plenty of them from the Western Electric Company which is located right here at our city limits, and those requests and complaints and suggestions come in from all parts of our city, because those men have been connected with safety organizations, because they live and breathe safety, because they are interested in safety not only from the plant management's angle of accidents within and adjacent to their plant, but they have the full and true picture of safety.

The gentleman from Stevens Point a short while ago spoke about the storing of cars by the management of industrial plants, and while he was doing so I could not help but think that my experience has been a sad one with that sort of thing. Not because the principle isn't right, not because it isn't perfectly proper for management to provide the convenience for their employees of off-the-street storage; but the point is that generally they locate those parking lots right across the street from the plant, which is located on some busy thoroughfare, so that hundreds of automobiles are passing by while the workmen try to cross over in order to get to work. Some thought should be given to that subject of off-the-street storage by safeguarding the man when he gets out of his car after parking it and walks over to the plant entrance.

I don't believe that we can approach this problem of safety, whether it be on the job, off the job, in the home or on the street, unless every one of us has a full knowledge of the meaning of the word safety. I am going to give you just one illustration of a good example of safety, although there are hundreds of others throughout our country which I might mention.

Dallas, Texas—unless there has been an accident in that city within the last 24 hours—has just passed its 130th day without a motor vehicle fatality. That is a long

time to go without a fatal accident. If I were a statistician, perhaps I could tell you just how many man-hours were saved for a city the size of Dallas. Well, a short time ago, after they had established a wonderful record, an old colored fellow was injured about two o'clock in the morning on one of the streets of Dallas. Ordinarily this poor old colored man would have been hustled off to some state institution as soon as the ambulance got to where his body lay and the usual procedure would have been followed. But at three o'clock in the morning that colored man was lying on a cot in a hospital with the finest brain specialist in the State of Texas and five other doctors gathered around him . . . there were three squad cars of police officers outside . . . the Mayor was phoning every once in a while from his home . . . citizens who had heard about the mishap were calling up continuously.

Everybody was anxious and worried about that man. Citizens were calling the press, calling the telephone operators, to see if they could obtain any news or information concerning the welfare of this colored man. A little child was injured a few days later and the same interest was exhibited. One hundred and thirty days without a fatal automobile accident! The motor bus company and the City Transit Company fleet operators are jittery as to what would happen to them if the first fatality in Dallas was caused by one of their men after such a long safety record.

That is safety—that is cooperation. It hasn't been left in the hands of the public officials to do the job; it hasn't been left to the plant management to do the job; nor has it been left to the mother in the home to do the job; but everyone in the city of Dallas has assumed the responsibility of this task because each one understands what safety means. And when we have that sort of a cooperative spirit among all of us, we are going to have home safety, we are going to have public safety, and we are going to have industrial safety.

CHAIRMAN HARVEY: Are there any questions anybody would like to ask of either Mrs. Sime or Mr. Sorenson?

MR. BALENSIEFER: I would like to ask Mrs. Sime a question. She said something about this matter of walking against traffic lights. Do you think, Mrs. Sime, that

those violators should be given tickets just as though they were traffic violators?

MRS. SIME: I think we should carry on a program of education and remind these jaywalkers that we are going to issue tickets for violation of this jaywalking—I mean, we will educate them for a certain number of weeks and then issue these tickets to them and see what we can do about it. And if we will eliminate jaywalking, I believe we will reduce accidents 33½ per cent. Don't you think that is right, Mr. Sorenson?

MR. SORENSON: Yes.

MR. DUREE: Mrs. Sime, because of your keen observation as to what you witnessed on Michigan Boulevard this morning, I have an old barnacle for you to answer: Can you tell me whether, in your opinion, women are worse drivers than men?

MRS. SIME: Well, let me tell you this: Husbands say yes. But the policeman says no. And then the cops will say that they will never stop a speeding woman driver because when they do, she begins to talk, and they get enough of that sort of thing at home.

MR. SORENSON: Mr. Chairman, I think I could amplify that a little. Of those people killed in the United States last year as a result of auto accidents, 78 per cent of them were male and 22 per cent of them were female.

MR. STUBBS: Does that mean, Mr. Sorenson, that the women killed more men than the men killed women?

MR. SORENSON: No, I believe I can agree with Mrs. Sime: that the ladies are better drivers according to my experience and observation; and I will say this, too, that they are just about 75 per cent better walkers.

CHAIRMAN HARVEY: I should like to say that in the field of highway safety, we have gone far in the last few years, we have made many advances; and I think that a great deal of responsibility is being assumed by the regularly constituted authorities. I believe that in every community these officials should be encouraged in their work, because oftentimes they may need encouragement. I am thinking not so much of the traffic engineer as I am of the enforcement authorities, who need the weight of public opinion behind them, and it should

be up to every civic organization to aid in creating that public opinion.

W. A. JORDAN (American Rolling Mill Co., Ashland, Ky.): Mr. Bolt, in a city of about 35,000 population, what agency of the county should one contact with regard to organizing a city safety council and obtaining their help in getting that city safety council to affiliate itself with the National Safety Council?

MR. BOLT: I'm sure the best information would be secured from a representative of the National Safety Council, who will tell you the specific division to which you should write, explaining your problem; and I have no doubt that they will give you plenty of assistance and plenty of literature informing you as to the best method of procedure to follow. You might do that before you leave this convention.

CHAIRMAN HARVEY: You might get in touch with Paul Stricker. He just lives and breathes this thing.

MEMBER: We have been here for three days and we have remarked several times about the control, both of the pedestrians and automobiles, which is to be noted in this vicinity. I would like to ask Mr. Sorenson if it is all based on police or public control, or if he gets the cooperation of all the traction companies, taxi companies and citizens in general?

MR. SORENSON: We are very fortunate here in having the complete cooperation of the transportation agencies, the cab companies and the fleet operators. About the only place where cooperation is lacking somewhat is on the part of Mr. John Citizen, who doesn't do it intentionally, however. He doesn't mean not to offer cooperation, but he is so busy these days, with so many thoughts of other matters on his mind, such things as politics, war and what not, that he becomes careless and forgets to do the right thing. There is no such thing as lack of cooperation in this city. That is one of the reasons we have been able to do many of the things which we have done.

CHAIRMAN HARVEY: My friends, we will bring our session to a close. On behalf of the National Safety Council and on behalf of the members of the panel here this morning, I want to thank you very much for your attendance.

Plant Transportation

TUESDAY MORNING SESSION

October 8, 1940

The session on plant transportation problems was called to order by the Chairman, R. L. Leffler, Chief of Safety Division, Carnegie-Illinois Steel Corporation, Pittsburgh, Pa., who presided. Chairman Leffler

briefly commented upon transportation as one of the chief sources of accidents in some types of plants, and a cause of many injuries in all industries. He then introduced the first speaker.

Industrial Hand Trucks—Their Safe Construction and Use

By C. S. ZIOLKOWSKI

Manager, Insurance Department, Montgomery Ward & Co., Chicago

To most of us, the sight of a man pushing a hand truck along an aisle does not bring any immediate impression of a dangerous operation, such as would the sight of men handling molten metal in a steel mill or blasting in a mine.

Of course, actually the use of the hand truck does not involve the potential hazards of the steel mill or mining jobs. But it is because we so often take the relative safety of the hand truck operation too much for granted, that the number and severity of the accidents resulting from it are far above what they should and would be if we gave the problem the study and effort it deserves.

I have been unable to find any national statistics showing the frequency or severity of accidents resulting from the operation of hand trucks. This very lack of accurate statistics often contributes to our feeling that no serious safety problem is involved. However, I know from experience that, in addition to numerous temporary disabilities, unnecessary deaths and permanent disabilities have resulted from the unsafe operation of hand trucks.

From hand truck accident records available in some states and industries, we can conservatively assume that where large hand trucking operations are involved, an average of about 10 per cent of all employee accidents are hand truck accidents. We also know that in one case where real accident prevention effort was applied to the prob-

lem, only 1 per cent of all employee accidents were hand truck accidents.

Because of the varying sizes of hand trucking operations, my suggestions here must be of a general nature. Much of the information is known to some of you and others with very extensive trucking operations have probably dealt with the problem in much greater detail. However, it will prove helpful to all of us to review and discuss what some organizations have done toward safer use of hand trucks.

In its practical sequence, we shall first look into the structural aspect of the problem. The first decision to be made relates to the design of the truck. Pre-fabricated trucks adaptable to most needs are available and a careful selection should be made of those best suited for the type of material to be handled. If the ready-made trucks cannot handle the job safely (which also means that they probably won't do the job economically) a truck designed to fit your special needs should be developed.

You will find the manufacturers of hand trucks glad to lend you their specialized facilities in the solution of your problem. The time spent on its development and the higher original cost of such a specially designed truck will in the long run repay you in decreased cost of accidents and other operating economies. Once the general design of the truck is selected, we should then look into the structural qualities which will

give it the longest possible "trouble free" life.

First, of course, is adequate strength of its frame, axles, and wheels to carry the intended maximum load safely. Consideration should next be given to the materials of which its body is to be constructed—this to be determined by the operating conditions to which the truck will be exposed—acids, fumes, moisture, heat, cold, etc. and the kind of materials to be transported.

The axles and wheel bearings are very important items. The load which will have to be pushed on the truck will be heavy enough without adding to it unnecessary frictional resistance because of poor bearings. The slightly higher original cost will be more than offset by lower maintenance cost, increased safety and general efficiency in doing the job.

The same is true of wheels—and particularly the traction surfaces. The width of this surface and material of which it is made should be chosen only after giving full consideration to the floor surface on which it will be used. A wheel surface which is too hard on the floor surface will necessitate frequent floor repairs. Unfortunately, between such repairs, the pits and holes present a serious hazard to the trucker. In some cases where wood floors are used, rubber-tired wheels are advisable. Between the two evils of wear on the truck wheels or wear of the floor, I would choose the former because it is usually more easily and more permanently corrected.

Other points which frequently apply are the handles on four-wheel trucks—which should be counterweighted or provision made to hook them in an upright position in order to eliminate the stumbling hazard when handles are dropped to the floor. The two-wheel trucks should be provided with knuckle guards on the handles to prevent injuries to hands as a result of striking them against columns, door jambs, or other objects. Wheel brakes on two-wheel trucks will decrease the hazard when loading and unloading them. Four-wheel trucks, particularly those with solid side enclosures, if painted with a color sharply contrasting with the general color scheme of areas in which they are used, will eliminate or at least minimize collision accidents resulting from some employees' failure to see the truck when enough

To assure yourself of starting out with the safest new equipment, it is of course essential that you have your purchasing agent's close cooperation. After getting safe trucks, you should put into effect a plan of maintenance which will keep this equipment in safe condition. Although you will require the truck operators to check daily and report to you any dangerous defects, the most effective control of maintenance will result from a regular thorough check-up by experienced maintenance men. For this purpose it is advisable to number each truck and keep a maintenance record of it.

This will give you and your purchasing agent accurate information as to the current condition, over-all performance and maintenance cost of each unit. This regular check-up by your maintenance man should be a thorough one—everything from soundness of frame to missing cotter pins which were replaced by nails. The most frequent points needing attention will be wobbly or damaged wheels, cracked handles, grease or oil in wheel bearings, replacing nails with cotter pins. Defective trucks should be taken out of service until repaired.

If you provide safe hand trucks and maintain them in safe condition, your effort and investment will still return only partial results if you do not provide safe trucking surfaces and safe areas in which this equipment is used. Trucking floors should not be slippery or rough; they should be free from holes, ruts, or bumps; they should be clean and clear of obstructions; trucking aisles should be wide enough to permit trucks to pass one another without crowding. Whenever possible skids or trucking plates (particularly those used between loading dock and freight car) should be provided with permanent stops to prevent their slipping and falling between dock and car. Doors in trucking aisles should be provided with glass panels; trucking aisles should have adequate overhead lighting; the danger of "blind" corners can be reduced by warning signs or mirrors. Provide regular storage space for trucks to avoid any excuse for their being left in aisles and creating a stumbling hazard.

We are now ready to consider the most important part of our problem—the truck operator. The value of the safe equipment and floors mentioned so far is very small if the operator of the truck does not use it safely.

The first step is the selection of the employee for the job. If the major part of his work is to be trucking, he should measure up to the physical and mental requirements of the job. He should then be instructed and trained in the safe way of doing the job. The following are a few of the most general safe practice requirements which should be observed by truck operators: Never overload truck. Load material securely so that it cannot fall off. Don't load too high. On two-wheel trucks, balance the load over the wheels. Push truck, do not pull it. Do not push truck too fast. Use truck whenever possible instead of carrying heavy weight materials to avoid hernia or back strain. Do not permit any one to ride on truck. Wear safety shoes. Check truck each morning and report defects to foreman. Give warning when approaching "blind corners."

You will have additional rules which will apply to your specific operations. After the operator's original training and instructions, the foreman, who should of course be thoroughly acquainted with all of the safety rules, must carry on with the education during his daily contact with the trucker.

This training and education of the employee is a continuous problem. The complete cooperation of the foreman is of

course essential. In some organizations where trucking is done only as a part-time job of many employees, it will be possible to improve the safety and efficiency of the hand truck operations by combining all trucking work into a separate department. This department would be a full time trucking unit and would do the necessary trucking for the entire plant.

I have commented on the lack of hand truck accident statistics. To more effectively guide your efforts, you should keep complete and accurate records of the frequency, severity, and causes of accidents resulting from your hand truck operations. A frequent study and analysis of such records will point out to you where your accident prevention plan needs adjustment, addition, or greater emphasis.

To attain the desired results, the suggestions made here on the safe construction and use of hand trucks must be part of a sound company safety program, affecting all phases of the plant's operations—a program which has the sincere backing of the top management and which is administered by someone whose job it is to see that it is functioning effectively. Within such an atmosphere of "safety," the application of these suggestions for the elimination of hand truck accidents will succeed.

Electrical Hazards of Overhead Traveling Cranes

By VICTOR E. SCHLOSSBERG

Assistant Superintendent Electrical & Power Departments Inland Steel Co., East Chicago, Ind.

I consider boarding and leaving a crane the greatest hazard of the crane.

The first thing any authorized person should do who wants to board a crane is to attract the attention of the crane operator. Please note, I said "authorized person." Persons not authorized, or whose duties do not require them to go on cranes, should keep off them.

When the crane operator has been notified the person should proceed to the landing platform and wait for the crane to arrive. All landing platforms should be so located that a man may stand on them without danger of injury. When the crane arrives, the crane operator should push his protective panel

stop button, pull his main cab knife switch and come out of the cab so the man desiring to get on the crane can see him. The crane operator should also watch for approaching cranes. The man desiring to board the crane may now do so safely and once he is on board, the crane operator should keep him in sight at all times.

To leave the crane the same general procedure should be followed.

Now let us assume the crane is broken down in the middle of the runway. If no other cranes are on the runway, and the runway is walkable, then it is necessary to give the repairman permission to walk the runway. Of course, if there is another crane

on the runway the repairman boards the second crane in the approved manner, has the crane move the crane alongside the one that is down, push his protective panel stop button, pull out his main cab knife switch and come out of the cab to watch the repairman safely board the crane that is down.

The above procedure is one which is difficult to enforce, but once the men get the habit a serious potential hazard, which may cause a fatality, is eliminated.

Now let us consider another hazard, the proper connection of lifting magnets on overhead traveling cranes.

The magnet should have its own fused safety switch in the cab which the crane operator can readily pull out when the magnet is being connected, disconnected or the magnet cable is being repaired. Where in the system should this switch be connected? Let's begin with what we have in the cab.

Present practice is to provide a main cab knife switch in each crane cab and the stop and start pushbutton for the crane protective panel. If it is not too large the crane protective panel itself is included.

Lately there has been a tendency to eliminate these features but those who favor this have been unable to answer such questions as:

(1) What would you do if a controller jams?

(2) What would you do in case of grounds, shorts, or other failures which allow the motor to run after the controller has been centered?

(3) What would you do when making a combined trolley and hoist motion when a single unit kicks out by overload?

There are similar problems, however, these are enough to warrant keeping the main cab switch, as well as the protective panel, with its stop-start pushbutton in the cab.

Where is the best place to connect the magnet? If it is installed in the circuit after the protective panel, every time the protective panel opens the load is dropped. Hence it should be placed ahead of the protective panel and after the main cab switch. This allows the retention of the load when the protective panel operates and it insures the magnet being disconnected from the line when the crane leaves the crane. Some would

have it installed ahead of the main cab switch. Here we have the problem of not being certain that the magnet is disconnected from the line when the crane leaves the cab.

While on the subject of switches we should consider the heater and light switches which have long been a bone of contention. Present practice is to connect them ahead of the main cab switch and to remove all combustible material from the crane cab.

It is also safe practice to provide a main switch right off the connections from the collector rails which will disconnect everything on the crane. There is one exception to this; a separate extension light connection ahead of the switch may be permitted. All men should be instructed never to go on the top of any crane without first locking out this main disconnect switch.

We have spoken of the removal of all combustible material from the crane cab. This is a definite hazard and requires constant effort on both the production and maintenance departments. Bridge walkways must also be kept clean and free from grease and oils.

Another hazard is escape ropes. Escape ropes might be necessary in some locations. If possible, these locations should be altered so escape ropes are no longer necessary. They also present a problem in deterioration as well as in teaching men how and when to use them.

Let us discuss the proper method for protecting a crane undergoing major repairs where there is more than one crane on the runway. There is only one safe method. In addition to warning the crane operator bumpers should be placed on each side of the crane on each rail. Signs should also be placed in each adjacent crane cab reading, "Bumpers on Track." Also, "Danger, Men Working Above," signs should be properly placed.

This method works very well if there is not more than a single shift involved. If the job requires more time than the usual shift someone should see to it that all crane operators coming on duty are personally instructed that bumpers are on track. Some engineers insist on a red light on the bumpers. Experience indicates that this will not replace notifying crane operator.

Where should bumpers be stored? Some insist that a set be kept on every crane,

while others put them in charge of the repair gang. A new idea is to provide a box at the top of every runway staircase with four bumpers in it. The bumpers are taken out of the box on the way to the job and are replaced after the job.

Some prefer torpedoes ahead of bumpers. Others believe: (1) when they go off they shock a man and may cause him to lose his balance, (2) that after going off they are not replaced, and (3) to be effective bumper settings must be closer or torpedo settings wider. This might require too much space.

Building Clearance. New buildings should be constructed so a man can ride the bridge with room to spare. On certain cranes, like pit cranes, he should be able to ride the trolley without danger of injury. Places to watch clearance are the gusset plates and on the sides of the roof truss. On new buildings designers should make certain that crane height is such that the hoist limit switch need not be locked in order to service any unit in the building. Wherever possible clearance should be provided between the building columns and the crane trucks. Care should also be taken, where the trolley comes alongside the cab, that there are not collector staffs hanging down, or that the cables do not come so close to the cab that they endanger the crane operator.

One praiseworthy development is the practice of slanting the front of the cab and installing full length glass. This gives better visibility and keeps the crane operator entirely inside the cab. Standardizing controller positions has also been a big factor in eliminating accidents.

A definite hazard to electrical men is servicing the main collector shoes. When cranes were first built the collector shoes might have been installed above the crane where it was necessary to run the trolley in and stand on it to service them, or the shoes might have been below the crane where a man had to hang like a monkey to service them. Present day construction places the collector shoes in accessible locations where they are below the crane trap doors that are put in the bridge walkway through which a man can drop to a caged platform.

When the crane is outside and its hot rails are subjected to ice, two sets of collector shoes should be provided. This is to prevent accidents due to the loss of power.

Trouble shooting on cranes always will be

a hazard. This is trying out machinery, when it is not working properly, to locate the trouble. This is being overcome by teaching men to recognize faults when the equipment is down, and use the trial method only as a last resort.

Centering devices on controllers are installed for the benefit of operating men. Years ago the electrical man regarded the centering devices as his protection and as fast as they were installed the operating man would make them inoperative. But when the electrician took the attitude that the centering device was installed for the benefit of the operator and left them inoperative if the crane operator objected, the objections ceased. If at any time a centering device is taken off any unit the operating man should be held responsible, not the electrical man. All the operating man has to do is to blow for the electrician and repairs will be made.

When a good substantial crane safety limit stop was developed the steel mill electrician was happy. However, they have boomeranged like everything else that promises too much. The crane operator began overworking them, using them as a normal stop on short clearance hoists. It must be expected that even with the best of care there would be some failures, hence, failures will surely occur when the chance is multiplied by increasing operation from approximately six times a day to 240 times a day. The occasional failure of the safety limit stop leads some to the belief that they should be eliminated and that the crane operator should be held responsible for running blocks. The best course is to continue their use and to train crane operators not to use them as a stop for every lift.

A hazard that is present not only on cranes but all electrical apparatus is that of flashes which cause eye injuries and burns. On some automatic controls the moving armature sometimes jams on the arc shield. The electrician in making repairs raises the arc shields and stands in front of the board to see if the contactors work. This is a dangerous practice and should not be tolerated.

Some maintenance men recondition the commutators of their motors while on the crane. This is an unnecessary hazard. Any commutator that needs conditioning should be sent to the shop.

Another common electrical hazard is exposed controllers in crane cabs. All master controllers should be completely covered. All manual controllers should be covered, or, be so located that when the crane operator leans against them he cannot touch any live parts.

On modern cranes all electrical controls should be placed in dust proof cabinets, so located that the electrician can watch their operation without placing himself in a hazardous location or interfering with the crane operator's duties.

A hot weather crane hazard is buckling of the main runway collector rails. Buckling is not caused directly from heat but only comes after rail creepage has moved all the rails against each other in one location. The best way to eliminate this is to anchor the rail at predetermined places on the runway. Provisions should also be made at suitable points with strain insulators to prevent the rail from leaving the supporting brackets.

There should be a separate switch conveniently located on the floor for feeding each runway and if the runway is long it should be sectionalized so a section can be de-energized.

If the main runway feed is trolley wire instead of rails the floor switch should be a fused type. The trolley wire should be moved back and forth frequently to prevent it from wearing through where it rests on the support spools.

Brakes. In some places crane brakes are repaired by mechanical men, in others by electrical men and still others by crane repairmen. All repairmen should be frequently cautioned not to try to make brake adjustments with a suspended load. They should also be cautioned not to release the brake preparatory to changing the hoist motor without properly blocking the gearing.

The Travel Brake. Most crane operators stop their cranes by plugging the motor and for normal purposes a crane would not need any travel brake. However, there is always the sudden emergency that makes a brake necessary. The hydraulic brake fits the problem best for stationary cab cranes. The crane operator should be encouraged to use the brake instead of plugging.

The traveling cab crane presents another problem which is best answered by dynamic braking. This can be supplied for power failure only. It also can be controlled

through the master controller and used for every stop, or, it can be controlled by means of a separate foot control. It will not completely stop the crane but it will considerably reduce its speed.

Stiff leg cranes, such as pit cranes and strippers, are always provided with a slip gear so their trolleys cannot lift off the runway. However, even with this feature the trolley is subjected to shock which may knock trolley slides off collector bars. This annoyance can be eliminated by the use of trolley wires.

All wiring should be in rigid conduit. Where wiring runways are used care should be taken where the wire enters the runway to avoid grounding. Where wires leave the back of the control board care should be taken to see that they are mounted on insulated brackets. Codes should be rigidly followed. If the main feed on the crane is so small that the power house circuit breaker does not protect it against fusing, then the main crane switch should be fused.

Overload circuit breakers should be set high enough to protect motors against flashovers and wiring against fusing. For D. C. cranes with mill type motors, the setting is usually 300 per cent of the hour rating. This also protects the crane mechanically.

Clothing. No man should be allowed on a crane at any time with loose clothing. Short overcoats should be kept buttoned at all times and tool belts worn on outside. Overcoat belts should not be worn. Long overcoats should not be worn.

Lighting. Crane lighting should be arranged so lamp changing is easy. Lamps should never be changed with the crane in motion or with the power on. The best method of mounting crane lights is under a hinged and guarded section of the bridge walkway.

Drums. Magnet drums should also be located so that the electrician can safely service them. On many cranes we have installed small caged platforms between the girders at the end of the crane the magnet drum faces. The electrician has the trolley racked over to that end and services the magnet drum from the platform.

Trolley Shoes. Always lockout the main top switch before changing trolley shoes. Always check to see that new shoes will not strike a bracket and never try to hold more

than one shoe at a time. Always keep one hand free.

All motors and other parts that require changing should have hand holes so it will not be necessary to get underneath the trolley to remove the bolts. In rare cases units, like limit switches, may be fastened with tap bolts.

Motors. In changing motors make sure danger signs are in place and bumpers are on tracks. Rigging should be adequate, and pinions, brakewheels and other parts should be secure. The repairmen should wear hats and take particular care to avoid burns.

Grounding. Exposed non-current carrying metallic parts of all electrical apparatus should be properly grounded. Grounding wires should be ample in size.

Miscellaneous Suggestions. Blocking of faulty electrical contactors should not be al-

lowed. Blocking of overloads, overloading of fuses, over-tightening slip gears and overloading of cranes should never be permitted.

The tonnage capacity of each crane should be plainly marked on the crane for each hook so it can be read from the ground and no one but the superintendent or his immediate assistants should be authorized to make heavier lifts.

Electrical heaters should be located and guarded so they cannot start fires or cause burns. Our preference is for the space heater type where the conductor is completely covered. This type should also be protected by a guard.

As a last, but important, suggestion I believe that rules regarding crane operation should be posted in the crane cab. Also, the crane operator should be continuously checked to make certain they know and obey them.

Industrial Power Trucks—Their Safe Use and Operation

By C. E. WOOLIEVER

Assistant Personnel Director, Buick Motor Division, General Motors Corp., Flint, Mich.

Safety begins with design in the power truck field. The designer should always provide a generous factor of safety from the standpoint of the human being expected to operate the truck and also from the standpoint of the work which the truck is expected to do. When a designer fails to take into consideration these safety functions of his product he is not only displaying his own inability, but also giving his company a bad reputation as a business firm.

I believe that much good would result from a comprehensive study, conducted jointly by truck manufacturers and truck users, for the purpose of agreeing upon and setting up certain obviously needed standardizations. Automobiles are highly standardized in regard to the gadgets you must operate to make them run, but at the same time they retain their "make" identities in a highly competitive market. Power trucks can do the same.

The lack of truck control standardization contributes much to accident rates and increases cost of operation through damaged equipment and slowed down efficiency of

operators who must change trucks often. Large users of trucks in some cases have been forced to restrict their purchases to a very few makes of trucks in order to establish any semblance of standardization in their plants—a fact which tends to eliminate wholesome competition among power truck builders.

We have in daily operation in our plants nearly 200 power trucks. For the last four years our lost time accidents involving power trucks have been as follows:

Year	Accidents	Days Lost
1937	10	141
1938	3	50
1939	2	54
1940	None	None

Here are a few of the standards required in new trucks we buy.

Riding Position. In normal operation the operator should be facing in the direction of travel with the platform ahead. The position of the operator should be such as to allow him to see the end of the platform in lowered position. This permits him to spot his truck accurately when picking up

a skid or coupling to a trailer. Many accidents have been caused by the driver not being able to spot the platform under the skid. The operator in riding position on the truck should be well guarded to prevent injury to himself in case the truck should be accidentally backed into any obstruction. This guard should be high enough in back to give ample protection, and low enough on sides to allow the operator to quickly abandon the truck in emergencies, such as sliding off a dock or down an elevator shaft. In certain operations, where high lift trucks are used in stacking materials, it may be advisable to use some method of overhead guard rail to prevent injury to operator from falling material. In trucks used for transporting small dies, platforms should be arranged so dowel pins can be placed to prevent dies from sliding off platforms while in transit. Rubber pedal pads should be provided for the comfort of the operator. A back rest that is adjustable and comfortable might be designed along the lines that are furnished on some of the older models of rear control fork trucks.

Visibility. Visibility should be as good as possible. Some accidents are the result of the operator not being able to see clearly where he is going, especially in narrow aisles and in other places where accurate spotting is necessary. In the new type center-control fork and ram trucks much improvement has been made, but there are still some types that can be improved by new design.

Controls. The subject of controls is always a popular one. We think the two pedal system is the safer. This compels the operator to be standing in operating position before the truck can be moved. Both pedals must be depressed before any traction movement is possible. Speeds can be controlled by foot or a combination of foot and hand control. In the combination control we prefer the first speed only to be foot operated and the remaining speeds to be hand control with a return to neutral each time the brake is applied. This compels the operator to start on the first point of the control which gives a safe acceleration. It is advisable to provide a mechanical interlock to prevent reversing when in traveling position, but this does not prevent returning to neutral position at any time.

The introduction of a magnetic or mechanical circuit breaker in the circuit saves the burning of the contact fingers and seg-

ments and lessens the danger of control freezing in operating position.

The improvement in control design has not only lessened the hazard of truck operation but has resulted in cutting down the operating expense. In the older models control maintenance ran as high as \$30 per truck per year. It is advisable to locate the battery charging plug readily accessible to the operator, so that he can easily and quickly pull this plug to disconnect power from the truck in case the control should accidentally freeze in operating position.

Steering. Standardization of steering is a very important item. We think that each truck in the same plant should have the same type of steering. Some wheel steer trucks are right hand or left hand steer; either is optional with the manufacturer. If the load is always ahead of the driver and he turns the wheel to the right, the truck should turn to the right. This causes less confusion among our drivers especially when you consider that everyone knows how to drive an automobile. Steering mechanisms should be designed to give minimum shock to steering wheels, when any of the truck wheels strike a small obstruction on the floor.

Brakes. On the whole, brakes on all makes and models are quite satisfactory. Recently there has been little trouble due to brakes not being equalized, and grabbing has been almost eliminated due to improvement in linkages and quality of lining used. However, no brake is better than its state of repair and adjustment.

Any study of the failure of the mechanical element would not be complete without considering the maintenance problems of power trucks. We have found, where there is decentralized control of electric trucks, that not enough specialized attention is given to the maintenance of trucks. Maintenance becomes a rather hit and miss proposition when handled in many separate departments. Often trucks are misused, repairs are delayed too long, trucks are improperly lubricated, battery charging and servicing of power units are handled by inexperienced men. This results in high cost of operation and more accidents. With centralized control we obtain better maintenance which results in fewer breakdowns, reduced accidents, and more efficient use of the trucks.

With centralized control, trucks can be

shifted from department to department or from factory to factory to meet peak load conditions. More skilled men can be employed in a centralized location specializing on power truck equipment than can be employed in numerous locations trying to maintain a few trucks along with other responsibilities. Records can also be kept in a central location which will definitely point out weaknesses in certain parts of trucks which should be corrected, and will definitely put the finger on any continued misuse of equipment in certain working areas or by certain individuals. The volume of contacts in a central location will call attention to conditions which in scattered locations would be overlooked as possibly happening so infrequently that the difficulty would not be noticed. Other advantages of a central location are: reduced inventories of spare parts, more accurate cost statistics, and more useful performance records of individual trucks.

Further reduction in accidents from failure of the mechanical element in power trucks must come largely through improved design, better maintenance and servicing facilities and policies, and from more adequate records which enable us to definitely locate recurring mechanical failures.

The second accident cause is the failure of the human element. In the early days of power truck operation, it usually fell to the lot of one of the hand truckers in the department to be given the operation of a power truck. He was shown the controls and how they operated and then was left to his own devices to run it or wreck it according to his luck.

As the trucks became more numerous in our plants, accidents such as pinching the operator between trucks and walls or other objects, trucks falling into elevator shafts, trucks running into other employees in the aisles pinching them between stock containers and causing the truck wheels to pass over the feet of workmen, and many similar accidents were being caused in such large numbers that something had to be done about it. In our plant we were faced very directly with this situation in 1925. It was in the early part of 1926, after a survey of trucking and material handling accidents, that we set up rules for our truck operators and restricted the operation of power trucks to authorized persons.

We approached the problem by surveying the types of accidents which had been occurring, and then set up rules to govern the operation of trucks. We called into consultation the foremen from our various plants who were directly responsible for factory truck equipment and with their help agreed upon a set of rules. To be easily remembered by the average operator, these rules should be few in number and very clear and understandable.

In order to limit the operation of trucks to certain men we set up a numbered badge system. The badges were marked "electric truck operator" and were worn in plain sight by truck operators while on duty. The operators were also issued special license cards. Our procedure was to call the men together in small groups and instruct them regarding the rules, impressing upon them the responsibility of handling electric trucks in our factories. We called their attention to the type of accidents which had been occurring most frequently and outlined the remedies we proposed. Each man was also given a special medical examination to test his vision, hearing, and general ability to operate trucks. Each man's familiarity with the truck equipment he was to operate was vouched for by his foreman.

The results of this program reduced our accident rates to a figure far below that we expected to attain for several years to come. Through the following years we have continued this plan with some variations to maintain and improve on the early results.

We found there was some reluctance to wear the badge authorizing the truck driver to handle the truck; also occasionally these badges would become lost and as the numbers were stamped in the metal they could not be easily replaced. This caused us, after a few years of operation, to do away with the special badges. The original card which we gave each operator was sometimes retained after a man had been transferred from electric truck operation; and it was so large it was inconvenient for him to carry it except in a special windowed leatherette case which we furnished him. Sometimes this authorization card would become misplaced or not carried.

In the course of time a man who was physically fit when issued the card might later become unfit to operate a truck because of ill health, failing eyesight, etc.

This caused us to change our system. At present our truck operators are issued small permit cards which they may carry conveniently in billfold or card holder. This card is issued in two colors. Any employee issued an operator's permit between the months of April and October is issued a green card which carries the man's name, block number, the date the card was issued, and the signature of the physical examiner and safety inspector. Any operator who is issued a card between October and April is given a buff colored card which carries the same information. Our procedure now requires that every operator must have a permit of the right color for the period. This involves rechecking physically and a visit with the safety inspector once each six months.

The safety inspector maintains a file of all employees who have been issued permits and keeps a record of any complaints or minor accidents. Before issuance of the permit for the next six months, accidents and complaints are discussed with the operator and he is cautioned or reprimanded as occasion may require. If he has set up a good safety record he is given encouragement to maintain it. This gives the safety inspector a chance to know personally the men handling electric trucks in each plant. Very definite standard procedure is set up for the handling of new hires and transfers, so men cannot be placed on trucks without meeting the requirements in connection with the issuance of permits to handle power trucks. A copy of the rules is given each driver at the time the permit is issued.

Briefly these rules are:

1. *Qualified Operators.* Qualified operators are interpreted to mean only employees who are properly authorized to operate trucks. The operators are cautioned that throughout the time they are assigned a truck, from the time it is taken from the charging room until it is returned, they are responsible to see that no one operates the truck except themselves or another operator who carries similar authorization.

2. *Position of Loads.* Loads should always be carried in front of an operator except in the following instances: hauling trailers, backing out of narrow aisles, going down steep inclines, or when load obstructs view. We explain to the operator that it is important to acquire the habit of driving

the truck with the platform or load in front.

3. *Elevators.* Some of our worst power truck accidents have been caused in connection with elevators. Our operators are instructed to always approach and go onto an elevator with the platform ahead. With the platform ahead, should the elevator fall when the load comes on the platform, the operator always has the opportunity to step away from his truck and save himself, where otherwise he would have no chance. The operators are instructed when necessary to wait for the elevator, to stop from six to ten feet from safety gates. This is to give the operator the opportunity to steer to right or left and avoid the open shaftway. Violation of these rules is not only dangerous to himself but also endangers passengers who may be riding on the elevator. We found, after one or two experiences, that when an electric truck runs into the shaftway, in falling, it goes through the platform of the elevator as though it were made of cardboard and usually ends up in the elevator pit.

4. *Repairs.* Each operator is instructed that he is responsible for the mechanical condition of his truck while in his operation. He is instructed upon taking the truck from charging department to satisfy himself it is in good condition by trying brakes and steering. If the truck is not in proper state of repair or develops some trouble, he is instructed to return it immediately to the repair department. In other words, an alibi that the truck was not operating properly is no excuse for him should an accident occur.

5. *Signals.* We caution each driver not to use horn signal unnecessarily but to reserve its use for such times as the signal is necessary, and then to give the pedestrian the benefit of the doubt for occasionally he may run across a man who is deaf.

6. *Aisles.* We impress upon the operator that it is only the man that controls the truck who may avoid an accident and that he must be alert at all times when his truck is in motion. He is instructed to approach blind corners with caution and to use judgment in crowded aisles.

7. *Passengers.* We do not allow passengers to ride on the platform of the trucks with the exception of a helper who may be authorized by the foreman and then he must ride in such a way that he does not obstruct the view of the operator. In early

days we had to discourage maintenance crews from riding on trucks to their work. Many accidents were caused when the direction of trucks was changed without warning to the passengers, causing them to lose their balance and fall from platform of the truck.

8. *General.* We tell the operators that they are driving a truck which weighs more than the average automobile and is a very powerful piece of equipment. They are driving this piece of equipment under traffic conditions which are much more serious than we find on public streets and highways. There are no particular rules for the employees who walk in the factory aisles

and they must maneuver their trucks in such manner as to not injure fellow employees or damage machines and equipment. They must be alert for the safety of others throughout their working areas. We caution them to be courteous and watch the path of travel of their trucks at all times when it is in motion. They are cautioned not to overload their trucks and to familiarize themselves with the load capacity of the elevators and floors in their working areas. If there are any special hazards, additional instructions are given to cover these. Lastly we caution them to report any minor accidents, to either equipment or men, immediately to their foreman.

ADJOURNMENT

Psychology and Safety

(Early Morning Classes)

The four Early Morning Classes at the 29th National Safety Congress and Exposition, held in Chicago, October 7-11, 1940, were arranged to discuss the many human shortcomings and failures in the field of Psychology and Safety which every executive, safety man and supervisor meets with continually in his efforts to prevent accidents.

The lectures were delivered in the Grand Ballroom of The Stevens Hotel, before two thousand or more delegates and guests, on each of four successive mornings, Tuesday to Friday inclusive, by Dr. Harold S. Hulbert, M.D., F.A.P.A., of Chicago.

Dr. Hulbert is well known as a psychiatrist, writer and lecturer, and has appeared

many times in the past years before members of the National Safety Council and at the National Safety Congresses. In 1931 he delivered a series of lectures before Psychology Classes of the Congress similar to those of this Congress, his subject being "Healthy Thinking versus Accident Risk." Again, in 1933, he conducted the Early Morning Classes at the Congress, his subject being "Mental Training for Safety."

Dr. Hulbert was introduced by W. H. Cameron, Managing Director of the National Safety Council. His four lectures, which have had his personal editorial revision for these Congress Transactions, are presented below in full.

Mental Mistakes Which Cause Factual Accidents

Lecturer—HAROLD S. HULBERT, M.D., F.A.P.A.

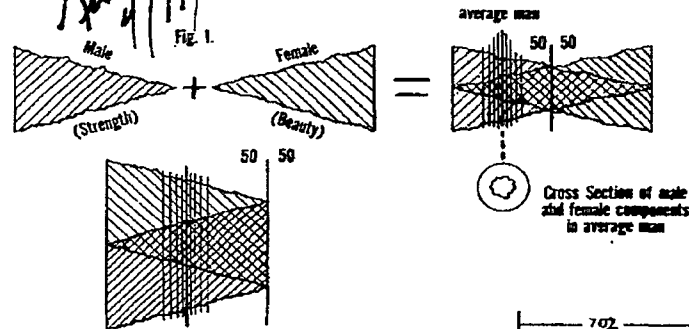
Chicago, Illinois

LECTURE I

Mental Health—Its Foundations and Its Termites

When we deal with an individual, we must realize that he has a certain constitution. I think you all have in your hands the mimeographed copies of some diagrams which I asked to have prepared for you, because I cannot draw very well on my blackboard here. (See Pages 2-6.)

In Figure 1 you will see that in every person there are two integrating triangles—there are some male and some female characteristics, the male characteristics showing personality strength, and the female showing personality beauty and aesthetics. The average man is part way between, 50-50, where



the two triangles exactly overlap, at the extreme left as you look at the drawing; below is a cross section of the average person where, if the outer circle is the masculine entity, then the inner irregular figure is the female components in him.

I mention this to show you that in everyone you should not be surprised to find certain strengths and certain, shall I say, softness, gentleness, tenderness, etc. The mere fact that we are all here engaged in this wonderful movement, largely humanitarian, although of course not wholly so, shows that we all do have within us an appreciation of the nicer things, including substantial health and the preservation of it.

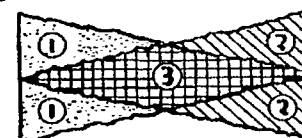
Now, men, we will talk largely of men, will distribute to the right and to the left of that average man line, according to the human graph, three, twelve, fifteen, forty, fifteen, twelve and three per cent. Some men are very much more masculine than others, and some very much less; there is room in the world for all such persons. I mean to say, if there was a run on a bank and I wanted to send some boy down there to get out my funds, I certainly would not pick an effeminate boy, a soft boy, to do that. I would pick a Jack Dempsey type of boy to go down and "elbow his way in"

toward the head of the line. And yet, if I had a diplomatic errand to do I would pick a man more toward the center line, the 50-50 line.

Going on, we are often asked which is the greater, environment or heredity. Figure 2 shows my concept of that. There are again two integrating triangles. You will notice in Figure 2 the stippled places marked "1": those are the characteristics in an individual which are due to his inheritance. They cannot be modified by any environment or influence. On the other hand, (marked 2) toward the right you will find a shaded portion with lines. There are parts of various individuals which are responsive to the environment, irrespective of his heritage, or his race, or family training, or particular family ancestry.

The outlines of the triangles are waving lines, for inheritance is not perfect: no child resembles perfectly any one ancestor, but some do resemble certain ancestors more than others. The lines of the triangle representing environment too are waving, because no child, as he grows up, receives all the environmental stimuli that are impinged against him, e.g., sometimes he is too dull or too distracted to notice what is going on. You will notice that the larger part, the

Fig. 2. Heredity vs. Environment.



Parts 1 and 1 are not modifiable by any environmental influences. Parts 2 and 2 are wholly controlled by environment, irrespective of inheritance. Part 3 is mixed variably. H should be H and -H, as congenital development modifies later maturing, hence immaturities. E should be E and -E, as environmental stimuli may not always register as expected.

In fact they should be $\begin{matrix} + \\ - \\ 0 \end{matrix}$ $\left\{ \begin{array}{l} \text{more, or} \\ \text{less, or} \\ \text{distorted.} \end{array} \right.$

diamond shaped part of Figure 2 is a variable composite of inheritance and environment. That is true of all of us. All the men and employees who look to us for guidance are modifiable to a large extent.

If we were to try to describe personality that would not be complete, those two triangles. We would have to add in there, as in Figure 3, additional factors which determine what sort of person a man is, considering his constitution as well as his inheritance.

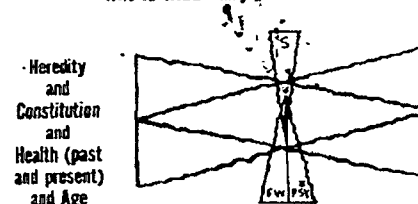
Constitution is the type of build, and body, and function of body, and function of mind that we get from our ancestors and from our family. We should include, also, on the left, the health of the individual: not only his present state of health, but his previous states of health. Perhaps he has had typhoid, or some other sicknesses, and

maybe he is now suffering a mild anemia. Those things will modify his personality and reactions at any given moment.

To the right we have the environment, and in the environment I want to include instruction. Instruction should include formal schooling so far as the individual learned as things were presented to him. Instruction also includes parental instruction, and no child ever feels that his parents are perfect—not while they are living. Then we have the informal instruction from other persons than in schools; and there is a star (*), and where there is a star is where you come in, the informal instruction we give to a person, and to the persons associated with us.

Then under instruction I also want to include the instruction an individual gives himself. That instruction he gives himself

Fig. 3. Adding points 1. and 2., and amplifying them: "WHO IS WHAT" may be charted thus:



$\begin{matrix} + \\ - \\ 0 \end{matrix}$ Environment, especially instruction
Schooling
Parental
Self, i.e. Convictions
S. is Spirituality, Religiosity, Esthetics.
F.W. is Free Will or Volition.
Psy. is Psychology, including habits, and Available Memories.

is a very variable thing. If he has had a bad night troubled with dreams and nightmares, and he tries to think out something the next morning, his conclusions are quite apt to be blue and troubled, uncertain, and rather pessimistic. The instructions one gives oneself when he is in the best of health are better and sounder. The conclusions one draws from experiences in life constitute what we call convictions: you cannot change a person's convictions.

Furthermore, I might tell you that it is impractical to ever ask a person, "How did you arrive at such and such a conclusion? How did you reach this conclusion?" He cannot tell. It is too complex.

Well, heredity and constitution on the one hand, and health and environment on the other hand, do not explain an individual very totally, so let's add some other factors of which we are sure. On the top, in Figure 3, there is a little triangle which I have marked "S," which means spirituousity or a sense of rightness of things. I want to tell you, although that is a small part, it is a real factor in every individual's makeup. We do have a sense of right, and it does modify us very much, and it isn't always moral right we are talking about. There are a good many standards of right. There are many things which are right, such as paying your debts, which is a very noble thing, and seeing that all who owe you money pay you, which is equally right, but not so noble.

Now you see two triangles pointing up. One is free will or volition. I maintain what religion teaches—there are beliefs to the contrary—that there is such a thing as free will,

that the people do have some freedom of choice, that they can more or less decide for themselves, and that endocrines and experiences do not totally determine one's makeup. I doubt very much if free will is of importance at any given moment. I think free will is attained largely by our resolution bearing on the future, that the individual decides now, "I shall at some future time do so and so, be more careful," or whatever it might be.

From below the other half of that triangle is marked psychology, and psychology means habits, the cause of aptitudes, things which are distinctive to the individual; and if you will, please, mark on that, or put in a star after the words "available memories," because you, by talking to your people and leading them one way or the other, create memories which will modify, and which they can use in modifying themselves in the future.

Figure 4 is another way of trying to describe that very complex central zone that we had in Figure 3, where all these triangles meet. It is a graph of expectations. Of this triangle the largest part is the base, and that is the ancestral and racial expectations. My ancestors a thousand years ago, if they were forward-looking at all, figured they would have more offspring in the land of Israel, and that their offspring could carry on certain culture, traditions and traits.

That is true in the things we are doing today; e.g., the fact that we have a democracy in this world that is angry and torn, so angry that it is not doing good thinking,

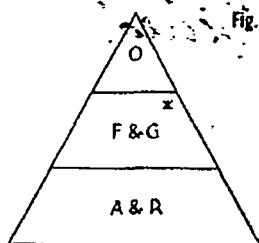


Fig. 4. Expectations, where the 5 overlap may be charted thus:

A & R—Ancestral and Racial.
F & G—Family and Group's.
O—Own expectations of self.

In the above, in 3 [(Informal*) and in 4 (Group*)], the star indicates where we, in authority in industry, etc., may modify those, who are under our authority.



Fig. 5. Effect of the home: really two homes, viz. the home where he was bred and born and raised, and the home he longs to, expects to and does develop.

wherein it is much like an angry individual person. The fact that we want to live peacefully with each other is not thought out by each individual. We feel that because our ancestors had that expectation, and passed it on by word of mouth on down, down, down the line, generation after generation. I would say persons are more reactive than they appreciate in doing things which were expected of them by their ancestors.

The middle stratum of that triangle in Figure 4 is the family and the group's expectation. I would say, in all modesty, and the same thing applies to each one of us, within individual variations, that before I was born, my parents decided that they should give the child the best education they could give him, and expect him to establish a nice home of his own, following our standards, and ways: and that is the way it worked out. I did get an education, and I have established a home, and I claim no credit for it. That urge, that drive, was passed on to me by my family. But they also figured, about 1900, or thereabouts, that the next generation would pay off some bond issues—and I am doing it.

Now at the top, the apex, the thing that distinguishes one's mental features from another's is the difference of one's own expectations for himself from another's ex-

pectations of himself. I expect I shall always drive on the right side of the road. I expect that I shall be a good citizen. I expect I shall pay my debts. I expect I shall play some of what I call golf (but my family doesn't). I act according to my own prior expectations of myself, and to that extent I am not a free individual from moment to moment.

In Figure 5 I try to illustrate the effect of the home. Now, if you please, when you think of an individual, please think of his two homes; the home from whence he came, where he was bred and born and raised, and that is the major part of the paper this morning; and, second, the home which he belongs to, and expects to develop, and actually does develop. You will see that these homes, these two triangles, overlap, and as one diminishes proportions the other grows. The figuring is not perfectly true. The drawing is of small importance; it is just a graph. I would say that the home he intends to establish does not begin quite at the base of the triangle at the left. The influence of his original home never terminates during his life.

Now, Figure 6. I urge you to study this. In order to understand me, realize that the individual's social life and industrial life overlap, and they may be charted somewhat

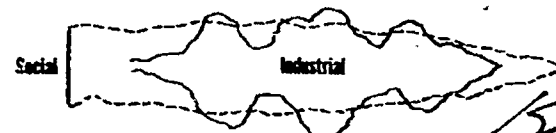


Fig. 6. Social and industrial life depends on background: It might be charted thus:

as we have them in Figure 6. That chart, as you see, is a variable. His social life begins in the home from whence he came, and diminishes as he grows old, very far over into the right, until it finally tapers off. The industrial life does not begin at birth. It begins in the habit training at childhood, and it stops before he dies, if he lives his full span of years.

You will notice that there are times when his industrial life is greater in influencing him, in engaging his attention and work, than his social activities. Please do not forget that point. There are a great many men in industry who are more keen about their job than they are about their home. Their homes become well established, and there is no longer any great problem there, and they are focusing themselves on their jobs, and on promotion, and the social contacts which grow out of their work. And yet the home life may intrude at times to interfere with business and professional progress. Now, if you should add all these together, super-

we have and what we are—in heart and blood pressure, memory, strength, previous accumulated faith and trust, and our faith in ourselves. It is only after a battle that a battleship can go into dry dock and be replenished with (new) ammunition: it must fight its fight with what it is and what it has."

There are many types of constitution. Let me mention a few different constitutions. Constitution has its origin in the home. Let me mention a few and show how it determines an individual according to the build of the individual himself. There are persons with constitutionally small hearts in large bodies; those persons may be named "slow motion." There are persons with big hearts, and they are restless and in competition, and if there isn't any competition or fighting going on, they will start one. There are persons with low blood pressure, and they have been called wall flowers and house plants. There are persons with tiny blood vessels, constitutionally: they are born that

Fig. 7. Superimpose them all together and there is an interesting constellation, not charted, entitled PERSONALITY.

impose them one upon the other, and I admit there are many other factors too; (I couldn't chart it, but maybe you can mentally) then you have some sort of a graph of what we call PERSONALITY. (Fig. 7.)

In adding these things, I want to say, do not be discouraged at individual differences such as are pointed out, because we are all more alike than we are unlike each other. There are three places at least, marked with a star (*) where persons are modifiable, even though there are limitations to modifications. I do make this point, and I think I can be quoted: I think the record is sound here, and not just my own opinion, viz:

"We each must meet the stresses of life, not with a bolstering drink, but with what

way and they are nicknamed "sissies." There are persons who are constitutionally anemic, and those persons lack the ability to polish their efforts, to go over and over and over again, and get things into first-class shape. They make several efforts, and then they are through.

Indolence vs. Fatigue

We must draw the line between indolence and fatigue. Indolence is a constitutional trait, whereas fatigue is an acquired condition from mental disorders sometimes, or stresses at home, or from physical disorders, diseases, excesses of alcohol, or one thing or another. I reserve the term "lazy" for those who indulge themselves by wilfully and inexcusably getting others to do for

them what they are quite able and capable of doing for themselves. Now, to show the difference between indolence and fatigue, I quote Dr. W. Norwood East in the table entitled "Disposition for Work," on page 8.

I do want to say that the young men entering the Army nowadays, entering industry nowadays, are apt to be indolent, not from constitutional reasons, for many of them are fine boys, but they are indolent because they have not been trained to work. They have not been trained in habits of industry. They do not know the joy that comes from working 12 hours, and then putting in an extra four. They have not had that experience. They have not had the experience of working 8 or 9 days a week. Medically, a doctor isn't a Class A man until he has been through an epidemic and learns he can and must work about 56 hours without stopping. So these boys who are indolent from deprivation have to be trained, and forced to work; they need a particular kind of forceful leadership to counteract this deficiency in home and neighborhood training. They, like indolent persons, are apt to be quitters. They are apt to be tired before they go to work. They are apt to be fatigued when they work.

Oxygen Want

Besides constitutional indolence, there is one thing that must be mentioned. That is, there is such a terrific variation in persons in their ability to take in and to use oxygen. I think most people are average well fed, but I should say there is a greater disparity between the oxygen metabolism in them than in their food intake. In many cases where people do not get enough oxygen, it may be because of bronchitis from smoking too much, or from a nose and throat condition. Maybe they have a lung disease. Maybe they have poor posture. There are numerous reasons why.

We have recently, in the last four years, tested people's abilities and reactions during oxygen deprivation by putting people in sealed chambers, or by sending persons up in airplanes to high altitudes or in chambers which have correspondingly low atmospheric pressures. These are some of the conditions which ensue when the oxygen intake and use is diminished, (and what I say now you will see in your workers, but to lesser degrees, if you please). I quote Dr. J. H.

Quastel. Oxygen deprived persons talk about the same things, and their conversation does not go from one thing to another. They are emotionally unstable. They may be irritable without much provocation, or boisterous, or weak. They make stupid errors which can be shown in a number of arithmetical tests. Their impulses may be primitive and uncontrolled. While they are thinking the same thing, like a wheel on dead center, they are not receptive to new ideas. Those of you who have to teach persons, and then find out what they have learned, are always astonished and disappointed at how poorly some of them have learned, although they seemed bright: that may have been because of poor oxygenization.

If you care to read a wonderful book, read "Blow All Ballast," by Nat H. Barrows (Dodd Mead, N. Y., 1940). On page 120, when he was describing the deep sea divers going down to bring up the U.S.S. Squalus, the submarine which was sunk, the air pressure was 100 pounds to the inch and the divers were not getting much oxygen out of it. The authorities said, and I quote:

"At that depth a man has the mental ability of a child and the working efficiency of an old man in his dotage." To a lesser extent, our sub-oxygen people are deficient mentally and physically.

What can be done about these business associates of yours when they are not as bright as they should be? It is very simple. You recommend two things: Get outdoors and walk at least an hour or two a day, and get outdoors and sweat at least once or twice a week. They do not have to buy medicine from some pharmacy. Hygiene is the treatment: natural, primitive hygiene.

Five Types of Errors

There are five types of errors, and the homes from whence our children come into industry, and the homes they establish while in industry, do not teach these five types of errors, nor how to avoid them.

The first type of error is doing the wrong thing. I think that is generally recognized.

The second type is omitting to do the right thing. That is rather largely recognized.

The third type is doing too much of the right thing—overdoing it.

DISINCLINATION FOR WORK

(By Dr. W. Norwood East—modified by Dr. H. S. Halbert)

Fatigability	vs.	Indolence
May be a symptom of mental deficiency, or Related to physical disease: e.g. endocrine glands imbalance sexual or other excesses chronic infections tuberculous glands foci of infection constitutional asthenia low blood pressure incomplete convalescence head injury blood disease (anemia) nephritis (Bright's disease) adenoids, tonsils, and malnutrition (incl. allergy) Mental disorder Psychological reaction to conscious difficulties, or repressed conflicts as guilt complex feeling unwelcome inferiority shame of self of parents, etc.		Inate constitutional disposition resembling the indolence of certain primitive races whose wants are few and easily satisfied.
Recent development in the life of the individual.	vs.	Habit of mind, acquired as the result of precept, example or circumstance.
Though it may restrict capacity for work it is not inconsistent with ambition.	vs.	From wrong placement, inadequate training, unsympathetic supervisor, enthusiasm is dulled so that work and all associated with it has, in time so many accumulated associations of harshness, discomfort, and inadequate reward that work is shunned.
Ambitions	vs.	(An indolent person) Postpones commencement of task as long as possible; Expend minimum of energy; Is exhausted when work is completed.
Failure causes disappointment, especially if results are a matter of concern and if fulfillment is coveted.	vs.	No concern if task is unfinished. Unable to appreciate the satisfaction of accomplishment.
Tires as quickly at play as at work, for energy is soon exhausted.	vs.	Success at play; for play is undertaken with enthusiasm and energy.
Sleeps badly.	vs.	Sleeps well.
Generally irritable.	vs.	Not necessarily irritable. Display of temper when forced to work.

The fourth type is doing too little of the right thing; and I want to stop for a minute on that. You safety personnel do not take to yourselves sufficient authority. You do too little of the right thing. I think in your work around your various plants, etc., you should go just as far as you can, until you are stopped from above. Instead of pausing to ask the tops, "Can I do this?" and "Can I do that?" please take authority. You have terrific responsibility given to you and with that responsibility comes some authority, an undetermined amount. Find out by going as far as you can.

Why? Because people like to rely on certainty. Workers and others look to you for rules and guidance in safety. If you expect extra authority, certainly this is the way to get it. They will like it; if you are a little bit timid about asserting yourself, perhaps it is because you don't have enough oxygen. So if you would sell your car and walk an hour or so a day, and sweat twice a week, maybe your blood pressure would come up; then you would feel like taking too much authority. If you go too far someone will stop you. Same with local or community safety councils: Take to yourselves authority; stand on your own feet, yet co-operate with the higher authorities.

The fifth type of error is wrong timing, doing the right thing at the wrong time, too late or too early. We could spend an hour on illustrations of wrong timing. You do not have to look very far for them. The best of us have seen examples of or have been guilty of wrong timing.

Objective Evaluations

We should make objective evaluations of the persons who come to us from these very inadequate homes. By inadequate, I mean the homes that have inadequately trained the men for industry. Look at the men objectively. Look at them. Watch what they do, and do not listen to their excuses. Realize that these objective evaluations must change: one must not form a permanent opinion of any man.

The mistake we are apt to make in handling the individual persons who come to us is to over-expect, to expect more of them than they are able to deliver. The penalty of over-expectation is disappointment. From disappointment grows mutual disappointment. He becomes disappointed in you. From mutual disappointment grows hostility, and

from that grows mutual hostility. Then leadership is gone when there is a state of mutual hostility between you and the group. Don't expect too much from a person. See what he can do. Persons have, as you look over the mimeographed drawings of Figures 1 to 7 inclusive, profound limitations.

A false premise always leads to a bad and upsetting conclusion. So often we in our hearts are building false premises. We say these men who are working at our plants are "our younger sons." They are not our younger sons at all. They are our younger neighbors, working together with us. We should treat them as our neighbors; but when we try to buy their loyalty in advance by certain things we would like to do for them, such as we would do for our sons and sons-in-law, we should not be astonished if they turn out to be neighbors and not young sons continuously. You cannot buy future loyalty by past actions.

Diversements

The home, if it is to support the individual, should encourage him to have four diversements, four things to divert his mind: two winter diversements and two summer diversements, or two outdoor and two indoor diversements. These should be diversements where a man has some opportunity to express himself, to express his personality, because I tell you, gentlemen, the desire for self-expression is greater and more important than the desire for security. In a diversement, any one of the four, the individual man finds happiness in carrying on his own ideas, and that happiness and that enthusiasm and certainty in betting on himself. "I am pretty good, I can work out problems." This increases the rate of speed of thought and the height of intelligence and the breadth of the individual's vision; such persons are not accident prone. Just pastiming and self-entertaining are poor. The smart man uses the early morning hours for self-advancement before the group gets under way. The smart man is interested in entertaining himself, to be sure, and entertaining others, and being entertained by them, but he is also interested in advancing himself seriously.

Self-Discipline

Therefore, importance is placed upon self-discipline to avoid the unwholesome, and to improve the intellect, and to seek a good auditory environment, i.e., to turn off

the radio or turn the conversation when things which come into our minds and ears are loathsome and not good for us.

Authority

In order for the individual to assume growing responsibility at work, he must take to himself authority at home. He must grant authority to others in the home to run their departments, he must trust the integrity of human nature and trust his children, but he must keep certain authorities to himself. Time after time we see fine men who are whipped and discouraged in business when something goes wrong, and they never reestablish themselves. They take subordinate jobs, and they do a poorer job, although they work harder. In those cases we can trace out the fact that they have been whipped at home, crushed at home; things have gone wrong in spite of their efforts. Usually after this happens twice they quit trying to exert authority.

A dear friend of ours lost his wife and three children in a steamboat disaster on the Hudson River. It did not crush him. Later he had another tragedy enter his life: one more child died. Now he is whipped. He has had two accidents of the same kind happen to his mind. He is a whipped personality for life. There is no repair.

So I say that the individual who is whipped at home, who lets other people decide when he should wear his rubber or whether he should wear his top coat, and not smoke too much, etc., is whipped in business. You can figure out these things: they are counter to a person who does not have some authority at home is not going to have authority in business. Authority means he makes his own decisions, and making one's own decisions builds character, and character is another word for character.

Painless Habit-Breaking

Homes tend to be persons who are pure in another way, i.e., persons who are habit sick and do not know it because the sickness is painless, or persons who have been completely contrived from a machine, or persons who are even sick at home in their domestic relations, or such financially, or persons who have not settled their own personal problems. These persons as they come to us in industry are anxious, tense, fatigued; they are irritable, they are blue, they are touchy, and they are no good after

three o'clock in the afternoon after an ordinary day's work. In fact, they ought not to be at work at all. What can we do for them?

Well, I maintain anyone who thinks that somebody he has to associate with does not look well, has a little responsibility toward that person. If he can possibly do it, he should send him on an errand where he has to walk, and when he comes back in about a half hour, send him to another part of the plant, etc. He will probably stop for a malted milk on the way, then he will probably be brighter and more secure for himself and others for the rest of the day. I am not recommending that we send to a doctor this person who looks just a little under par in health or emotional balance. I recommend hygiene, ordinary hygiene.

Conclusions

Now may I draw some conclusions?

1. A man is what he is, whether or not we know the complex reasons why he is so.

2. The home from whence the man comes, either his ancestral home, or the home that he has established, does not prepare him for industry, has not taught him the various personality traits or the manual skills that industry requires.

Furthermore, that home does not support industry. If he comes home and describes some troubles, the family would probably say, "Well, you are right, Paw. You ought to have told him so. I am glad you did it even if you got fired." The home should be taught to realize that industry and good organization is thoughtful and is not sacrificial of people, and that the wives and children, and others, should tell the man: "Well, you had better listen to what the supervisor said," and encourage the man to do better, to fit in.

Industry must, therefore, since the homes do not tend us men properly equipped, teach these men; and I want to lump all your teachings under one heading: Teach them normally. Teach them the normal things to do under such and such circumstances. Teach them the normal way to meet this or handle that problem, because when we have taught (as we will take up in some of our further lectures) men what industry needs, whether it is safety practice, which is on our minds today, or whatever it is, when we have taught men normally, then those men become predictable. We can anticipate what

such a person is going to do. That is glorious. That is our goal, predicting a person.

3. Are we learning about the management of others?

Let me quote a case. This was in London in 1750. A woman was hanged, and the same day a boy was half hanged and then beaten. The woman had stolen three fish; and the boy roamed the streets. She was his mother. The courts did this saying, I quote: "Perhaps this will be a lesson to him."

We are learning. Our social progress from that time to this is tremendously great. Anyone can see it.

The State of Illinois today is mourning the passing of a great man, Governor Horner. I knew him, I am proud to say. Count-

less others knew him in one aspect or another. We respected him because he knew his subject, the law; he understood our problems; and he was a gentleman. We knew he understood human nature, and guided and shaped it for the benefit of humanity; for such men in our time we are thankful. We can say:

"Throughout harsh and selfish lands
Comforted by saintly hands . . .
Man is thankful for the past
Gifts like fire, seeds, happiness,
Wisdom, teaching, nature unmasked,
Sympathy, tenderness:
These redeem our darkest time
And revive our hopes sublime."*

*The full quotation, from which this is an excerpt, is available on request to Dr. Harold S. Hulbert, 30 No. Michigan Ave., Chicago.

LECTURE II

Mental Hygiene of the Industrial Worker

Before I start this morning's talk, I have been asked to explain two things. The book to which I referred yesterday morning is "Blow All Ballast," the rescue of the submarine U.S.S. *Squalus*.

I frankly, in a friendly way, tell you that if you read that book you are going to be shorter on sleep than if you went to a Safety Congress. It will hang you up.

I was also asked to explain the graphs we used yesterday. If you will imagine one triangle over three (marked "1" on the blackboard), with its apex to your right and another triangle, marked "2," with its apex to your left, and join the two together, you will then get the graph that you had in your hands on the mimeographed page.

My topic this morning is, "The Mental Hygiene of the Industrial Worker: Obligations and Opportunities of Management and the Supervisory Staff." Is there a basic philosophy which is fair and advantageous alike to the workman and his personal constellation and to industry and the nation?"

A Three-Point Basic Philosophy

Some of our people come to us without any philosophy. They have no central nucleus around which to hang their thoughts. They were not given one at home. Their parents had none. They had a vague idea of doing right and being dutiful and being obedient and so on, but no concrete philosophy.

Now industry, the various, specific industries, apparently have no basic philosophy. I would like to bring to your attention something which has been rather carefully worked out and which is generally applicable, because if persons can learn this, be taught it by you and learn it at home, if you can pass it on to your children and others, you will find that it is very easy to teach them in detail the application of it.

And, as we are gathered together under the flag of safety—national safety as a national asset—it is well to have this in our minds because it emphasizes that persons must not hurt—must not hurt themselves and must not hurt each other.

A BASIC PHILOSOPHY, IN THREE PARTS

Fair and advantageous alike to the person and his constellation, to groups and to the nation. (Based on Dr. Hardy Clark, modified by Dr. Harold S. Hulbert.)

* * * *

1. (When. A child up to the age of 6, or at any time thereafter, should be taught and trained, or if not so taught and trained a person should teach himself.)
 - 1A. TO DO ANYTHING AND EVERYTHING WHICH IS GOOD FOR HIS OWN BEST INTERESTS
(provided he does not hurt or wrong anyone thereby);
 - 1B. TO AVOID ANYTHING AND EVERYTHING WHICH IS CONTRARY TO HIS OWN BEST INTERESTS
(especially to avoid the unwholesome and to avoid self-indulgence); and
 - 1C. TO AGGRESSIVELY ATTACK ANYONE OR ANYTHING WHICH MENACES HIS OWN BEST INTERESTS
2. (When. A child up to the age of 9, or at any time thereafter, should be taught and trained, or, if not so taught and trained a person should teach himself.)
 - 2A. TO DO ANYTHING AND EVERYTHING WHICH ENHANCES HIS OWN GROUP'S BEST INTERESTS
(provided he does not hurt or wrong anyone or any other group thereby);
 - 2B. TO AVOID ANYTHING AND EVERYTHING WHICH IS CONTRARY TO HIS GROUP'S BEST INTERESTS
(“his group” will be in turn his family, his clan, his gang, his school, his church, his community, his town, his societies, all schools, all churches, his new home, his state, all states, and his own Nation.); and
 - 2C. TO AGGRESSIVELY ATTACK ANYONE OR ANYTHING OR ANY GROUP WHICH MENACES HIS OWN GROUP'S (GROUPS') BEST INTERESTS
3. (When. A child up to the age of 16, or at any time thereafter, should be taught and trained, or if not so taught and trained should teach himself.)
 - 3A. TO BE TOLERANT
 - 3B. OF THE EXPRESSIONS OF OPINION
 - 3C. OF WELL-INTENTIONED PERSONS
 - 3D. OF OTHER GROUPS; and
 - 3A.' TO BE INTOLERANT OF AND TO AGGRESSIVELY ATTACK
 - 3B.' PERSONS AND GROUPS
 - 3C.' OF BAD OR OF HOSTILE INTENTIONS.

I do want to comment on some of the parts of a “BASIC PHILOSOPHY” which I am presenting here. Point 1B: “To avoid anything and everything which is contrary to his own best interests.” Once we have trained our workman on that point, we can use it to say, “Now, if you handle a step-ladder this way” or whatever the hazard is “you are risking your own best interests.” Point 2A is of considerable interest, and I want to explain that. An individual should be taught and trained “To do anything and everything which enhances his own group's best interests.”

In a child's life it runs somewhat like this: He should be trained to do anything and to help the family, to answer the doorbell, to help wash the dishes, to do any chore at home. His idea of his own group enlarges, and he should do anything to help his brothers and sisters and cousins, and, when he goes to school, anything that doesn't hurt others, anything to help the school. He learns to be fair and not step out of bounds, because the referee might see him, and that would hurt his team's chances.

His idea enlarges so that his group includes all the persons who live on our side of town, all the persons who go to our church, all the persons who go to any church, all the persons in our town, in our community, in our state, all the persons who belong to our society, to the lodges or to whatever the father and mother belong—all such clubs. Finally, in the development of this idea of being loyal to his own group, the idea of the group becomes the nation: that is patriotism.

A person should do anything and everything which will help his nation, and not do anything which will hurt it. I am very sorry to say that the human mind has such profound limitations that it is not able to react dynamically to an idea of international brotherhood. Patriotism stops at the national border. We can think about international brotherhood, but masses of persons cannot react to it. The basis of patriotism is the simple thing that a person should do anything and everything which is beneficial for his own group.

The third part of this basic philosophy is not related to safety. It is put in here because it is the third part of such a philosophy.

America's Two Commandments

Now, if I can rephrase this, I can say that there are in our country, in our culture, two great commandments. The first one is: “You may and you should help yourself and your group, provided you do no hurt thereby.”

The tendency would be for persons to think that the second commandment is that you may and should help others over and beyond your duty. I say no, that is not our second great commandment in America.

The second commandment is: “You may and should permit others—*permit others*—to help themselves and help their groups, their own groups, provided that they do no hurt thereby.”

Repeating, then: the first is to help yourself, and the second is to permit others to help themselves—always circumscribed by “it must not hurt.”

The point that we should help others is the hallmark of nobility in America. Superior persons only grasp this idea that we should help others. We do not have lords and barons and other such ranks in this country, but we can identify high grade and superior people, and that is one of the ways in which they can be identified. They go out of their way to help others.

Positive Intercommunication

If we are to deal with other persons, it is quite important that we think clearly and speak understandably. I would say that the inability to speak understandably is the greatest handicap of our people. We are not able to communicate our ideas one to another fully nor exactly. You can think about four to seven thoughts per second; you can talk about two thoughts per second. The person who is listening to you will listen to about, oh, a fraction—I don't know—maybe a sixth of what you say, and the rest of the time he is thinking about other things, about himself.

How, then, can you get your ideas across to the other person? I recommend, in the first place, that you be very explicit; that when you are talking to persons you do not talk in an involved way. I recommend, because of the limitations of the human mind, that you talk conclusively. Only when a person challenges what you say should you give the reasons for your conclusions.

Ordinarily he will assume that you have thought it out, that you have reasons. If you will talk slowly, . . . staccato, . . . one idea at a time and briefly expressed, . . . with a pause between, . . . to let it sink in, . . . you can communicate your ideas better.

Please, when you are talking to other persons, make it easy for them to think, to agree, to follow. Do not express yourself in such a way that they have to rearrange your ideas before they understand them or can use them.

An old story illustrates this point as well as any episode I know: A foreman was showing a new workman through his part of a large paint factory, and he explained to the man in passing, "In case of fire, do not leave that door open." They went on to other things.

Well, there was a fire sometime later. The inquest brought out the fact that this workman remembered that the foreman said "something about that door being open in case of fire." (Remember, the foreman had said, "In case of fire, don't leave that door open.") So, the workman opened the door. Paint factory fires are dreadful things, black, noisy, scorching, stinking, frightful. The foreman should have said to him: "In case of fire, shut that door!"

Then the man could have received that idea and kept it in the storehouse of his memory, could have brought it out at any time that it was necessary and could have put it into action without rearranging the thought. So, I urge you to talk in positive terms.

The subconscious mind, a contrary, selfish, horrible part of all of us, does not serve us very well. To help that, I urge that we speak so that there can be no misunderstanding between our selfish subconscious mind and our sociable, dutiful conscious mind.

There is a tendency to condense too much what we have to say, a tendency to condense into symbols, a tendency to have a flag, to have a star, to have a sword and sickle or hammer and sickle, if you wish—I don't care much for it. I tell you to be very cautious in using symbols, because only one-third, roughly, of persons will react to a symbol, and the other two-thirds become blind to it; it has no significance to them, although we may think it does or should.

It is so much better to use words which cannot be misunderstood. In your words, of course, talk in positive terms, what you want people to do. It is very much better to say "Be careful," than it is to say, "Don't be careless."

As I told you, this tricky subconscious mind will take that word "careless," the morbid, the negative, will contemplate "carelessness, carelessness, carelessness" until pretty soon it is dictating to the conscious mind, "You be careless."

But if you will talk in terms of both these two fractions of our mind, "Danger, keep off, high voltage," there can not be any conflict in the man's mind. "This is dangerous." Every part of him tells him so, and he will react as though this thing were dangerous.

Depersonalized Statements and Mistakes

In this dealing with employees and how to make things stick, possibly I can use an unpleasant illustration that was brought to my attention recently.

A question was asked me in a conference consisting of a group something like this one only it was smaller: "What shall be done about a man when the women employees complain that he acts improperly and bothers them?"

A depersonalized statement is the way to handle it. Stay in your own sphere when you are talking officially or authoritatively to persons. Now, of course, if you want to discipline him, if you want to put him at a disadvantage, there is a technique to that. Some persons care for it; others do not. The technique is to have him walk up, not take the elevator, two floors, and without waiting or pause come right into your office "on the carpet"; he will be breathless and not able to express himself.

But the major thing is not to converse with him but to give him a depersonalized statement. You must not talk about him. He is on the defensive. You can not talk about the girls. He will not know exactly about whom you are talking. You may talk about the Company, yes, something like this. Say to him: "When women employees complain that they are bothered, we give the man one warning to behave himself, for we cannot condone any disrupting influences within our business. That is all. Good-by."

If he does not go, you may go on and say, "You may, but you need not, see me next week to discuss this. Good-by." And, if he still lingers, "Sorry to have to take this up with you, a good workman and one otherwise having a good future. Good-by."

You have only talked about your Company viewpoint. You are speaking *ex cathedra*. You cannot be argued back. No one can argue back against rules.

I mention this here because there are other types of men that need to be warned. Some of them are the heedless men, the men that are somewhat accident-prone, possibly from inattentiveness; they could do better. Others are the careless men. Others are the slovenly men who are dangerous. And, if you care to extend this into personnel work, the cynic who is a mild agitator, who is a grumbler, who is upsetting things; the alcoholic man; those who belittle everyone's efforts; the defeatists; and certain impetuous persons.

Call him up. Issue a statement, "We cannot condone any disrupting influences within our business. That is all." The man is entitled to one warning, but do not talk about him, talk about the Company. Why do I emphasize this so much? Because it is something we all know and yet we hate to face the fact that all mistakes must be paid for over and over and over, and perhaps endlessly, and may involve the innocents who also must pay. "Mistakes are what hurt." That is the definition I am using here today.

Did I give you the illustration of two friends of mine in Oak Park playing cards one Thursday night—two businessmen? It developed in the conversation that they were each going to Omaha. They decided to go out Monday morning. They met at the Oak Park Avenue station, each carrying a medium weight overnight bag. They felt quite good that they were there six minutes before train time, but the ticket agent said, "This train does not stop at Oak Park Avenue; it stops at Wisconsin Avenue. That is four or five blocks down." They hustled and almost ran and got there in time, feeling pretty good, sort of winded. They got on the train and had a big breakfast, . . . and both were sick.

The man who later found out he had heart disease was hurt by the hurrying and carrying his bag. The man who found out later he had diabetes was hurt by the too big breakfast. So, I use that as an illustration.

that a mistake is what hurts. I am not sure that we can say that a certain thing is universally a mistake. I think it is quite apt to be selective.

Fair Description

In handling men, I think you should be very careful in the words you use in describing the man, even in the words you use to yourself in describing the man. Because a person has a certain personality trait, let us say, we can give it a good name or we can give it a bad name. We can say he is a very persistent man, or we can say he is stubborn.

If we give that trait a pleasant name, we have a pleasant attitude toward that man from now on. If we give that same trait a horrid name, we have thereafter an attitude of aversion to that man.

If we are talking to someone else and we use an uncomplimentary term, like saying he is stubborn, he is a squarehead, or whatever it is—then not only are we hostile to that man and his future but persons we talk to will be, and they may quote us. So, a great deal of hostility arises against the man, all tiny hostilities, but a thousand mills add up to a lot of money, even though we can not count any one. So, I recommend that we be most careful in giving properly descriptive titles to men and to their traits, lest we prejudice ourselves to their detriment and ours.

Attitudes

My next point is, and I really and truly hope that you can accept this, because the more you see of human nature, the truer this thing is, (with a three or four per cent exception to the rule): You may assume that everyone does his average best, even if it is a poor best or a poor effort, considering what he is and what he has—(refer to the various graphs which we used yesterday morning, his constitutional assets and liabilities, and so on).

Assume that everyone does his average best. This is particularly true, gentlemen, in dealing with women employees. They average best efforts much more of the time than men do. If a person's poor best isn't good enough, then you can do two things: You can increase his knowledge and you can increase his skill with his own hands, not telling him what to do but having him do it under your eyes.

Leadership

If you take the attitude that everyone is doing his best and he can be helped by knowledge and can be helped by certain practice or skill right under your supervision—"Now, let's do it once more" and repeat it occasionally—you will find that the person responds to your leadership. Before a workman or anyone else can accept you as a leader, he has to sense that in you is an approval of him as he is, and the potentiality of greater approval of him from you if he measures up and grows the way you want him to. He will not accept you as a leader until then.

Fear Is a Poor Whip

You can not handle men with fear, unless they are feeble-minded, and who wants to associate with—oh, how shall I say—birds of that type of feather? No, leadership means that there is approval in advance and greater approval waiting if a person does better.

From childhood up, persons take attitudes towards others. May I illustrate? My nurses in my child guidance and other clinics know that they please me when they bring me *bon mots* for my collection. Here are a few children's definitions expressing attitudes: "A mama is wot pulls splinters out." In other words, except when children (workmen?) are in trouble we adults (supervisors?) are static in their radio of life. "A papa is wot picks you up after you fall down, and den tells you about it." Is that not a definition of God? "A aunt (pronounced ant) is wot has charge of you but can't whup you." How about that, you Safety Engineers? "A uncle is wot says, 'Go ahead, Kid,' before you try." An encourager. We should be "uncles" to many younger men. "A gran'ma is wot feeds you between meals." In spite of pediatricians' diets? "A gran'pa is wot protects you when you shouldn't have." I need many, and you? cf. Tolerance.

Yes, attitudes *are* taken. It is wisdom for leaders to use their best discretion in the forming of their attitudes.

Development of Business Character

This approval that is mutual will grow, depending on a great many things, but one thing I want to mention. It will grow as he sees in you that you are decisive, that you can make up your mind and you can, within

reason, stick to it, and that you encourage him to make some decisions within his capability of making sound decisions and that you allow him to stick to his decisions.

Now, decisiveness of character is—and I use those two words as synonyms—very important in business.

Irritability

A thing that will distress you from time to time in these people that you have to work with is their irritability.

We know many of the causes of irritability. The chiefest cause is pain. A man has troubles at home, or he has some debt trouble that causes him pain. Yes, we know many of the causes, but I want to put you on your guard. Look for the causes of irritability in normal things missing from that man's life. Of course, you look to see what wrong things are present, but I want you further to see what right things are absent or insufficient.

One source of irritability is particularly psychological and causes persons to be accident-prone, and that is when they are baffled, when they can not carry out what they want to do or expect to do, when they are frustrated.

An illustration of that: A man was promised the opportunity to be transferred to the New York office, and he rather counted on that. Mind you, *he* had not proposed the idea in the first place: it was proposed to him. He began arranging his property, maybe selling it. He began looking around. But it did not work out that way. No one from the Chicago office was transferred to the New York office. He was not displaced by somebody else, but he was disappointed. His type of irritability showed itself in slowness, in disinterest, in heedlessness—I mean that in the sense of unreliability. You could tell him to do something next Wednesday and he would not do it. He would not be reliable to his trust. He did not go on strike nor do the opposites. He simply didn't have the internal yeast to keep him bubbling up with activity. He became not only accident-prone but he became a disappointment to those who relied upon him.

Mental accidents in the front office, gentlemen, are more dangerous to the business, I believe, than manual accidents in the factory.

Accident Proneness Is a Personality Characteristic

A question comes up now, "Should we keep persons who are accident-prone?" It was my pleasure to have come across A Study of Accident-Proneness Among Motor Drivers, by the Medical Research Council of England, published in London by His Majesty's Stationery Office, price nine shillings net, Report No. 84.

They studied the bus drivers of London, thousands of cases. Some of them they studied by psychological tests; some of them they studied by their work record. I would like to read to you their conclusions, if I may quote, realizing that reading is not always good taste.

"The accident records of several groups of motor drivers have been examined to see if the distributions of accidents are consistent with the hypothesis that some people are more liable to accidents than others under conditions of equal exposure. It is clear from the data that accident proneness among motor drivers is an important factor in the causation of accidents."

We know that. "By psychological tests it would seem as though some persons are accident prone. By batteries of tests, different kinds of tests, it would seem like some persons would be accident-prone."

I tell you there is no warrant for dropping persons from industry because tests show that they are accident-prone. But that information should be retained in our minds to be used later along with other criteria. "The persons who had a high accident record throughout their employment had the highest accident records in the first two years of their employment." In other words, you can tell in two years if a man is accident-prone.

It is best, therefore, to use the man's accident record over two years. Whether you use psychological tests or use supervisory opinion of him, it makes no difference. They agree very well. If he is in the lowest group, say the lowest tenth of the bus drivers in accident records, who have had the most accidents, AND if he is in the lowest tenth of the employees as judged by tests or by the supervisors' opinion, then that man should be dropped.

"Accident proneness was shown to mani-

fest itself in all kinds of accidents and throughout all conditions of exposure."

"This accident proneness of certain men persisted even though they gained in experience and years of employment. The man who is accident-prone from the beginning, although he will be less liable to commit accidents as he gets more experience, still will be an accident-prone man and will have more than his share of accidents."

Can I summarize that in my own language? Well, I have in part. Use two points of view on a man before you let him go—his record and the opinions of those who know him best.

Fascinations and Indecisions

My next point is a difficult one and does not come up very often, but I want you to realize that the persons under your leadership will need help here, because on these two points the human mind cannot do at all well.

If a person is fascinated by something or some wrong person, he himself cannot break that fascination. He needs an outsider to break in and be rough and bawl him out and dress him down and scold him, and so forth, very abruptly, and spare no feelings, and tell him to stop it and get out, it is unseemly, and so on. He may be fascinated by the danger of a certain piece of machinery. A few per cent of our people are fascinated by high heights, dangerous machinery, treacherous women, or what-not, or fascinated by some contemplated plan for mistake, like stealing money. It takes an outsider to break right in like a roughneck and stop him. Don't be nice to these persons who seem to be all engrossed in something that they shouldn't be thinking about. "Block that kick! Rough 'em, STOP 'EM!"

The second thing where they need your help, and this time you can be somewhat more delicate, but you must be very, very authoritative and brusque: People are unable to choose the lesser of two evils where they desire neither of them. Our whole life has been so pleasant, so comfortable, we have grown up with the idea, "Shall I buy a Dodge or shall I buy a Buick? Both are splendid cars." "Shall I marry Isabel or shall I marry Hazel? Both are lovely girls."

That is the way we have grown up. We have offered to our children, our parents offered to us, the world offers to us countless choices, countless options, both nice.

But occasionally we are confronted with an option where neither one is desired, neither one is pleasant. The market is falling and a man holds two kinds of stocks. "Shall I sell one and get the money to protect the other?" As Jack Cleary, a friend of mine, said to me one time, "Hal, why can't people take a little licking now to save a big licking later? They hang onto their stocks and lose them both."

"Shall I go to war? Shall I send my boy to war? Shall I get married? Although I am not very much in love, still he (she) is available, and I think would say yes." "Shall we let this man go? He is a rather valuable employee in many ways but he is a detriment in many other ways and a bad example."

This choice of two evils confronts our people occasionally. We are going to take it up more at length tomorrow, but I want to say today that that is one of the places where the human mind cannot of itself alone function well.

New Ideas May Be Either Good or Bad

Along this line of fascination, may I say that new ideas, even poor ideas, are often presented to people in a fascinating way. They lead men astray. There are certain paranoid persons who feel they have a mission in life to perform, that it is right to do wrong because of their missions, and they will infiltrate themselves into our plants and into our universities and other large groups, and so forth. They have a palaver that sounds pretty good to the unsuspecting and to persons who never studied logic or never acquired logic without study. They are plausible.

I am not referring to the Townsend Plan or any one thing, but I mention that only as an illustration to guide your thought. These people, these paranoid leaders, have a program, "Let's destroy and build again. Why should so-and-so make so much more money than we do?" and so on. "Why should they have parking privileges, and we can't?" You know how it goes in the plant.

A lot of our young men and a lot of our older men who can not be found guilty of being sound thinkers, will follow, will be

infatuated with this idea, fascinated, wreck the plant, wreck their own future, wreck their homes.

I saw a boy recently, a lovely boy, an only son; anyone would love to have him as his own. His father was one of these paranoid leaders of a weird idea who had wrecked a large factory in a subdivision where the people lived. There is no joy there any more; no one gained. This poor boy is shunned in high school; everyone hates him, because they hate his father, because his father ruined the community. Speaking of him, my host's son said, "I try to do things for this boy. He is nice. I gave him my other bow and my other quiver of arrows. He is a real good marksman. Some of us boys are trying to do nice things for him. It is just tough to see how that boy and his mother and his sisters are suffering from his father's folly."

Now, I urge you, in trying to break this infatuation, this fascination, to make use of this philosophy, this three-point philosophy, in talking to persons who tend to follow a new idea. Say to them, "Will it hurt?" If the new idea is going to hurt, then if the person has already accepted this three-point philosophy, he will say, "Well, sure, it will hurt. Therefore I guess I will have nothing to do with it. There must be some non-hurtful way of working out our concept."

Immaturity

The immaturity of persons is their greatest handicap. The thing, the one thing in you, gentlemen, that dissatisfies you with yourself is that you are not equally mature in all ways, that you are pretty good in some lines and not very good in other lines. You may be very good at golf and not very good at poker or conversely. You may be good as a student and yet do not express yourself well.

Perhaps you are a very lovable, affectionate husband and a splendid father and yet you are not a good money-maker and not alert to pick up the extra shillings here and there, so you may prosper and mature equally. None of us is well rounded, but we can excuse it in ourselves. When it is in someone else who is very brilliant here and very unreliable here, and so forth, we find fault; we are mad at him, cross at him. We do not want him around. He is a great disappointment. That is our fault. We did not size him up fairly.

Did you ever buy a second-hand car? If you haven't, really, gentlemen, it is a wonderful experience. Your right front tire, let us say, is not very secure, not very good. It is the weak one of the four. As you drive through the paths of life, you are going to have bumps with that right front wheel.

So, in evaluating another person, he is not a flat tire, but he may have parts of his make-up here and there, and so on, which are not equally developed and reliable and comparable with other parts. Are you going to fight him? Are you going to hate him? No. You have to live with him. You have to get along. Just make use of his assets and, if his liabilities are non-hurtful, you can enjoy him very, very much.

People Obey

The next point is that people obey. You don't know that. I tell you that you can give orders and people will obey them, and they will not resent them very much, especially if they are depersonalized orders. People do obey. Every minute of our lives we are obeying something, the physical laws of gravity, of physiology, and what-not.

We took up expectations, the three-stratum triangle, the fact that we obey what people or others expect of us, what we expect of ourselves. The only question is, who are they going to obey? Do they select well the persons they are going to obey? That is your duty, to see that it is easily done. We people tend to obey.

I want you to believe that they want to obey. They want authority that is well intentioned. If they take exception to it, they may discuss with you the why. They will not ask you many why's. They will not even think many why's, but in America they are entitled to ask why if they want to. It is a nice way to live.

Promotions

Some persons are going to be promoted. Their safety record is a part of their credits. I think I would put it about first. If we were to consider who should be promoted, I would say, first and foremost, those persons who learn or benefit from experience and do not repeat their mistakes.

Second, I would consider persons who learn from the experience of others. There are two ways to do that, by observation

and by study. All of you here today are learning by study at these large congresses, and you are learning by observation in your plants, but you are learning from the experience of others.

We tend to promote persons who are "regular guys." A "regular guy" is a person who is predictable, who engages himself in ordinary activities. He does not join in any freak minorities. He plays golf, he goes to church, supports his family, goes to conventions, belongs to the lodge and to his service group, and his whole life history from years past is just like other persons. On the basis of being like the rest of us, he has also developed higher, like the spire of the church is above the high roof—he has developed those special things which make him valuable to us in industry.

But for the man who has not a life history of being an orthodox or regular fellow but is sort of a queer duck in many, many ways—thumbs down! He is not predictable.

I would consider promoting persons who have settled their own problems, making some necessary compromises and adjustments, but have settled their problems in such a way that they are still free agents to go ahead and be progressive.

I would consider persons who have good hygiene, and good hygiene includes being alert, and persons who are alert and thoughtful, are, of course, not accident-prone. Strange how this characteristic comes back again and again.

I would consider persons who have "force and brains." If you have enjoyed those stories of the gobs on the West Coast, one had force and one had brains, you know what I am talking about. Persons who are awarded leadership are persons we can trust.

Preview

Tomorrow's lecture will be on "Mental Hygiene and Individual Differences Complicated by Divided Loyalties and the Unusual Stresses of the Times." That is going to be controversial. I am going to say things that some of you are not going to like. I think a great many persons like Tom Kearns are going to agree. So, if I provoke you tomorrow, it is only to start certain trains of thought.

LECTURE III

Mental Hygiene and Individual Differences Complicated by Divided Loyalties and the Unusual Stresses of the Times

The first point this morning is to review a few of the things we said in two previous talks and tie them together. We said that personality is a complex thing, and we tried to make a quantitative chart of triangles that were imposed on each other, showing the effect of health, constitution, environment, instruction, spirituality, free will, and the psychology of the individual, including his own memories. We said that personality is a complex against a background of home but really is two homes, the home from which he came and the home he longed to establish.

We said that personality reacted against a social background and industry, and that the social background and industry themselves overlapped.

We said that an individual is largely what he is because of his expectations, including the racial expectations, the group expectations, and his own expectations of himself.

Now, when we speak of the group and its expectations of him, we should say "the groups," because on this question of divided loyalties, there are several groups, all expecting things of the individual. These groups overlap in a very irregular way.

We said in the very simple philosophy, the basic philosophy that we offered—I admit there are many finer ones, but I think that this is a necessary fundamental one—we said, among other things, that an individual should do everything and anything good for the best interests of his group, provided that it does not hurt.

We also said that no one is able to do well in deciding which of two bad things to do, or which of two things to do where there is a bad factor or bad factors in each.

We also said that men award leadership to those who already approve of them and from whom they can and they may earn more approval.

I want to say to you that loyalties, like all interests, fatigue. It is a point that you must remember in your campaigns for safety, that interest in this particular campaign fatigues; or, restated, interest in this

campaign, as presented, fatigues. We said, further, that loyalties cannot be bought and that men, therefore, at times at least, follow strange ideas and strange leaders. So much for review, trying to tie those things together. Let us go on.

Duality, Ambivalence

Some of us are aware in ourselves, unfortunately or uncomfortably, and aware in others most uncomfortably and sometimes unfortunately, that the mind takes a dual attitude toward things. That is normal. Whenever an idea comes into a person's mind, the opposite idea comes along also. When an emotion enters a person's mind, the opposite emotion enters also. Usually, however, we are not aware of these opposites. Nervous persons are, and we have studied them.

A person, a woman, for example, loves-hates a child; a child loves-hates his father; a man wants to comply with the rules—oh, to hell with them!

Ideas come in opposites. I mention this now so that later I can tie it in under the heading of the word "ambivalence," the rule of opposites, the law of opposites. If you expect a person to be consistent and faithful in carrying out his own assignments, whether they are assigned by himself or by others, you will be disappointed because of this ambivalence. There will be times when he will revolt against what he has been habituated to react towards.

Over-Expectations

Now, when we have over-expectations of a person, expectations which are not fulfilled, or not fulfilled consistently, there is disappointment. Let me give you the rule of the sequels of over-expectations. Over-expectations lead to disappointment. Disappointment leads to mutual disappointment. Mutual disappointment leads to hostility on the part of the leader—hostility at the person who has disappointed. Hostility leads to mutual hostility; and teamwork is gone.

It does not matter whether we are talking

about a child who has been transferred from one school system to another, or if a man who works in another factory is sent to work with us, or a man is fresh from home. We think he comes from a fine home, and he will make a fine workman; his father is a good man and his mother is a saint, and we have high expectations of this young man.

If our expectations are over and above what his human nature, constitution, and so on make him, then we are going to be disappointed, and pretty soon there is trouble between us. There is actual rebellion. There is actual disloyalty towards us. I do not mind the disloyalty of the employee towards management, but what I do object to is the fact that the employee rejects not only the personnel but he hates a certain supervisor, he rejects that man's teaching, that man's instruction, that man's supervision. He goes contrary to what he is told and taught.

Comparisons

Sometimes we hurt ourselves and hurt others and hurt the relations between us by making a specific comparison. No person could or should be specifically compared to any other one person, because no two persons are identical.

Every personality is historically unique, and when we compare one person with another, then we have an over-expectation as a rule, or possibly an under-evaluation, which is almost as bad. Let me make it clear.

Suppose that from this very fine home from which this young man came and made rather good in business with us, his younger brother years later also came to this same company and was employed—having the same home, having the same cultural opportunities, having the same parents, the same ancestry; that is what we think. Of course, persons do not have the same identical ancestry. No person represents his ancestors equally. A child represents the composite of his progenitors in various ways, but we think he is identical with the other boy, and we expect the same of him.

It turns out that he is a quieter child or a more restless child or a more flippant child, and we think we can iron that out, and we proceed to try to do so. Then we compare him with his brother. Some time, when he is a little in wrong with the superiors, we say to him, in what we think is

a stimulating way, "Why aren't you as reliable in your work as your brother Jack? He has been here three years, and he is one of our grandest workmen." You offer that specific comparison in the hope that it will stimulate him, stimulate him to live up to his older brother's standards. It does not work, it can not work. All you are doing is, reviving a domestic feud. He does not like his brother wholly; none of us like even ourselves wholly!

He does not like his brother wholly. He goes on strike against his brother, goes on strike against you, goes on strike against the very things that you are trying to coach him to do.

You must never compare one person with another; especially, you must not compare out loud to the individual; even in your own heart, you should not. It is proper, it is fine, it is good, it is therapeutic, it is stimulating, it is helpful, it is corrective, to compare a man with his group; to say to this boy, "Of our apprentices this year, you are the most frequently tardy." That hurts; that is corrective; it is factual. But when you compare him with his brother and say, "He is always here on time and you are the slowpoke," he will be slower. So, specific comparisons hurt. Let us go on.

False Premises—Bad Results

My next point is a delicate one. I am very much embarrassed to talk freely before such a large, intelligent, diverse group as this, and if I am restrained in what I am saying, it is because I am handling an embarrassing situation. I hope you will try to understand me, without my speaking too frankly.

My point is: False premises lead to bad results. We have mentioned this before. Assume that a company gets the false idea that: "These workmen are our sons in industry, and we will do all for them that we would do for our sons. We will furnish them maternity service for their wives and coming children. We will furnish them a bank; we will put in equal money with their deposits. We will furnish them a cafeteria. We will do everything in business for these young men that we would do if they were our sons because, figuratively speaking, they are our sons."

Well, gentlemen, that is a lie. They are not our sons. They are our successors in business, true. That does not make them

our sons. They are our young neighbors, and we should do all for them that a kindly and intelligent and well wishing person would do for a neighbor's son. But we would keep fundamental the fact that they are working for us for money, and we are employing them for money, for our mutual profits, but they are not our sons. When we indulge them, when we act as if we are grandfathers to them, or granduncles; when we ignore certain primary truths that the employment is here because each side financially needs the other, and when we put in things which are untrue, then we are going to find, to our great hurt, that they become disloyal to us at times.

Well, even our sons and daughters become disloyal. Our sons and daughters marry the funniest people! (That is what they said about us, too.) After our sons and daughters have taken up following strange ideas, then they move away from us. They have deserted us. Can you imagine anything worse than that?

I had one mother who put on an awful act. I happened to be present. She had a temper tantrum in front of her son because he had been calling on a girl who belongs to the church of the same denomination, across the river, and she argued, "There are just as nice girls in our church!" I hardly need to tell you that he ran away to get married; he couldn't get cooperation at home; whereupon she had a stroke, and the picture was simplified.

So, if even our own sons are not going to be totally loyal to us, we must not be astonished when these persons, whom we have falsely regarded as our sons and patronized, turn out to be disloyal. Please understand me this morning: I do not care if they are disloyal to us as individuals; I do care that they are disloyal to our teachings, our safety teachings and our other teachings.

Possibly I can illustrate that point of disloyalty, when they leave, in the case of truant children. As you know, I have several child guidance clinics in some of the bigger cities around here. We have this problem of the truant child. This is almost always found, it is the rule. The child who runs away from home because he has been hammered at or, as the child says, yammered at, about being home early, is the child who, when truant, is up all night. The child who has been nagged at, before running away from home, about being honest, is the child

who becomes the thief. The child who has been scolded and warned and over-scolled about being modest, is the child who becomes delinquent. In other words, to quote one of our school reports: "When the child transfers his geography, his locus, from here to some other region, he abandons particularly the standards of that home. He goes diametrically opposite."

So, to avoid persons going into rebellion against our teaching, let us see that our thinking about them and their relation to us is a true premise, not a false one.

Pastiming

A great many of our people, ourselves too, pastime together. They do things to pass the time. It may be bridge, or some of us like poker or pinocle. I know folks who play golf together and swim together. It is a delight, but I want to tell you that pastiming together is not constructive. It is just a way of passing the time. If there is coincidental hygiene, as in golf, if you don't keep score too strictly—I told you about the time I played golf with the minister, and it was the first time we ever played. He had his derby hat jammed down on his head, talking all the time while he was playing and while I was playing. He kept score. (We had a nice time.)

Toward the last, he said, "Let me borrow your pencil, Doctor. There is no eraser on mine. I made a mistake in the score."

I said, "There are no erasers on golf pencils."

He said, "Now I understand why they say the game of golf is hell."

Passing the time together contains so much of minor consequence that it is not worth comparing with constructive, tangible, mutual efforts along some sideline.

Let me illustrate my thought. I recently had an opportunity to examine a lovely booklet put out by a company here in Chicago. They have up in the country, up near Wisconsin, a summer lodge and some cabins. Their employees go up there in small groups, ten, twenty and so on, and spend weekends.

I want to tell you that, from my viewpoint, the men and women who went up there and constructed that summer camp and had something tangible to show for their results—they built a fireplace, they built this and that—got more out of it and

they are more loyal to their company than the persons who just go up there now and pass the time. It is a place to go, but there is nothing tangible.

Sensitivity

My next point is that we are unconsciously sensitive to and receptive to and reactive to the stimuli that our ancestors were. That will explain to you why it is so easy for some persons to revert to type.

Let me give you some illustrations. An Armenian child who was being brought up by some kind Greeks did not do well. We transferred her to an Armenian home where a foster child was welcome, and the child did well because her personality traits of a racial nature were offensive to the Greeks and would be perfectly sympathetically understood and not frowned at by Armenians.

We had a Montenegrin child that we placed in an Albanian American home. We thought they were alike. That is where I made a mistake. I did not realize that Montenegrins were mountaineers and particularly stubborn and the Albanians were on the coast and, therefore, more acquiescent, more given to compromises, as persons on the coasts have to be.

We had a Sicilian child who was adopted into a Danish home. The Danish people were swarthy; the Sicilian child was swarthy. Conduct that was ordinary childish activity to the Sicilians was regarded as a temper tantrum by the more complacent Danes, and we had to re-transplant that child.

Transmissible Cultural Traits

Now, it is true that people can accept superficially a culture that is not their own. I am emphasizing the word "superficially."

I think one of the most interesting examples of superficial—and sometimes that is enough—acceptance of another culture was an experiment by Boas. I hope I am telling this story correctly. Anyhow, I tell it to illustrate the point.

Professor Boas was one of America's most delightful absent-minded professors. He was just grand that way. He might stop lecturing before his class and apparently look for a handkerchief, go out in the cloakroom where he left his topcoat and about three months later Columbia would get a cable from the Philippines, "I found a new tribe. Please send me \$4,000." He is an anthropologist. He studies people.

In 1891 or '92 or '93, he studied a certain school district in Brooklyn, and he found the children there short, with round heads, black, glossy hair, big upper lip, blue eyes, playing Irish games, using Irish oaths, swearing by the Irish saints; in other words, an Irish community.

He was there in 1923, which is quite some time later. He had a lecture in Brooklyn and decided to walk back over the bridge, talking to himself as usual, "I have been here before. Yes, I have been here before." He kept that up for a while. He passed a school building and said, "I know. I remember, the time the British fleet had its review in the river opposite the University, the same time as Chicago was having its Columbian Exposition. I must come back and study these children again some time. Yes, I have been here before."

He went back after a few days. I do not know what prompted him, what he lost this time, but he went back. He went back and he found the children short, as before, with round heads as before, glossy black hair as before, two full lips, whereas before they had one full lip, the upper one, and brown eyes—an Italian group—playing Irish games, using Irish oaths and swearing by the Irish saints. In other words, the Irish developed a culture there. They moved out; the Italians moved in. The culture remained.

The point is that we can teach our persons ideas, and they will transmit them from year to year, generation to generation, among the employees that follow them, but that is superficial. It helps.

But, I am telling you, in case of strain the individuals tend to react according to their ancestral pattern.

Divided Loyalties

Now we come to the major point of this morning, the illustration of divided loyalties. We have already said that persons cannot decide well when things are unpleasant and they have to decide one against the other.

To explain divided loyalties, I think I will give you a few examples. A rather nice man was widowed and continued to care for his mother, who was a sweet old lady who had nothing the matter with her. He continued to care for his daughter who was now a second year high school girl. Then came a financial reverse, inability to earn as before.

He had either to put his mother in an old folks' home—and she had not broken down mentally—or he had to take his daughter out of high school and deny her her future, although she was bright enough to get through high school and have an ordinary future. What to do? No one had given offense. He had divided loyalties in his heart; he had to decide one way or the other, and he could not.

Another case of divided loyalties. A man had been working for some \$17-something a week as a trucker's helper, and then in time became promoted to be a trucker and was earning \$34 a week, which is just twice as much. Well, he could fulfill his life's ambition now. He bought a car, an old car, I do not know why truckers have to have cars. (I know the greatest problem in the life of a physician is how to keep out of his car. If we could stay out of our cars and walk more, we would live longer.) Anyhow, he bought a car. It had been his ambition for years.

Then, within a few weeks, he came to the boss and said, "I got to have a raise."

"You just had a raise, you got double."

"I have got to have a raise."

"Well, why?"

"Got twins."

Now his divided loyalties, "Shall I keep the twins or shall I keep the car?" His boss frankly told him to sell the twins. I don't know that I agree.

Divided loyalties: There was a very dear friend of mine born in Germany, educated in this country, who visited back home at times. He was and is a very fine, high grade man. Then for three years, 1914-1917, Germany was at war with the Allies, and the United States was not in the war. The poor doctor had a case of divided loyalty, "Where is my loyalty, to the Germans or to the Americans' viewpoint, though we are not in it?" It was tough going. We helped him to decide one way or the other; he became pro-American; whatever America is for, he should do. We went into the war, and he became a U. S. Army officer and was a very successful one.

He came to me one time and said, "Now I am in trouble. They want me to go down to Carolina where there is a prison camp for German officers and take care of them

because I know their culture and their idioms. Shall I go?"

I said, "No. You have settled the question once. It took you three years and pretty nearly wrecked you. Do not reopen it. Do not place yourself where your loyalties can be divided and pulled by them and pulled by us, and so forth."

He has thanked me for it.

Divided loyalties: A man got divorced and married again and misses his first wife some in some ways. I recommend that, when persons get divorced, they get 100 per cent divorced. In fact, I sort of like this 100 per cent proposition. I know a lot of folks that are not 100 per cent unmarried until they get married, and persons who are not 100 per cent married but they try to fraction it. Their loyalties are divided.

Here is a girl who is semi-engaged to two men. Each one has certain fine advantages. She has divided loyalties; she does not know how to make up her mind.

A very dear lady, one of the sweetest persons on earth, said to me, "When we got married, I became a Republican and my husband became an Episcopalian." Then, in all sincerity, and I do not think she thought she was funny, she said, "I would like to vote for a Democrat just once, because I think there are good men in that party too."

Well, anyhow, she settled her divided loyalties between her husband and herself on these two issues. So, we have many cases of divided loyalty.

The conclusion is that human beings, as we are brought up nowadays and trained by our homes and in industry, are not trained to be decisive. We are not trained in what I call character, meaning decisiveness, nor are we sufficiently trained in mental self-discipline.

Is it not silly? There is a tendency for persons to believe what they think instead of believing what they know. They may think fearfully and then they believe fearfully, or they may think wishfully and then they believe their wishes. In either case of course they get into trouble, because they are not strict in their self-discipline. It is important that persons think according to the facts. Facts are ugly and facts are hard to get along with, but you can get along facing, recognizing them.

No one is going to incur a breakdown if

he thinks according to the facts of life, instead of semi-paralyzing himself by his fears or falsely enriching himself with wishes with consequent disappointments. Thinking factually means there is no need for making comparisons. You do not have to compare two things; in fact, the bright people do not compare things as they are with things they fear or wish they were.

You ask a woman who has a son and daughter, or several sons and several daughters, which are better, boys or girls? She has never compared them, so she can not answer. She says, "Do you mean in the matter of expense? I think boys are. They have more demands. If you mean expense for clothes, girls are," but when you size them up, by and large, which are better, she does not know. In other words, we do not have to compare. We can think facts, boys are this way and girls are that way.

Ambivalence

Going back to this point of ambivalence, because we take an opposite attitude towards a thing, (one in the subconscious mind and one in the conscious mind), there is a tendency to turn against propaganda or education which nags at us, or persons who nag at us. I think you know the definition of nagging. Nagging is talking negatively about the same thing for over two weeks at a time.

Because of this ambivalence, there is a tendency to easily turn to the primitive, which I have just mentioned, and none of us are too mature. We are none of us too well adolescent. We are not too mature nor well adolescent, when we are out of our orbit.

When we get out of our orbit, we are apt to show embarrassing immaturities, hurtful immaturities. It is because of this that mass suggestion has its good and bad effects. If you can get a person out of his orbit, out of his routine, and get him to come to a meeting of a certain kind, and so on, and gush over him a little bit and appeal to the primitive in him, he is quite apt to react in a primitive way.

Now this getting him out of his orbit may be done for his benefit or be done for some selfish benefit of exploiting him.

Again, on this ambivalence, this thinking in opposites, this being contrary though we do not want to be, is rather characteristic

of our thoughts at those times when we are half sick or not quite convalesced.

Now, most persons find thinking very difficult. I believe it is probably one of the hardest tasks that human beings assign to themselves, and it is almost impossible for the average person to think a thing clear through. I doubt if we can do it, and I know we are all too lazy mentally to try to do it very long. We do not discipline our minds.

Let me give you an example in your own life. If you think it is easy to think a thing through, and I say it is hard, try this experiment. Suppose that you had not married the person you did but simply broke that engagement and married the next person who came along. You do not know what your life would be like. Think that through. I will give you a hundred years. We are not able to think complex things through. That is simple. You know what your life is since you got married, your assets, liabilities. What would it have been otherwise?

So, I say people tend to turn to the primitive. What can we do about it? We should train people to trust their leaders who are specialists, if those leaders are well intentioned, and by "well intentioned" Hulbert says they do not hurt anyone in carrying out their ideas.

Loyalty up! People must be trained to be loyal to their leaders. Loyalty down! Is it not unfortunate that sometimes some of these hurtful agitators are so loyal down to their gang? They gush over them and we do not. In fact, here is a meeting, maybe subversive, and so on, and some workmen go to that. Here is a safety meeting over here. When they come to the subversive meeting, everybody pats them on the back, and says, "Gee, you're a grand guy. Have a drink," and make much of him. When he comes to the safety meeting, we say, "Be sure and pass in a card." That is the welcome he gets.

We have to be loyal in order to get loyalty, so the men know we are loyal to them. Loyalty down! I think I spent half the time, when I was in the Navy as an officer, getting hospital corpsmen out of trouble; often they were on the verge of a court martial. I had to be loyal to them when we were at sea. You can not hire and fire at sea, you know: you have to make the most of what

you have. You cannot hire and fire yourself—the same idea. You have to make the most of what you are and what you have.

Loyalty down! I will say I was loyal down to those men, especially my own little coxswain. My duty was to take care of three hundred insane in case we were torpedoed; after that, to try to take care of me. My small boat, in charge of this little coxswain, was to be on the starboard side aft, and after I took care of my patients, I was to swim over there. I hoped he would be there. Was I good to him, getting him out of his scrapes? Loyalty down! You bet.

Loyalty Does Not Imply Hate

Now, some people get the idea—and this is erroneous and we must correct it—that loyalty to your group means you must hate some other group. No, just because you are a Methodist, you do not have to hate the Baptists. You can be loyal Methodists without any kind of hate. The intelligent person—please understand me—hates, yes—hates circumstances, not persons. Primitive anger is personalized and wants to destroy; civilized anger is what we call determination to hate a situation and correct it and get over it and stop it, like we hate these accidents that mutilate so many fine people.

I do not know how you are going to define the word "criminal." Believe it or not, I am an editor of a law journal, the *Journal of Criminal Law and Criminology*. In our editorial meetings I have never heard the wise men define a criminal. You can make your own definition. I think a criminal is a person who is willing to hurt someone else for his own gain. That makes a person a criminal. There is also the super-criminal, a person who desires to hurt, because of his hates.

A person who has a lot of anger in his system is a very dynamic person to be sure. I maintain that the greatest criminal of today is the most hating man in Europe; his rages are historic and umbrellas will not keep you dry nor protect you from them.

That is Point 3 in this philosophy, that we should be tolerant of other persons and not hate them just because they are different. Hate infections, hate pneumonia, hate cancer, hate iniquities, yes, circumstances, but do not hate people unless they are hurters.

Social Instinct

My next point is the social instinct. Groups always welcome new individuals. Groups always welcome new individuals! I want you to say that often to people. They need to be told. Of course, groups must welcome new individuals, or after one of that group's generation it would cease to exist.

Now, this welcome lasts or endures only as long as society's eleven requisites are met. This group-welcome endures as long as the individual is agreeable. An agreeable person is one who agrees on all unimportant things, at least, and tends to agree in principle. Second, welcome persists as long as the individual conforms in action, acts as he should, acts as the others do. A fine example of that was a man, a friend of mine, named Mack, who moved from Oak Park to Virginia. The day he got there he became a Democrat. Three years ago he came back to Oak Park and instantly became a Republican. He conformed to the pattern of his group.

The welcome of society for the individual endures as long as the individual is respectful of authority and of the preferences of others. I think one of the definitions of a gentleman is, "He respects the preferences of others"; and as long as the individual is respectable. You can make your own definition of respectable: one person defined it as "not misbehaving publicly." I would say not excusing in advance his own mistakes. I would say a respectable person does not neglect his hygiene. I would say a respectable person is one who is stricter with himself than he is with others. I would say a respectable person does not indulge himself in too many eccentricities, who is moderate and not extreme.

Going on, this automatic welcome which the group extends to persons is enduring as long as the individual is decisive, takes a strong stand on things, but it is a thought-out stand, not an opinionated stand, i.e., not jumping to conclusions. We can rely on persons who take a certain attitude. We know they mean what they say.

As long as the individual is lucid and is understandable, he remains welcomed. Unfortunately a great many persons who can otherwise think fairly well do not think very well because they indulge in wishful, anticipatory thinking. They rehearse to themselves in advance: "What am I going to do in

certain circumstances?" When the time comes, they stammer and blush. It doesn't pay to be anticipatory emotionally, to think in advance wishfully. It spoils later teamwork.

This welcome endures as long as the individual is useful. To be useful, an individual has to be strong, as strong as he can be, optimum not maximum strength, through hygiene not through iron pills; strong enough to carry a load, not to be carried by the group. Nothing annoys me more than when I am head of a group, like commander of an American Legion Post, than to have some guys just pay dues and not be able to get them to serve on committees. I would rather pay the \$5.00 back and say, "Join some other Post. I want a group of reactive, useful persons."

The individual must be productive; he must be reactive. We do not like the inert, the passive, the old stone-face.

The welcome lasts as long as the individual permits self-expression, by himself, by others, by other groups.

Welcome lasts as long as the individual does not hurt. There are many implications of hurt.

Summarizing: Groups welcome automatically. The welcome endures as long as the individual agrees, conforms; is respectful, is respectable; is decisive, is lucid; is useful, is productive; is reactive, and permits self-expression by self, by others as individuals, by his group and by other groups; AND DOES NOT HURT.

Loyalty Up and Loyalty Down, Loyalty to the Rules

My twelfth point of these fourteen this morning is that loyalty up means that the individual is willing to follow the rules. Loyalty down means he is willing to help others follow the rules, and loyalty to himself means that he will follow the rules, such as safety rules, when he is not under supervision.

So, we must train and educate our people in loyalty before we can trust them to fol-

low the rules when they are alone or away or unsupervised. That ties in with that basic philosophy which you can use in your various plants.

Groups Resemble Individuals in Health or Sickness

My thirteenth point is that groups can be sick and discouraged and reckless and disharmonic. In other words, groups can have a neurosis just as an individual can be discouraged or sick or reckless or disharmonic or have a neurosis. Why? Because groups are made up of people. Therefore, groups will have the characteristics that people have. The treatment for a group neurosis is the same as the treatment for an individual who has a neurosis. Never mind the technique. It is, basically, an adequate physical hygiene. Get them busy and get them outdoors and make them sweat. Second, mental hygiene, strict self-discipline. Do not be discouraged, because groups can have a neurosis and they can get over it. A great many groups can be well, can be extra well, can be courageous and, at the same time, hateful. They can be in well integrated harmony with themselves, from the same causes that an individual can be superior, because they have a sound core, sensible and understanding head, and strenuous, energetic activities.

If we could make our working people work their bodies harder, either at work or when they are off work, we would not have so much trouble. It is so healthy to sweat.

Integration

My fourteenth point is that I am trying to tie together our first two lectures in this. Tomorrow, as one person said, is going to be the jackpot. I said, "I hope so." These lectures integrate; they interdigitate, not just with themselves, but if what I am saying is sound or, in so far as what I am saying is true, then this expression of our nebulous ideas, that I am trying to put into words for you, will fit in, will interdigitate, will integrate with your own knowledge and your own experience.

LECTURE IV

Personality and Its Modifications—Habit Patterns, Adult Education, Its Techniques and Its Limitations

We must not make mistakes in technique in modifying others. Practical psychology is an excellent offset against heedlessness and indifference.

Habit Patterns

First point: Because of his constitution and personality factors—and those were graphed in our first lecture, in considering the things that add up to make personality—every individual tends to have his own pattern or his own way of doing things or reacting.

If he is constitutionally slow, his pattern may be carefully deliberate and cumbersome; or he may be the opposite, or can be described in any number of ways. But each individual tends to follow his own pattern. This habit pattern is extremely hard to change.

Education

It is easy to develop new habits. It is easy to train a person into new habits, if there are no resisting ones to displace. I can restate it—re-education is vastly harder than education.

Education is slow. Adult education is slower. Adult re-education is slowest.

I urge you, then, to be very patient, and yet to be very persistent, and to repeat your educational training as often as necessary. We will take up some of those points on repetition in a moment.

Needs

I have tried to indicate to you that there are various men who need various educations, because they come from homes which have not trained our men for the particular industries in which these men are placed, exceptions, of course, being where the son follows his father's footsteps.

Our men come to us untrained in the personality traits which are necessary in an industry, just as much as they come untrained in manual skills and dexterity. I tried to indicate to you that there is some

limitation in the capability of persons; that they cannot all learn equally well because they have different personality factors in their makeup.

Leaders' Morale

My next point is to keep you from being discouraged, because if you lose your morale in your training of persons in safety, the whole department is greatly weakened. You must not get discouraged. And I have said that one of the things which discourages us and leads to disappointment is over-expectation. We tend to expect more of a person than that person can ultimately deliver.

Limited Educability

So that you may not over-hope, over-anticipate and over-expect of a person, let me describe a few of the many types of persons who have definite limitations in their educability.

We have the "no" man—the opposite of the "yes" man. Whenever we present an idea to him, he says "No," and if he is your superior that makes it tough. These people find fault with an idea, say it is not practical, it is too expensive, they do not see how it can be worked out, etc.

Now these persons who tend to say "no" before they say "yes" are, as a rule, persons of limited educability. They really cannot learn new ideas easily, and they may not be able to learn them at all. Just because they say "no" does not mean that your idea is bad. It might be or it might not be—probably it is not—but it means that they are not able to grasp these new ideas.

The smart person tends to say "yes" in principle to all new ideas, and then says, "Let's study it further." He considers the pro's long before he considers the con's. He adds all the pro's up together, and then he adds in his contra-ideas and things against it; then weighs them, and maybe votes "No."

The highest type of thinking is called by

the lawyers (and I do not like their conceit at all) "judicial thinking." I believe the highest type of thinking is called "scientific thinking." (Our conceit.) The highest type of thinking is technically the ability to suspend one's final judgment until all the data are in.

The ability is to suspend final judgment, but in the meantime—until we finally make up our minds—we have to have some ideas to work on. When a patient comes into a hospital, he is not immediately diagnosed but is given what is called the working diagnosis. Then after the X-rays are taken and the laboratory and clinical tests are made, the final diagnosis is made and the patient is treated. When he leaves the hospital, he comes out with a discharge diagnosis, the final diagnosis. But if a person does not have a working diagnosis when he comes in, he may die for lack of any kind of treatment.

So when a new idea is presented to you, you should form a working opinion on it. It need not be final; you can vote it down later. I want to restate this. The smart person considers the pro's at some length before he considers any of the contra-ideas.

Another type of person is the inelastic-minded man. His mind will not stretch to include any new ideas. He may be a good man. I know of a case, a carpenter, who was "set" in his ways, and you could not teach him anything new. As he grew older and a little more "set," he began to have a very bad record. He would not permit guards on his ptise, and so on. You cannot teach that type. I would like to put them all on an island—maybe the Canadians would lend us the Thousand Islands. I could fill them, couldn't you?

Then we have another type of man who cannot be educated very far—the man who has complexes. I will tell you how you can identify a complex. It is like a mine in the North Sea. You can always differentiate a log in the water from a mine—the mine explodes. When you touch on a person's complex, you get an over-emotional reaction all out of proportion to what was talked about. If you know a person with a complex on this or that, I would advise you to go around it. You cannot modify him in that respect.

Other persons whose limitations of ability are well recognized are those who are dull

or weak or asthenic or anemic, or whose heart or kidneys are not functioning well.

Another group takes in those who are tense and anxious, depressed, and irritable—usually from domestic causes.

Another group, and the group we first recognized out of all these groups, is composed of persons with low "I. Q."—intelligence quotient. If, for instance, a person could not get farther than the sixth grade in school because he could not do long division, you have a right to suspect him of being feeble-minded and mentally deficient, and you cannot educate him. You can only train him.

Mental Digestion

We realize that the human mind cannot digest and assimilate ideas as well as the gastro-intestinal tract can digest and assimilate foods. The mind is the weakest part of our whole body; it is the most recent in the history of evolution. The mind differs from the gastro-intestinal tract because it has no refuse disposal system; therefore when wrong ideas get in the mind, they tend to stay there. That is why we must not make mistakes in dealing with other persons, because mistakes have to be paid for—they cannot be eliminated. The intent may be forgiven, but the debt from error must be paid and paid and paid.

Rule of Thumb

My next point is an unpleasant one to many people, and that is this: About one-third of the people you meet are of what we call "rule-of-thumb" type. They want an exact rule on this and an exact rule on that. They are not able to grasp principles and apply the principles to the immediate case; they want a rule for it.

They are very disappointing people. They tend to abide by the rules faithfully. That is why we have rules, and that is why you should have rules for your men.

When persons are half sick or half convalesced, then about half of all people become "rule-of-thumbers." And when we say that one-third of us well people like the rule of thumb, and it includes sick as well as the well, we can see where two-thirds of our people want specific rules.

These "rule-of-thumb" people want the last word only, just as a lawyer wants the last decision from the Supreme Court. The lawyer does not want all the previous de-

cisions and rulings, he wants to know the law—the last word. So for your rules' sake, do it this way: Never mind putting in "Don't do it this way or the other way"; don't say "There are several optional ways"; say "Do it this way!" That is the way they want it.

To "do it this way" is pretty hard for the "rule-of-thumbers," so I want you to break down the job into its various steps, and have your rule on each step: "Do it this way."

Adult Education

My next point is the one that some of my personal friends have asked me to enlarge upon a bit—practical hints on adult education, which I have grouped under A, B, C, D, E, F, G and H.

A. The capacity of the human mind is only 14 ideas relative to one thing. Fourteen points bearing on one topic are as much as the human mind can hold. If you have 16 or more or endless number of points, they will get confused. That means, gentlemen, that in your safety work, although you may have subordinate points, you will have to study out for yourselves the 14 points of safety in this factory, shop or whatever. You can teach those 14 points over and over for three years or whatever, but you must not add in any 15th or 16th. You must confine your safety instructions to 14 points. You may have subordinate points if you wish.

Now a smart lawyer realizes that the capacity of the human mind is 14 points; and if he is talking to a jury, a smart lawyer will say something like this: "Gentlemen, our case rests on the following points: 1. (and he names the point and does not discuss it), 2. (he names the point and does not discuss it), 3. (he names the point and does not discuss it), 4. (he names it and gives it a paragraph), 5. (he names it and gives it a paragraph), 6, 7, 8, 9, 10, and on up to 14." He names each and gives each a paragraph. Then he comes back to Point 1, renames it, and gives it many paragraphs. He renames Point 2 and gives it many paragraphs, Point 3 the same. Thus after covering all 14, he says "And on those points, gentlemen, our case stands or falls." Of course if he is talking to the judge, he can give the judge 4 major points and 10 subordinate points, but it still adds up to 14—the judge belongs to the human race, too. So you may have three or four major

points, but the sum total must add up to 14. Do not go beyond that.

I recommend further that you do not teach more than one of these points at any one time in dealing with your people, unless they are the kind of people that we are here. Give them only one point a day; one point a week is plenty.

B. The same point must be taught 7 times over, because the human mind does not fix into itself the ideas that it is receptive to until they have been repeated for a total of 7 times. Now in teaching these points 7 times over, you ought to use 7 different methods. One person I know is accustomed to using signs around his plant, and he is right, it is one of the 7 ways of teaching these points. Another person is keen on giving orders, another likes personal instructions, another is strong on rehearsals, and these are all good. Use your own imagination in the matter of the 7 ways you are going to teach each point. I would say that it is disadvantageous, in general, to teach the same point oftener than once every two weeks.

C. In adult education, where you want to get a result and not just have a dispersing of information—where you want to get things done and get a result—it is best done in small discussion groups of from 11 to 15. With more than that, they begin arguing; one says "That reminds me of an experience in Pittsburgh," and someone else says "That reminds me of an experience in a factory in New Orleans," and so on, and when they get to reminiscing, they are not on the topic you want them to be. They are lost. You can hold a group of 11 to 15, but you cannot get unanimity of result or action in groups larger than 15.

Now take our local or community Safety Councils. Take some city where we have none. I do not know any cities where we do or do not have them, so we will just pretend we are talking about Milwaukee. I was there three days ago. In the conferences to organize a Community Safety Council in Milwaukee, do not have over 15 men. Have about 11 at your first meeting. At your next meeting, have 11 or 15, not identically the same persons, but with some going from one batch to the other, and have an executive committee when you are through that comprises a small number, around a dozen. Too large or too small a committee does not work right.

D. In these small discussion groups or educational groups, it is very important to speak lucidly and to use words which will convey your meaning—words which have the same significance to your listeners as to yourself. That, of course, is the great failure in all our inter-communication. For a nation of bright people, we do not get along very well because we do not understand each other.

Semantics is a word which I think is simply an overcropping, again, of the mother lode of logic, but the men who are doing pioneering work in semantics say it is all very new, no doubt. If you want to read a tough book on semantics, (I had to read it four times) try "The Tyranny of Words" by Smart Chase. And don't blame me if it is hard, because I told you so. It is a book on semantics, on using words with identical meaning to others as to you. So often we are apt to use the same word to cover entirely different situations. You talk about "faithfulness," which might mean one thing to the auditor of a bank and something entirely different to a troubled wife.

So in your small discussion groups, use words and phrases—or, better still, illustrations—so that they will understand what you mean. And, of course, talk in positive language. Talk in short sentences. Talk with a pause between sentences, or at least between ideas, so that the ideas can fix in their minds. You must realize that the person who comes into this little discussion group to learn has a headache from the din of the world and the din of his memories, which is made worse by the din of the conversation at the conference, and by your voice. Have pauses in your talk, so attention can revive; it will only take the matter of a split second.

E. Talk with them with authority from your knowledge and from your prestige. Often use the word "we." They do not know who "we" is: they do not know whether you mean you, or yourself and the editor of Scientific American, or yourself and the editor of the Encyclopaedia Britannica, or whether you discussed it with your oldest son, but it leads a lot of prestige.

We have a very fair way of handling that "we" question. "We," in medical science, means that the doctors agree on this point. "I" means that I disagree or I am pioneering, and there is no support yet or

there are contradictions from the others in our guild.

Just say "We think so," or "We have found this," etc. Men need to be taught the elements of logic—that X plus Y produces Z. "If you do this and this, you will get this result. Failing to do this, or doing too much or too little, or doing it at the wrong time, will give you bad results." They need logic.

F. Repeat from the basic principles up. Repeat your safety instructions every generation. Now a generation may be assumed to be plus or minus 7 years, on account of turnover. A generation at college is five years. If we did not take in any new students within five years, there would not be a Wabash College, for instance. A generation of the human race is about 18 or 19 years. That is about how often we start having a new crop of babies. A generation in industry is about 7 years. So every 7 years you have to begin from the simplest principles and teach safety. Do it smilingly and do not feel that it is a burden, that "I have covered all this before and now I have to do it again." Do not take that attitude. Schools have a first grade every year. It is an opportunity, and you may even do it better as you go over it every 7 years.

G. Do it pleasantly. That is a good way in adult education, to do it pleasantly. I do not mean softly. Do it with crisp authority, but still pleasantly. Use absolutes when you can. Use figures. When you cannot use absolutes, then of course you can say something like this: "It is certain that if it is done so-and-so, then this will follow," even if you cannot prove it numerically.

H. And here is where some of you differ from me, and I like to differ from you then. Avoid pathology. Avoid the morbid. Avoid negatives. Tell them positives; tell them what to do. I do say that it is all right occasionally to do an autopsy, so to speak, on a social situation where an accident follows, but study the prevention of accidents if you want to focus men's minds on safety. You may have to study the causes of accidents, but do not teach the causes of accidents to your workmen; teach them the causes of accident prevention; teach them the causes of safety.

We know that the human mind will think about what it hears, and we know the human body will do what the mind is thinking.

about, so it is best to tell them what you want them to learn. Then they will follow safe procedures, and they will tell others in their squads, etc.

But teaching them, gentlemen, does not quite complete the point of the subject. There is the duty always on you to ascertain if your men have learned what you have taught them. It is good procedure to go through the shop and see them and talk to them, and see if they have learned.

I want to reiterate the A, B, C, D, E, F, G and H which I have just outlined to you.

Tell most men that "this is the one best way to do this maneuver." Do not tell them "this is a good way to do it." Help them do it best.

Convictions

My ninth point is that 85 per cent instruction on any point is enough to give a man or men. After you have gone over 85 per cent of the procedure in educating them, then ask them how to perfect and finish the maneuver, and you will get the nicest results. You do 85 per cent of their thinking for them. You transfer that thought to them, then you get them to do 15 per cent more. It doesn't have to be the highest 15 per cent—it can be the remaining 15 per cent—but in each case the man reaches the conviction that "this is what I thought out; the foreman and I were talking this over, and we worked out a darned good plan on this." He will carry out that plan because he has the conviction that he has added to it. Do not tell him you let him figure it out.

Conviction—people like to explore, like to experiment, and we should let them, with great caution. Let them make some decisions on how to finish a thing, and as they make decisions, they develop business character, character which is an asset.

Oxygenate

Ten. In the meeting with your small group of a dozen or so in your adult educational conference, please use your eyes—e-y-e-s. Look them over. Look at their color. Look at their faces. Look at their eyelids—are they a bit droopy? Look at their chests—are they sitting humped up, or really breathing sometimes? And if they are sitting shallowly, and not breathing well, if they are a little bit dopey, they may get a bit sleepy. Somehow or other, get more oxygen into them. There is no tax on oxygen, it is

the freest thing there is. Give them some coffee, not food. Coffee will wake them up. Or put a pencil and paper in their hands and borrow the pencil back. They are holding the paper, wide awake, and in the back of their mind are wondering what it is all about. It works—no fooling. Get men who are slumped over to go to the blackboard, if you have one in your room, and show just in relation to the factory driveway and the fireplug where this happened. You know, and the rest know, and he knows, but he will come back wide-awake.

Get oxygen into them. They will learn more; they will like you more.

To Talk Is to Believe and Remember

And in this conference, my next point is to get the man to talk. I hate to use the word "recite," but yet that is exactly what I mean. Get the man to recite. We have learned that persons believe what they say. Get me straight on that, however—they do not always say what they believe, or we would have a lot of trouble in life if we all said what we believed all the time.

But if a man says something—if you formulate his nebulous thoughts and crystallize them into a statement, and he issues the statement—he will believe that thing from now on. He will remember it, also; it is a part of his life. It is an integral factor in him, provided that he is formulating his own thoughts on the subject, and provided that he is responding to his own thoughts.

That is not true if you provoke a man to say something. If his statement is a reaction to your stimulus or provocation, then it is not an integral part of him, and he may or may not remember it. He may remember it in a distorted fashion, and act in a distorted way. No, my point is to get each man to talk—and in my heart I mean to recite—his thoughts on this thing as we go through the hour and one-half discussion period. An hour-and-a-half conference with this dozen men is the right length of time, if you stop in the middle of it for some coffee, as I said.

Summarizing a Session

In summarizing a session in this adult education, you tie it all together. All that has been said at the meeting has to be summarized, and they look to you for that. And if you possibly can, gentlemen, give them something to take home—something tangible, even if it is a pamphlet on the

same thing worked out by the California Bell Company and you represent the Illinois Bell Company. But give them something to take home that can be a nucleus for their thoughts.

In the summing up, it is important that you not only summarize the conference and tie it together, but that you tie it to something basic in the philosophy or code of your company, or some philosophies of their own. That is, you can say "This is in accordance with what the Church teaches," or "This is in accordance with the views of the American Legion," etc. You have to tie it to something that is already a landmark in their lives.

Duty to Anticipate

One of the safety points that we can stress (and now I am going to offer you one of the 14) is that it is the duty of everyone to anticipate. That is a legal phrase—the duty to anticipate. Having anticipated, it is your duty to react.

The Illinois Supreme Court says if you are driving down a boulevard and you see a green light at the next crossing or a block ahead, it is your duty to anticipate that it may turn yellow, or stay green. It is your duty to anticipate that the pedestrians may not wait but may start ahead of time. It is your duty to anticipate that there may be traffic coming from the right or left. The Supreme Court is always three or four taps behind. Things well established, they accept, and things frivolous never reach them. I have the most respect for the law, probably, of all the professions, in its better moments.

In this reaction after they have anticipated, they must not think wishfully and they must not think fearfully. Those are two big mistakes that people make. That is one of the 14 points, gentlemen. You work out the others according to your needs.

Group Conclusions

My 14th point is that group conclusions,

like group emotions, are safe and sound and trustworthy. I think that we can trust people when they think I know we can trust people—groups of people, masses of people—when they think factually, according to facts, and not wishfully nor fearfully.

Avoid Pre-Details

You must not lay out your 14 points in too great detail in advance. You cannot say to yourself, "Well, I'll have among the men in our plant 60 hours a year to spend on safety, and I will use 13 of them on floor safety," etc.; with your infinite (only it isn't) present wisdom, you cannot outline a whole year's program. You had better teach safety and find out what they have learned. If they have not learned, go back over that. Have a vague plan of time, but have a definite plan of points you will take up.

L'Envoi

Now in closing, I want to express to you my appreciation of the invitation of the Council and of all of you to present some gleanings of psychiatric understanding of human nature—things which are normal or normalizing. It has really been a high honor. I have met quite a number of you, and I admire your personnel very much, as well as your goals.

Perhaps because people may be a little bit shy or diffident, I can possibly express something which you feel but do not feel free to express. I must quote from "A Child's Definition of Love." "Oh, see the beauty of this beautiful thing! I own it more than anyone else owns it, but I can somewhat share it."

Unimpaired strength and unimpaired health, therefore, are lovely and beautiful. Accident prevention by all means—mechanical and psychological—contributes to America's finest. It is a noble effort, for our present and for our future, to have unimpaired strength and unimpaired health, which the individual owns more than anyone else but which he can somewhat share.

ADJOURNMENT

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Safety Belts

THURSDAY MORNING SESSION

October 10, 1940

The session for the discussion of safety belt problems was called to order by the Chairman, W. P. Yant, Director, Research and Development, Mine Safety Appliances Company, Pittsburgh, Pa., and Chairman, Steering Committee of Research, A.S.S.E.-Engineering Section, National Safety Council, who presided.

The discussions were planned as a symposium, to meet the wishes of Council members who desired information on the construction, installation, use, maintenance and methods of testing various types of safety belts, anchors and terminals. The Chairman, after a few brief comments, introduced the first speaker.

Safety Belt Anchors—Design, Quality, Placement and Maintenance

By J. L. MANES

Safety Director, Sun Oil Company, Dallas, Texas

When an employee falls from a derrick to his screaming death, immediately the safety department, the supervisor, and the management make the statement: "If he had only used the safety belt, this would not have occurred." Rarely is any mention made of that most vital link which connects the belt with the derrick, known here as the tail line anchor.

When safety belts are mentioned, where do you associate their use in the derrick? Possibly your thoughts were the same as mine—that their only use is on the tubing, thribble, or fourble boards. Yet, the records show that most fatal accidents, due to falls, occur during periods of rigging up and tearing down the rigs.

In an effort to determine the causes of these fall accidents, a survey and personal contact was made. From 133 superintendents, foremen, engineers, gang pushers, and drillers, representing two thousand years of experience, we found the following:

1. That in drilling, and in some production operations, two and three men were required to work in the derrick at the same time, and invariably only one safety belt was provided.

2. In some cases, safety belts were provided, but not used.

3. In many instances, the tail line was not even tied, and, in questioning the worker, he stated that, being in one part of the derrick only a short time, it was too much trouble to tie and untie.

4. Without exception, every tail line used was the manila rope type.

5. We found belts in some cases which had been in use for as long as 14 years.

6. Last, but by no means least, the care and maintenance of the safety belts and anchors were given only a passing thought.

A study of our findings convinced us that a change was necessary in our tail line anchors to make them more adequate and flexible to meet all requirements and situations.

Unquestionably the greater number of problems encountered were in the design. We realized the necessity of standardizing on our tail lines as to length, convenience, adaptability, elimination of cumbersome-ness, ease of inspection, and something in which the worker would have confidence. Many of the supervisors and their derrickmen were reluctant to change from the old

method of using manila rope tail lines for all purposes.

On one occasion, a man was seen ascending a 122-foot derrick with 26 feet of the one-inch rope tied to the safety belt, swinging back and forth. On another occasion, we observed a man going to the top of the derrick to land a crown block with 22 feet of one-inch rope tied to safety belt and wrapped around his waist. To overcome this problem, it was decided that a wire cable seemed to be the solution. This is a $\frac{1}{8}$ -inch 7x19 tinned steel aircraft cable. Each end of the line is braided around a steel egg-shaped thimble and soldered with a steel snap hook at one end and a $\frac{3}{4}$ -inch by 2-inch steel ring at the other. They are easily attached and detached, and can be made into varied lengths for any place needed in the derrick.

It was found that steel cable was not desirable for all purposes. For tubing, thribble, and fourble boards, we designed a one-inch three-strand manila rope, 14 feet long. This rope is braided around the steel eye through the D-ring of the safety belt. The specified length of 14 feet eliminated the hazards encountered in climbing with the extra long rope. It also allows the worker all the freedom needed in performing work on each side of the derrick. Where extra rope is allowed, the worker will tie the rope near the end, leaving 8 or 10 feet of extra slack lying directly behind him on the boards. Extra slack in tail line anchors presents serious hazards.

At the time of the survey, I was told of two fatal injuries occurring in the same company one night apart. The travelling block caught in the slack of the tail line anchor, jerking the man from the board, breaking the anchor line, and allowing the man to fall to his death on the derrick floor.

Selection of the proper material was our next problem. Our object was to design a tail line anchor that was lighter and easier to handle, yet we did not want to sacrifice any portion of the safety factor. The wire cable decided upon is a $\frac{1}{8}$ -inch 7x19 tinned steel cable with a tensile strength of 4,200 pounds and weighs $6\frac{1}{2}$ pounds per 100 feet. A number of breaking tests on this particular cable show a breaking point of 4,600 pounds.

The standard steel snap hook and the $\frac{3}{4}$ x2-inch steel D-ring each are rated at 2,400 pounds test.

The 1-inch 3-strand manila rope has a tensile strength of 8,200 pounds and weighs 27 pounds per 100 feet.

No doubt, many are wondering why use tail lines of two different materials and three different lengths. It is impossible to design an anchor line which will serve all purposes. The location of the derrick where the work is to be performed is the factor which determines the material and length to be used.

The 1-inch manila rope is used by derrickmen working on the tubing, thribble or fourble boards because the men say it is easier to hold onto while leaning over the boards to rack pipe or tubing. It is also used in the crow's nest, when rigging up or tearing down. Usually the third man is necessary in landing or taking down crown block and in "stringing up." In this operation the tail line is anchored to the cross bar of the gin pole.

The 8-foot wire tail line is used by the second man working in the crow's nest and is anchored to the cross bar on the gin pole at opposite side from where manila rope tail line is attached. It can also be anchored to derrick girt, brace, or leg, by either passing snap end through ring of tail line and attaching to belt, making an 8-foot tail line; or passing snap through steel ring of belt into ring on other end of tail line, making it endless and reducing the length to 4 feet.

In some cases the 8-foot wire cable may be used at the same locations mentioned for 1-inch manila rope; either tail line used is to be anchored in the center of angle iron girt, one girt above the board on which the man is working.

When three men are sometimes required to work in a derrick when "rigging up" or "tearing down," the "third" man is required to work just under or below the water table, assisting in passing the winch-line or cat-line from below the water table up to the men working above and then assists in pulling the line back to the derrick floor. He is also in the derrick installing light-wires, or assisting in landing the mud-line stand-pipe. For these operations a 5-foot tail line is furnished with a snap hook on each end which can be anchored at any point in the derrick where the man may be working.

This line is also used on rod boards and stabbing boards; for use on the rod boards the tail line is anchored to the first girt above the rod board, when it is used on the

stabbing board the tail line is made endless around safety line assembly which stretches across the derrick from girts immediately above the stabbing or swabbing boards.

There are some who question the necessity of using safety belts and anchor lines while working on top of the derrick where they are protected by a run-around. The following accident will show clearly why we have included the top of the derrick.

In March, 1939, at 11:30 a. m., a married man, father of two children, was killed when he fell through the top of the derrick. He had gone into the crow's nest on top of the water table, preparing to lower the crown block. He had wrapped the cat-line around both sides of the one sheave block. As he was the only one in the derrick, our conclusion was that he knelt down, or was in a squatting position on the I-beam of the crown block or I-beam of the water table, bracing himself with one hand, and reached under the crown block with the other hand in an effort to get hold of the loose end of the cat-line to complete tie on crown blocks. It is virtually assumed that the right hand, which was bracing him on the lower part of the I-beam of the crown block slipped off, leaving him in such a position that he was unable to catch hold of anything with his hands. He fell headlong to the ground, falling between the crown block and the water table, a space of 33 inches.

The life and condition of the anchor lines will depend upon the care taken of them. We have provided each drilling rig and production gang with a box of 24x24x24 inches for storing, maintaining, and moving safety belts and anchor lines. In some production gangs where a box is not convenient, this equipment is carried in a regular gunny sack. Unless some means is provided and instructions given for the proper maintenance of this equipment, it will be given treatment that will make it unsafe for the work for which it was designed. Recently I observed a gang that, even though instructions, outlines, and information had been given them, was hauling the safety belt and anchor line on the bed of the truck without any protection whatsoever, with a 300-pound floor block bouncing up and down on the belt and anchor line.

Specific instructions have been issued by our executive vice-president that all safety belts and tail line anchors, regardless of condition, are to be replaced after 18 months' use.

The date of purchase is stamped on the snap hook of each safety belt; a record is made by the safety department, and a new line ordered when the 18 months period expires. Other than a daily inspection by the appointed derrickman, we make no other tests.

Important Factors in Testing Safety Belts

By S. V. JAMES

Engineer, Underwriters' Laboratories, Inc., Chicago

What I have to say concerns chiefly window cleaners' belts, but the important factors involved in testing these safety belts apply equally to belts employed by construction workers and others, who require protection against falling while engaged in their routine duties.

The kind of testing I have in mind is that which should be employed in making the preliminary investigation of a belt to determine its suitability for the job. I do not mean the kind of routine check testing which should be performed by the owner of the belt at intervals during its period of service. The kind of testing I have in mind is usually testing to destruction in order to

determine the limits of the strength incorporated in the belt and its attachments.

The logical way to develop strength tests of such equipment is to consider the types of service to which the belt is to be subjected and thereby to predetermine the strength necessary to safeguard the life of the wearer.

In ordinary routine use a safety belt has very little to do and, therefore, is not subjected to any great amount of stress. A window cleaner normally has both terminals of his belt attached to the window anchors and is leaning lightly against the ropes or straps while engaged in cleaning the window. The wearer of a safety belt in con-

struction work imposes no stress whatever on the belt during his ordinary duties. It is only in the case of some accidental slipping that the belt is brought into operation as a protective appliance.

A window cleaner may, for example, step out onto the window sill, get one belt terminal attached, and then slip off the sill and fall. The terminal ropes can usually slip through the fittings of the waistband until the terminal at the opposite end of the ropes is brought up against the hardware of the waistband, thereby limiting the free fall of the wearer. The energy acquired by the man in falling must then be absorbed without breakage of belt, terminal straps or anchors. Neither must the anchors pull out of the window frame.

The heart of the matter is the absorption of this energy so as not to impose too great a stress on the belt structure or subject the wearer to a sudden stopping which will lead to serious bodily injury, even if it keeps him from falling to the ground.

The various ways in which this absorption of energy may take place in the case of a window cleaner's belt of the usual waistband terminal rope construction are:

1. In distortion or bending of the anchor.
2. In distortion, stretching or tearing of window frame, if anchors are fastened to it.
3. In stretching or bending of the terminal fitting.
4. In stretching of the terminal ropes or straps.
5. In stretching of the waistband.
6. In the slipping of the ropes through the hardware or fittings attached to the belt.
7. In the distortion of the body of the wearer.

My discussion of the method of testing belts will be limited to a consideration of the consequences of the first six of the ways, leaving the seventh, namely, distortion of the body of the wearer, for discussion by medical authorities.

Basing consideration, therefore, on the emergency conditions under which a belt is subjected to maximum stresses and strains, some items must be standardized in order to proceed with a workable test method. It is necessary first to know the average weight of the person using the belt. It seems reasonable to assume 150 lbs. as a representative figure. Some window cleaners

may weigh considerably more, but some weigh less and the precision involved in making such tests is to assume a fairly general average figure.

Besides weight of the wearer, the other item of primary importance is the probable distance through which he will fall before bringing the belt into action as a protective device. A study of belts shows that under the assumed condition, namely, with one terminal attached to an anchor and the wearer standing on the sill, he may be expected to drop a distance of five feet before bringing the other belt terminal against the hardware at the back of the waistband for the beginning of the absorption of energy necessary to stop the fall. We shall assume, therefore, these two basic conditions: 150 lbs. weight and a vertical drop of five feet.

Naturally a belt must have a margin of strength over and above the ability to stop a falling weight of 150 lbs. after it has dropped a distance of five feet. We need to make sure that a belt embodies a so-called factor of safety. To determine this we must subject the belt to a punishment greater than that to which it will be subjected in actual emergency use. There are two ways in which we can inflict greater punishment, namely, by increasing the weight of the test load, or by increasing the distance through which the test load is allowed to fall before subjecting the belt to its protective action.

We will rule out any attempt to increase the drop or distance of fall because the falling weight acquires a greater velocity the farther it falls, and this adds some unpredictable complications; and because the greater length of terminal rope or strap required for the longer fall introduces a greater amount of stretching and resilience in the terminal rope assembly, which would unduly favor the performance of the belt, and, therefore, give a false indication of the protective value incorporated in it. Therefore the only thing to do is to increase the load beyond the 150 lbs. which has been assumed to be the weight of the wearer. In testing belts at Underwriters' Laboratories I have followed this assumption and have as a result of contact with other engineers vitally interested in this problem decided that a factor of safety of five is a reasonable test requirement.

This makes it necessary to put a load of five times 150 lbs., or 750 lbs. in the waist-

band of the belt for test purposes. The procedure then is to subject the belt to a load of 750 lbs. dropped five feet. This test must include, of course, the anchor and its attachment to the building wall or window frame as well as the belt structure itself.

I have already pointed out some of the ways in which energy has to be absorbed by the belt and its attachments in order to check the falling wearer. Obviously, the test method must take these ways of energy absorption into account in order that the belt may be given a reasonably fair test. The mounting of the anchor to which the belt terminal will be connected for test purposes must, therefore, be made just as it will be installed in a real building. A section of window frame or, in some types of construction, a complete window frame is necessary for this purpose in order to simulate the real supporting strength upon which the anchor attachment may be expected to depend in an emergency. The resilience of the terminal fitting, the terminal ropes or straps, and the waistband of the belt are of course inherent in the design of the belt itself. The distortion of the body of the wearer, which, in my opinion, is of considerable importance in the study of this subject, can only be approximated and can be introduced by the use of a test load or weight of a nature such that it may be readily deformed in a manner similar to that in which the human body is deformed under the same conditions.

It would be unsuitable, obviously, to employ a test load made in the form of a hollow-steel cylinder having a diameter approximately equal to that of the body of the usual wearer and loaded so as to give it the desired total weight of 750 lbs. Such a test load would not yield or deform at the point of attachment of the waistband of the belt and would, therefore, probably subject the belt to a much more severe shock or impact condition than it would be subjected to with a human body in actual service. An effective compromise was found to be a strong canvas bag filled with small steel balls to a total weight of 750 lbs. It yields and deforms and at the same time is strong enough to withstand the stopping action without failure of the test load itself.

In making the drop test, the method of procedure is as follows: the belt is first placed around the test load and the waistband buckled in place as it would be around the waist of a wearer. The load is then

lifted by a sling surrounding the test bag until one terminal of the belt can be attached to the anchor which has been secured in position ready to receive the terminal. After attaching the one terminal the load is lowered slowly until it hangs by the terminal ropes from the anchor. The lowest point of the load is thereby determined. The load is then raised five feet above this lowest point. A quick-release hook employed in connection with the supporting sling is then tripped and the load allowed to fall freely until it is brought to rest by the terminal ropes or until failure of some part of the assembly lets it continue to fall until it strikes the floor.

I have not had an opportunity to make many tests of this nature, but I have found by experience that it is possible to construct a belt of the ordinary type which will withstand this punishment. Whether or not the wearer of the belt can safely withstand the shock of such a fall is a thing which I have not had and probably will not have any opportunity of determining.

Objections have been raised to this test on the basis that it is unnecessarily severe and imposes upon the belt and the anchor stresses which would not in any way give a real indication of the ability of the equipment as a life-saving device, and that any attempt to design a belt which would pass such a test would lead to impracticably heavy or clumsy construction. If consideration is limited to belts of the usual waistband terminal rope type, these objections are, of course, to be given serious consideration. It is a well-known fact that if energy is absorbed through a very short distance correspondingly large stresses in the materials are required and, therefore, correspondingly large amounts of material must be supplied in order to withstand these stresses without failure.

An obvious method of overcoming this difficulty would be to incorporate some form of energy absorbing mechanism such that the energy would be absorbed through a considerable distance rather than in the few inches available in the usual construction, and thereby subject the materials to a much smaller loading. In this way it might be possible to reduce the total weight of the apparatus so as to overcome the objection of excessive weight and clumsiness. Just how this shall be done, I am not pre-

pared to say. It is entirely in the hands of inventors and manufacturers specializing in this type of equipment.

Briefly summing up the matter, we must base our development of test methods for safety belts upon the emergency conditions of service; we must standardize on our test weight and our test dropping distance; and we must then superimpose a test severity great enough to show a reasonable factor of safety, which we have set at five. The redesign and reconstruction of conventional belts to withstand such tests present problems of considerable difficulty to manufac-

turers, but such a condition does not preclude a radical improvement in design which will take into account the important need for energy absorption taking place through a distance sufficient to permit a practicable belt.

It still leaves unanswered the probable effects on the wearer of being suddenly stopped in his fall, but obviously these effects will be of less serious consequence if his fall is stopped gradually than if it is stopped suddenly as in the usual types of construction.

Safety Belt Materials

By A. S. SOUTAR

Vice-President, R. H. Buhrke Company, Chicago

Basically our experience as a manufacturer has been that the heavy steer leather now used generally for safety belts is entirely adequate for the purpose. Leather has its advantages and disadvantages. Some of the advantages are that leather lends itself to ease of fabrication and good appearance of finished product. When used as a safety strap in conjunction with belts it slips easily on the poles and other materials. It is easily cleaned and can be kept in good condition for a long time with proper care, and when properly cared for it seldom has to be abandoned from a standpoint of wear. It usually is abandoned due to some form of abuse.

Some of the disadvantages are that the average person not familiar with handling leather can easily mistreat it and make it useless for the purpose. I refer particularly to the too rapid drying of belts that have become wet. When the belt is placed too near heat a complete chemical change in the fibers occurs, changing it into a hard crystalline substance which is very brittle and would necessitate abandoning the belt. Also it is subject to deterioration caused by burns due to carelessly handled hot tools or metal. It is easily cut by the edges of sharp metal and also by climber gaffs when used as a safety strap on a pole. It requires frequent cleaning and periodic oiling to keep it in good condition.

Because of some of these disadvantages engineers decided to experiment with a man-

made product into which could be built definite qualities and strengths.

The government had experimented successfully with linen web for parachute work. Originally this was made by the cross weave process of a type of yarn which would establish a breaking strength of 2800 pounds. The webbing being 1 3/4 inches wide and approximately 1/8 inch thick and quite flexible. This provides a breaking strength per inch per width of 1600 pounds. The breaking strength of heavy steer hides usually is established at 3600 pounds per square inch of cross section area, which would give you a strength of 672 pounds per inch of width on this leather suitable for safety belts, assuming we use a thickness of 1/4 inch.

One of the large utilities, having done considerable research work on this belt problem, has established a minimum strength of 650 pounds per inch of width as being satisfactory for safety belts and safety straps; and the reason they established this minimum strength test rather than a cross section area test was because of the fluctuation in cross section area strength at different parts of the hide.

It might interest you to have an idea about the strength of the heavy American steers which we use for safety belts and safety straps on the basis of one inch samples, disregarding the thickness of the hide. In making these tests we select one sample from the shoulder near the backbone, one sample from the middle of the hide about

six inches from the backbone, one sample from the butt near the backbone, and one sample from the center of the lower portion of the back near the break where the belly has been cropped off. These are tested in units of four, one of each of the samples mentioned being cut from a different hide. The average results of 13 tests selected at random having been made over the past three years gives us an average as follows:

From the shoulder: average 852 pounds; minimum of 730 pounds; maximum 995 pounds.

From the middle of the hide 6 inches from the backbone: average 1,115 pounds; minimum of 785 pounds; maximum 1,520 pounds.

From the butt: average 817 pounds; minimum of 670 pounds; maximum of 1,050 pounds.

From lower portion of back near the break: average 1,203 pounds; minimum of 1,010 pounds; maximum of 1,460 pounds.

However we are still faced with the fact that the linen from a purely tensile strength standpoint is far superior to the leather, even in the early development; but now the government has developed a new type of weave and the easiest way to describe it will be to call it a "herringbone weave." This type of weave combined with a special yarn required, produces a tensile strength of 5,000 pounds. The webbing still remains the same size as the early type; namely, 1 3/4 inches wide and approximately 1/8 inch thick, but it is considerably more flexible and this surplus strength over that normally required provides a larger factor of safety particularly where the safety engineer has set up periodical test practices. These tests usually are several times more severe than could possibly be applied in normal usage, but this great strength permits the periodic testing, assuring definite safety to the wearer.

On the other hand, leather is fully capable, when the belt is properly made, of providing the amount of protection necessary. It must be given more reasonable tests. That is, more nearly to the maximum load the belt might be required to handle in use. The reason for this being that extreme tests on leather will have a tendency to stretch the fibers beyond their elastic limits, which might result eventually in the belt breaking down in service.

Talking from a manufacturing standpoint

we do not propose to attempt to give an opinion as to the relative merits of either product in service as the relative merits of either could better be handled in a round table discussion with engineers who have used both. However, from our observation, the trend seems to be as follows in various classes of industry:

Window washers seem to prefer the leather belt usually 3 1/2 inches or 4 inches wide. This is probably due to the fact that a man is constantly leaning back into his belt and the leather takes the form of his body and therefore gives him greater comfort. The same can be said of linemen. Linemen almost exclusively use leather, although there are two companies I know of who are experimenting with fabric.

In other industries such as the oil fields, mines, steel mills and other large industrial plants, the demand seems to be more divided, depending on the particular engineer's feeling on the subject. Although the trend seems, to me, to be towards the flexible linen, because the men wear these belts as an added garment and therefore the light weight and flexibility appeal to them, particularly where shoulder straps are used.

Due to the present national emergency I am told there will be no linen available beyond the stocks which the manufacturers have at present, so we will have to prove to the government that the preservation of man power in our industrial plants is of sufficient importance to release quantities of linen for the purpose of producing web for safety belts, or go to a substitute.

However in the event that the government will not release linen for this purpose, I am very happy to say that we have in conjunction with our weavers been able to create a cotton webbing which will be about the same size and the same flexibility as the present 5,000 pound linen web. Test sample broke at the jaws of the machine at 3,690 pounds. This is far above the strength I had hoped for in the light flexible web of this type and is certainly more than sufficient for our purpose. The web probably has a natural strength rating of about 4,500 pounds, if the web was processed for test, but I like to make these tests under ordinary conditions and consider the strength of the web the weight at which it breaks whether it is at the jaw or between the jaws.

In each belt there must be some method

of attaching the worker to the point of operation. In the case of a lineman he uses what we term a safety strap which goes around the pole and hooks into both deerings on his belt.

While the use of leather still predominates, investigation into a man-made substitute has resulted in the limited use of two products. The first was a very heavy and firm woven linen web about 2 inches in width and $\frac{1}{8}$ inch thick, having a breaking strength of about 7,000 pounds, treated to preserve it against moisture and mildew due to the fact that it was used outdoors. While this product gave considerably more strength than ever would be required of a safety strap in use it was not popular because of its stiffness and lack of ease in adjusting.

About 18 years ago two utilities tried out a safety strap made of an impregnated folded canvas similar to transmission belting. This product was not popular with the men and it was dropped, but after several years the idea was again revived and as a result a very desirable type of impregnated folded fabric strap has been developed which is more flexible and easier to adjust because it can be used with a tongue buckle if desired or a special type of slide buckle which increases the strength of the strap because of the elimination of the buckle holes. The fabric has a breaking strength of 3,000 pounds or better; it is $1\frac{1}{4}$ inches wide and $\frac{1}{4}$ inch thick. This gives a tensile strength of 1,700 pounds per inch per width of the folded fabric as compared to the accepted requirement of leather of 650 pounds.

It has been established by practical use that these folded fabric straps are safe until two layers of fabric have worn through, which would theoretically leave half the original strength or 850 pounds per inch of

width, which still gives you 200 pounds more strength than the established requirement for leather.

Like leather it has its advantages and disadvantages. It will stand considerably more mechanical abuse without appreciably affecting the strength. It is not easily cut nor easily burnt, and the third advantage is that the fabric material can be designed ahead of time to meet any specific strength which may be needed. Its disadvantages are that it is subject to wear and as a result gets rather shabby looking, even though it will still hold up until two layers have been worn through. Most fabrics that have been designed for this purpose do not slide easily on poles.

I know of three utilities who are using rope safety straps made of $\frac{5}{8}$ inch rope which has an established breaking strength of 4,400 pounds. In industrial plants rope is used almost exclusively, to the best of my knowledge, either in $\frac{1}{2}$ inch with a breaking strength of 2,650 pounds, $\frac{3}{4}$ inch with a breaking strength of 4,400 pounds, or $\frac{1}{2}$ inch with a breaking strength of 5,400 pounds, depending on the requirements of the particular job.

For the hardware required the consensus is that the mild steel forging is the most desirable. In this type of forging brittleness is entirely eliminated. The drop forged snaps are usually tested to 1,200 pounds, showing no distortion at this load, although it is my observation that they will go to 1,500 pounds before they start to distort, and will pull to about 3,000 pounds before you can distort the nose sufficiently to allow the keeper to escape from its seat. The deer rings and buckles are also scheduled to stand a load of 1,200 pounds without distortion, the actual strength of course being several times the undistorting load.

ADJOURNMENT

Safety Supervisors

FRIDAY MORNING SESSION

October 11, 1940

The session for the discussion of safety supervision was called to order by the Chairman, H. W. Boggess, Superintendent of Safety, Sinclair Prairie Oil Company, Tulsa, Okla., who presided. The Chairman briefly

commented upon some of the more outstanding problems of supervisory training and direction, and then introduced the first speaker.

What the Foreman Can and Cannot Do For Safety

By C. A. BOUGHNER

Director of Safety, Gary Sheet and Tin Mills, Carnegie-Illinois Steel Corporation, Gary, Ind.

This discussion assumes that accident prevention is distinctly an operating problem. It is our considered opinion that it is so designated in most plants. Being a problem of operation, quite logically the impetus given it will originate in management, and regardless of names or job titles, accident prevention will eventually become responsibility of the foreman. In order to avoid any misunderstanding about the "foreman," we shall refer to him as a supervisor who directs men.

Too often supervisors are prone to think of safety not as an opportunity, but as an added responsibility, something apart from their already varied and exacting duties. But accident prevention effort goes hand in glove with every other supervisory activity, can be controlled by exactly the same methods, and frequently by the identical effort that is used to control production, costs, and quality. There must be, first of all, painstaking instruction backed by employee support and day-by-day supervision that is both sufficient and efficient.

The mere fact that a supervisor must accept the responsibility for accident prevention does not mean that he must personally watch over each member of his group every hour of the day, any more than he would be expected to stand beside each workman to see that he does his work properly. Actu-

ally, the supervisor is responsible for the result, and in like manner is responsible for carrying out the program aimed at the result. It is obvious, then, that any safety program, to win the support of the foreman, must be designed so that it will be a help and not a hindrance to him. Above all, it must be in keeping with good industrial relations.

We are now faced with the problem of building safety organizations under new conditions. There can be no doubt that the supervisor and the employee alike have felt the impact of the sudden social and economic swings which industry has undergone. In too many cases the net result may be a change in philosophy that will tend to increase the feeling of indifference on the part of the employee and a feeling of helplessness on the part of the supervisor.

With a job to be done that is exacting as to quality requirements the supervisor obviously would pick the most dependable employee to do it. He would make sure the employee was fully equipped and properly instructed before starting. Under these conditions the chances are a hundred to one that the job will be done well and safely, because the same elements that assure quality are a guarantee against accident. Lack of instruction, or failure to follow instruction, permits improper methods to continue.

These will cause mishaps to men that result in injuries, just as they cause mishaps to materials that result in spoiled work. We are constantly reminded that accidents to men and accidents to material spring from the same source.

The time has long since passed for using shotgun methods in preventing accidents; what we need is sharpshooting practice. There was a time when accidents were so numerous that almost any kind of effort, if aimed in the right direction, would show results. As the number of accidents has decreased, however, the problem has become more specific, and we must adjust our methods to suit these conditions.

Two things are necessary: First, we must convince ourselves that accidents can be prevented. Ask yourself, for example, how many accidents have occurred in your plant, or within your knowledge, that could not have been prevented. We all know too well that after an accident, means can be found to prevent the same kind of accident from occurring again. Second, we must train ourselves and those who work with us to anticipate the probable accident and do something about it, or we may send men home to face their families and their futures as cripples.

Let me suggest that each job, regardless of its nature, be thoroughly studied for accident possibilities and that a definite, systematic method be followed to make sure that something is done about it before an accident occurs. At first this may seem to be a large order; yet if it is done in an orderly and systematic manner it can be accomplished quite easily. For example, if one job or operation is covered each week, a total of more than fifty different jobs can be taken care of within a year. When we consider that this work would be carried on by each department along the same lines, it is apparent that the task is not at all impossible.

Now let us mention the things a foreman can actually do to help the safety program.

1. Study his equipment.
2. Assist in formulation of a safe procedure.
3. Enforce safety rules.
4. Watch for, correct, and, if necessary, discipline for unsafe practices.

5. Maintain constant contact with safety organizations so as to benefit by new ideas or the better application of old plans.

6. Conduct safety meetings, huddle or group, as may be permissible.

7. Listen to, answer, and act on constructive suggestions.

8. Publicize all accidents.

9. Give specific, definite instructions.

10. Personally investigate any injury before signing an accident report.

11. See that tools and equipment are in safe condition.

12. Arrange immediate hospitalization of any injured man.

13. Be a good-housekeeping advocate.

14. See that rules and regulations are given to, and clearly understood by all employees.

15. Know in detail the plant policy and procedure on safety.

16. Arrange to conduct safety tours and good-housekeeping inspections by safety committeemen in different units.

17. Visualize all operations from the standpoint of accident possibility.

18. See that all new or borrowed men are instructed.

19. Arrange training programs.

In most of these items there is sufficient material for plenty of discussion. We will choose a few to discuss briefly. A complete investigation of all accidents, whether serious or not, by the supervisor will bring out some startling points. Too often we accept a story from an injured employee and because we feel it *could* have happened that way, we record it that way; but if we attempt to reconstruct the happening, the various factors will appear in their true light.

A persistent effort to get all the facts involved in an injury will immediately convince any employee that there is a real interest in knowing how it happened. The actual reconstruction of the practice or the methods involved may lead to the adoption of a safer, more efficient procedure. It may also prove that our safety training is neither properly adapted nor progressive enough for the situation and show us a better way.

If any employee is injured on his job, it is a fair assumption that somewhere in the

sequence of operations there is a gap. Of course, some human elements enter into the picture, and a real investigation should show what corrective measures are desirable or practicable. If investigation shows that a method in use permitted commission of acts which resulted in an injury, the indication is clear that the method must be altered so as to be safe and efficient.

The story told by an employee to his foreman at the origin of the injury or accident, and the answers given at the First Aid Station may not sound like the same case. A good foreman can materially assist management in meeting all situations involved by making sure that sufficient facts and specific data are at hand to meet unwarranted claims or complications. One cannot be too careful as to the minute details of when, where, how, why, with witnesses whenever possible. If the safety bureau functions in the case, all facts are sifted into a record for future use.

Be sure that all the facts are positive facts, not hearsay. Take sufficient time to get all the answers and related points, even putting down more than might seem essential if it has a bearing on the case, as others may apply parts of records they feel are most advantageous to their interests. I have spent considerable time on this point, and feel it is worth it. This matter of complete records is particularly important in large industries or plants, since correct, careful, and adequate reports are fundamental to a good safety program.

Now let us look at another item for a moment. "Watch for, correct, and if necessary, discipline for all unsafe practices." Here we have a very controversial point. However, a rule with no penalty attached is hardly workable. If the foreman instructs and shows the man how to do a job the safe way, and the employee refuses to comply and accept some responsibility, then we must use an unsafe practice report to record such violations. Instructions may be written or typed, and may be lengthy or brief. These depend upon the particular operation as well as the company policy.

Given working conditions which have been made as safe as is humanly possible through suitable equipment, proper safeguards for the hazardous features of such equipment, proper plant layout, and adequate light, the responsibility of the foreman in accidents

due to faulty or unsafe practices cannot be overlooked or denied.

This statement may bring a protest from foremen to the effect that they cannot stop accidents when an employee is injured the first time a rule is violated. If actual investigation showed that employees were injured the first time they violated a rule, then it would be a reasonable protest. Innumerable investigations, however, have shown that rarely does an accident occur the first time an employee violates a safety rule. It is more clearly indicated that the employee had been repeatedly doing the unsafe thing that caused the accident. Usually such employees will evade the facts and state that they have not been admonished for their violation even though the foreman had observed their actions. If the foreman instantly stopped unsafe practices as soon as they commenced, there would immediately be a lessening of accidents occurring in his department.

A complete session could be allotted to this subject, and still there would be conflict as to the application and sensibility of such training program. The program properly administered is a definite reflection of what the employee himself actually does. Of course, there may be some resentment at the inception of the plan, as the employees may feel that someone is trying to "get something on them." However, if they understand that their practice is wrong or dangerous, and have been told in a proper manner, they should have little resentment. Needless to say, a good "tool" for the foreman is sound diplomacy and sensible justice, which must be evidenced in impartial handling, writing, and transmission of safety matters. Personalities or discrimination have no part in a safety program; fairness must be the keynote.

As an unsafe practice is checked, discreetly stop the employee performing it, show him the right way desired and prescribed by the company, then tell the employee it will be necessary to make a report of the unsafe practice. The real reason for this is to make the employee safety-conscious, and also to create a feeling that constant vigilant supervision is an integral part of a co-ordinated safety program. Unsafe practice reports should be used to help educate employees, and not as a part of any disciplinary program.

The scope of the program and the response to it will be limited if it is associated with any purpose other than education or training. In some cases only supervisors sign such reports, and in others the signatures may be omitted. Properly used, reports will serve as a guide or teaching aid, but they cannot be used if ever abused. This method has worked successfully and merits careful consideration.

The very common way of classifying accidents into the two groups of *mechanical* and *non-mechanical* does not go far when it comes to placing the actual responsibility for the accident causes. Classifying accidents according to whether they were caused by *physical conditions* or by *unsafe practices* produces two groups, the responsibility for which rests largely with the foreman. In the first group, management itself has not discharged its full responsibility until the best and safest working conditions possible have been provided through the liberal use of physical safeguards.

Now look at some of the other suggestions to help a safety program; particularly "Assisting in the formation of and arrangement of the training program." It seems self-evident that the foreman should know the right way to handle this work, and therefore should have a lot to say relative to the material used in the training as well as the procedure that should be followed in actually doing the job. Experience may give us better ways, but until these are demonstrated, approved, and set up, the training program should follow the best methods immediately at hand. Directly correlated with these is the transmission of definite, specific instructions. As nearly all men present at this meeting understand just what is here involved, no time will be spent on it. However, it means just what it says—definite, specific; leave no doubt, be definite; be careful to miss nothing, and be sure that instructions are clearly understood.

In addition to the assistance a foreman may give in developing the training program, he should also take advantage of specialists, such as, crane or tractor instructors. These are special trainers who are practical operators of more than ordinary possibilities and experience, who will assist other employees in their crafts to a safer and more efficient solution of their daily problems. It has been our experience that the

men welcome these "specialists" and willingly accept their suggestions and criticisms in a fair, open-minded way. The foreman can request this service, and the training given should be under his supervision. We are using this plan successfully and to real advantage.

We can spend a few profitable moments on a few more of the suggestions listed and one of these might well be "See that rules and regulations are given to, and understood by all employees." Most plants have printed plant rules and safety regulations. These should not be handed to a new man unless he is given some personal word of explanation. We should remember that at this particular time, the employee is probably very receptive to anything connected with the success of his new job, and easily impressed and definitely sold on the safety rules if someone assists him in understanding how they apply to his job. The time involved in doing this can in no way be considered wasted.

In some groups of employees we find sufficient illiteracy to make the problem more difficult than in the better educated group. At one time the speaker was serving as chairman of a court of inquiry investigating a lost-time case, and it seemed evident that the supervision concerned was tending to develop employee responsibility from a rule violation angle. An eye witness was being questioned about the safety rules. It was soon brought out that he either didn't know or was purposely evading an answer. A copy of the rule book was given to him and the chairman asked him to read rule 5. The investigation disclosed that the man could not read and consequently never had an actual knowledge of any of our printed rules or regulations. Here was a real failure on the part of a supervisor; one that explains why delivery of the rule book or posting of departmental rules does not terminate, or even intelligently start instruction.

A great deal could be said about foremen who tolerate men on the job without protective equipment. This may involve shoes, gloves, wristlets, goggles, tongs, leggings, etc. Practice and experience, some of it very bitter, has set up sensible safety standards which should be rigidly enforced. Do not relax on these matters or your men will rightfully feel you are not particularly interested in safety.

Little has been said about what the foreman *cannot* do for safety, but it is our opinion that if we get the foreman to do all he can do, little will be left undone.

Safety is good sense applied to the safe and efficient way to do a job. It is not fad nor fancy, but reality. It is nothing the company owns or produces, but is "You"—your body. Industry recognizes its responsibilities and is trying to convince its employees that they should be safety-minded in their daily tasks. It makes no difference what your plant has in the bank; money can not replace a lost finger, as there are no spare parts for a human body.

The foreman can consistently talk safety to his men at any time. His attitude toward safety will be the attitude of those who work

under his supervision. He can explain delays or loss of product, but he can't explain an accident. The desire to have a good safety record is the wish of every plant management, and all loyal employees should co-operate. No plant wants the stigma in the community of being derelict in the care of its employees.

Any foreman can do plenty for the plant safety program and at the same time have an efficient unit. There will be times when in spite of all efforts we will have accidents. Help your men to know all about their jobs, discourage the chance taker, demand observance of plant and departmental rules. Then you can feel assured as you leave the mill to join your family in your home that all your employees are enjoying the same privilege, and that you had a part in it.

The Safety Supervisor's Part in the Investigation of Accidents

By A. H. ZEILINGER

Safety Engineer, The Colorado Fuel & Iron Corp., Pueblo, Colo.

All safety roads lead to the prevention of accidents, and the accident investigation road should lead exactly to that destination. It has been my observation that it is often very beneficial to investigate near accidents, as well as actual accidents.

Pertinent to this thought I might say that we are calling an "incident," where a personal injury happens, an accident. In reality any mishap is an accident whether there is a personal injury or not.

Now, relative to the safety supervisor's part in these investigations, he should see that the investigations are made. In cases where other members of his organization have been trained to conduct the investigations properly, the supervisor himself may not always be obliged to do the work personally. However, especially in younger safety programs, men, the injured and others, may feel reluctant, afraid, or non-cooperative, to the extent they do not tell all they know about the accident.

In these cases, through tact and sympathetic understanding, the supervisor can get these men to dispell their fear or reluctance and really open up; if he will permit no browbeating, and convince those involved that the whole purpose of the investigation is a sincere effort to prevent accidents and

not an attempt to place blame or liability. The supervisor must be able to make witnesses at the investigation feel that it is no court where the injured is a defendant, and that there will be no humiliation; that the whole process is an honest effort to prevent a recurrence of the accident, and also to help others from having similar unfortunate experiences. All in all the investigation must be friendly, sympathetic and cooperative. This does not mean that it shall be other than fair, prompt, accurate and thorough. The supervisor should see that it embodies these qualities or all value may be lost.

It should be fair that all data from both sides, that of men and that of management, shall be brought out, and the predominating feature, that of preventing future accidents, should be the only one to have a front seat. It should be prompt, because that prevents the scene of the accident from materially changing and prevents the witnesses from changing their stories, or from being influenced by comparing notes with others. If it is not complete and accurate it does not permit accuracy in forming conclusions and thus it defeats the very purpose of the investigation, that of preventing other accidents; for we all know that it is essential to learn the *true* cause. That will enable

one to apply the proper remedy. Then, accident investigations will help in accident prevention.

When data that is fair, accurate and complete is obtained, some may ask the best way to use that data. Here we may differ, but on this point may I repeat that safety must be sold. We can say it needs no introduction, there is an interest in it, and people are convinced of the need of it; perhaps I had better pause there in climbing this sales ladder. But remember we are not at the top of this ladder yet, and the product, in this case safety, is not yet sold. A desire must be created and then the prospect must resolve to possess and finally sign on the dotted line. Then and not until then can we consider the sale made.

After the investigation of the accident, after proper data are all assembled, then the supervisor can start to create the desire for safety. He can do this by advertising this data, which is nothing more than education. This gives him an opportunity to create desire. Next, by using a "now, not later" appeal, he gets the individual, or individuals, to resolve to possess safety. Then they line up to pay the price, which is honest effort, and thus the sale is made.

The first customers should be the injured and his supervisor. Then by posters, letters, talks, meetings, etc., other employees are informed and educated to the point of a real desire to prevent getting hurt. Next they reach a point where they resolve to possess safety and thus they are sold. In a desire to prevent waste and other loss by accidents, members of management can be interested and subsequently they resolve to possess safety and thus they are sold. Even some of the safety supervisor's own staff will be benefited by the accident investigation for it should implant and maintain a greater enthusiasm for the sale of safety. And so the safety supervisor by proper steps in salesmanship uses the data obtained from accident investigations to get men and management to play greater roles in the prevention of accidents.

Now the supervisor is not the whole show in the prevention of accidents, but he should be a good ringmaster and so direct the show that the real actors, men and management, will all play their parts better. The benefits obtained will reach much further

than the job. The community and the home, as well as the industry will be far freer from the curse caused by accidents.

Good material comes from every investigation and after the sale of this material is made and the goods delivered then the supervisor or his agent must return to the customer to make certain he is using those goods to the best advantage. If he is, a pat on the back is fine. If he isn't, then a different pressure must be applied at some other point for the delinquency. Down will go accidents and up will go efficiency. Thus your safety program works its way onward and upward.

Now, by way of review, let's state again that the safety supervisor should see that accidents are investigated; that the investigations are fair, prompt, accurate and thorough; that the true purpose, that of preventing accidents, be kept in the foreground; that there be no browbeating; that the investigation be on a kindly, sympathetic and sincere basis; that the data be well advertised and also used, otherwise as sales points to further sell safety. Thus this data can be turned into stepping stones to get men and management to play better roles in the prevention of accidents. Finally by checking back to determine how the whole thing is working, the Safety Supervisor has played his role in the investigation of that accident.

Perhaps to all this you'll say "I'll try." Honestly, gentlemen, that is not enough.

Two football players were out for the same position on the college team. Those fellows were both about the same size and age; they were in the same class and had about equal football experience. One evening before the first game on the schedule, the coach approached the one and said, "Those fellows coming down here Saturday are big and they're fast. Can you stop them?" "I don't know, but I'll try," was the reply. By all ordinary standards of comparison, we may accept that answer as pretty good. Later the coach approached the other candidate in the same manner and asked if he could stop them. His reply was, "You're damn right I can. Run them out here."

We don't need that kind of language, but we do need that kind of spirit, even in safety. There isn't any need to tell you who got the position, you've already guessed that. Nor do I need to remind any safety super-

visor that he is the ringmaster of the safety show, that he is the sales manager of the force selling safety. He knows those very things and should proceed accordingly.

Just What Is the Safety Supervisor's Place in the Operating Organization?

B. J. J. PLZAK

Claims Manager, Consolidated Water Power & Paper Company,
Wisconsin Rapids, Wis.

(Editor's Note: Mr. Plzak spoke extemporaneously. The following is a brief outline of the highlights of his speech.)

The safety supervisor is a "Ways and Means" committee in his organization. It should be his responsibility to develop a better understanding of human relations in his organization. The objective being to properly direct the activities of the employees.

The human element is much the same the world over—there being correspondingly little difference among workers of one industry and another.

However, a safety director is and has to be just a little different. He has to be an average man, a diplomat, a statesman, a man who knows the answers correctly to any question raised by the men in his organization and if he does not know it is wise to admit so. His knowledge has to be shared—"for him alone to know and not tell others is a gross sin."

The safety director, if a good one, gives his organization spirit—through his own enthusiasm and through the personality displayed by him in his work and contacts with men in the organization.

To do this job right it is well first to analyze the program of the safety director: In the first place, your safety program is an expression of yourself.

Basically you must have a sound safety program, sound policies—built upon a foundation of honest principles. You must place this program on the same level as you do production and distribution. Of course, there will be some overlapping in your program but there is in every good program—so why worry about it?

This fundamental program can't be bought—nobody can command it—nor wish it or write a formula for it—but it can be and must be created by you!

You in your work as safety director must weigh carefully the problems of management and the employee. Management is interested in producing a product as efficiently as possible—at a low cost and to provide a market for it. The employee's interest is to make this possible so he in turn can earn a livelihood for himself and family. Your part, therefore, should be and must be to help achieve these objectives by providing the employee with all necessary facilities to make possible this accomplishment under the safest conditions and through the safest practices.

This is indeed a big order, and you can't do it overnight. You must start at a beginning and work toward your goal. How?

1. Get a definite foothold in your organization.
2. Know company policies thoroughly.
3. Set up a budget of operation—a definite program.
4. Convince your executives that your program is a good one.
5. Identify yourself with all departments. (What safety supervisors need is more identity.)

Such departments as: employment, engineering, purchasing, technical, medical, etc.

6. Go about honestly in taking care of all your obligations and responsibilities.

Some of your responsibilities should be:

1. Know the employment standard, and confer frequently with the employment department as to suggested changes in such standards.
2. If you have physical examinations in your plant for your employees, be sure you are familiar with the program.
3. Be aware of and follow through all mechanical inspections.

4. Keep a close contact with your first aid department—study especially all minor cases of injury.

5. Be familiar with all of the engineering standards of your company and the safety codes of your state.

6. If you have opportunity, develop a job analysis in your organization (care should be taken to do this job well).

7. Study job placements.

8. Follow up the injury cases and be

aware of the type of job an injured employee returns to.

9. Afford your organization every possible means of education in accident prevention and higher health standards.

You are a sort of good will emissary in your plant. You are the Ways and Means Committee. Remember that the success of your safety program depends largely upon the amount of attention you devote to it and the method of your procedure in its administration.

ADJOURNMENT

Safety Training

WEDNESDAY MORNING SESSION

October 9, 1940

The session for the discussion of problems in safety training was called to order by the Chairman, Professor R. J. Greenly, Chairman of Trade and Industrial Education, Division of Education and Applied Psychology, Purdue University, Lafayette, Ind., who presided.

CHAIRMAN GREENLY: For the last few years we have spent much of our time discussing the matter of gadgets and rails and guards, and other mechanical phases of safety. There is a need at the moment for thinking more in terms of the human factors in safety and we this morning are to think and talk about these human factors. We, the members of the panel, have not rehearsed what we are going to say. We want to present to you an informal discussion, and you have the privilege of asking questions. For we want very definitely to provoke thought, to have you raise questions, and take a part in answering them.

This panel is going on record as believing that teaching is learning, and, therefore,

dramatically speaking, the job of the safety director and the job of the foreman and the job of the manager is to *learn the worker*. Now, to learn the worker, we must know something about the worker himself, not only the content we are going to present to him, but, more important, the things that make up the man whom we are learning. We are going to face the embarrassing truth, and facts that are sometimes embarrassing will be brought up.

The chairman then introduced the members of the panel, as follows:

P. A. Alberty, Secretary, The Ohio Fuel Gas Company, Columbus, O.

H. W. Boggess, Superintendent of Safety, Sinclair Prairie Oil Company, Tulsa, Okla.

P. N. Bushnell, Manager, Safety and Personnel Department, Missouri Portland Cement Company, St. Louis.

Roy S. Bonsib, Chief Safety Inspector, Standard Oil Company (New Jersey), New York City.

Panel Discussion

CHAIRMAN GREENLY: Now, your program presents a number of problems that we are to discuss. It might be well first to name these general subjects, as follows:

Methods and Techniques,
Programs for Supervisors,
Employee Training,
Reaching Employees in Remote Locations,
How to Organize and Conduct a Training Program.

Are Merit Rating Programs Helpful in Safety Training?

In the matter of techniques and methods of training, I wonder whether we first should not discuss some of the techniques that are being used in training persons in a safety program. Mr. Bushnell, will you

start that off? Will you suggest some of the techniques that are now being used that are familiar to you?

Techniques and Methods

P. N. BUSHNELL: Well, first let me say that my experience is with small plants. I want to make it clear that I am not one of the big industrial men with thousands of employees on line productions. What I have to say has grown out of experience with small plants with limited facilities for expert personnel administration. So we have to do the best we can with our own limited force and experience.

One of the techniques that we use, the most important one, in developing the whole

background of our safety work is that of reaching the foremen through panel discussions such as we are having here.

CHAIRMAN GREENLY: Do you use your panel technique to give out information to the foremen or do you try to get foremen to express their experiences there?

MR. BUSHNELL: We do both. We make every effort to get expressions from our foremen by provoking thought on their part and discussing problems growing out of their own experience. It may sound a little elaborate but, for instance, we require every foreman to report in writing on every first aid case, not critically but constructively, and in getting his comments we often find that he has entirely missed the point in his approach to the man. We find that that forces the foreman to learn the attitudes and reactions of his men, it gives him a little practical experience in human psychology, and in our foremen training meetings we discuss with them some of the approaches that we think they may have missed or need a little coaching on.

CHAIRMAN GREENLY: Now, Mr. Alberty, what other techniques do you use besides the panel method in your plant?

P. A. ALBERTY: It has been our policy, in lieu of a rule book, to get from our employees, through meetings with as many as we can get together, the building of codes. These codes are to outline the best method, if there is a best method, and if there are two or three methods, to attempt to select one as the method to be used by our company. These codes we think are more practical than the rule book and are therefore becoming the basis for the continuance of the practice or the method that we use in teaching incoming employees.

CHAIRMAN GREENLY: How do you get those codes? By having your men write them?

MR. ALBERTY: No, the leader, sometimes the vice-president, conducts the meeting, and he asks leading questions that get the answers, and those answers are reported when they seem to fit the building of this code.

CHAIRMAN GREENLY: More or less the conference method.

MR. ALBERTY: It is the conference method that brings it down, however, not to the entire discussion but to those points that

are selected as being the best procedures that we can decide upon.

CHAIRMAN GREENLY: Are there any other techniques that are used?

H. W. BOGGESS: Mr. Chairman, methods and techniques, it seems to me, should be considered from the viewpoint of the persons you have in mind to train. You may be interested primarily in a program to train your supervisory force or you may have as a problem the training of the employees. The technique as we employ it is a little different in either of those instances. If you are to train your supervisors there are certain general techniques that you follow and there are a great many specific techniques. The ones you have been discussing so far have been specific. Other specific techniques that go along in the full program of training supervisors—and so far you have talked only of supervisors—may include your investigation of accidents. Right there you can do a good training job while you are investigating. It may also include the inspection of properties. While those inspections are being made by your inspectors you can do a good job of training.

CHAIRMAN GREENLY: Would you call that a technique of job training?

MR. BOGGESS: Absolutely.

CHAIRMAN GREENLY: All right, Roy, are there any new techniques that you have to add?

R. S. BONSBIB: First, I should like to correct the impression that seems to exist that because a company is big it can do more than a small company. After all, any big company is made up of smaller units, and the same technique that would apply to a big company would apply to a little company.

I think the essential thing in training is that you start the employee right in the beginning. Catch him with a few words of instruction before he starts on the job. I think that is very essential in training technique. Before the man ever starts to work have somebody delegated to give him a few instructions, because never again while the man is with the company is he in such a receptive frame of mind. There isn't a man here who does not remember what happened the first day he started to work.

CHAIRMAN GREENLY: Do you need

to be careful about not giving him too much at one sitting?

MR. BONSBIB: Yes, you are right, we do. We were told by Dr. Hulbert this morning, that a man can grasp only a few things at a time.

Imparting Information

CHAIRMAN GREENLY: Now, we have, more or less, two or three techniques before us, one where you are giving the new worker or the old worker information as to what it is to be safe. Can we go a little farther with more specific techniques? What do we do in imparting information after the man is on the job?

MR. BUSHNELL: We use group meetings. It ties in pretty much with what you said about job training. When we have an operation to perform, we feel, as one gentleman expressed it, there are two or three ways to do it. We think there are any number of ways to do almost any job. Our ideal objective, which we never will reach but which we always try to impress the foremen we will continually work toward, is to find the one method that will rule out as many accident possibilities as possible, and the technique we use in doing that very often is to gather a group of workmen on a job and go through all the steps. We break the job down into its elements, and take up each element and analyze it to see the various ways of doing it and the men themselves agree on the best way of doing it. When they have agreed on the best and safest and most efficient way of doing it, it is pretty hard for them later to give any excuse or reason for not following the procedure that is set out.

That seems to me to be the basis of your codification of practices.

CHAIRMAN GREENLY: You have made several very interesting statements, it seems to me. We have analyzed the job and we have tried to teach the individual how to follow through. He has learned habits. Do you have anybody to follow through there, to find out if he retains or has developed a new habit in the right way or if he falls back to the old habit?

MR. BUSHNELL: I think often he does fall back to the old habit; quite frequently, I am sure he does. There is where your foreman and your supervision come in. The foreman has to be sold on these practice routines and then he has to be sold on see-

ing that they are followed. That is the nub of the problem to me. I haven't solved the problem of how to routinize a man after he has established work practices.

CHAIRMAN GREENLY: Mr. Boggess, do you want to go along with that a little bit? Have you had any experience along the same line?

MR. BOGGESS: I think the problem of keeping your routines and your safe practices followed up depends entirely on the supervisory force that has continual control over the employee while he is actually doing the routine, and you must depend on that supervisory force for the result. You come right back to your point of beginning when you do that; that is, the necessity of training the supervisor in the first instance.

CHAIRMAN GREENLY: Would you say also that your supervisor has not been very well trained to do that? Look how your supervisor came up. He has been a mechanic for the most part and tomorrow he is told by the superintendent he is going to be boss. Yesterday he was in overalls; tomorrow morning he has to be able to instruct the men in all these routines and techniques.

MR. BOGGESS: The fact that he is a foreman does not give him capabilities. Those things he must learn by study and the few who come by it naturally are a very small percentage compared with those who do not come by it naturally. They must be trained.

CHAIRMAN GREENLY: I am concerned with developing that point a little farther because the supervisor has been brought into the discussion on several occasions now. I am particularly concerned with knowing whether or not the foreman is able to teach.

Ability to Teach

MR. BONSBIB: It seems to me my conception of a foreman is that he is a teacher because, after all, the reason he has been given that job is that he knows more about it than somebody else; otherwise he would not have been given that job and, therefore, knowing more than others he should be a teacher. We look upon the people who know more than we do as teachers, at least we should, and consequently it should be a teaching proposition. However, a mistake that has been made very often is that we look upon safety as a separate thing. It is

just good operation. Get your supervisory force to consider this fact, that accidents interfere with jobs, interfere with their getting their work done. Get them to accept that the test of their good foremanship is the ability to get the work done, and anything that helps to get that work done is good business, it is good for them. Tie it in with the job, stop talking safety but talk good operations. The same things that cause inefficiencies and the same things that cause high costs are exactly the same things that cause accidents. When the supervisor looks on it as a matter of getting that job done quickly, efficiently and economically, it is going to be done safely, and I think if you can get that idea across to him, the second step is to see that he gets it across to his subordinates, and then you are going to get results. It is a question of close cooperation.

CHAIRMAN GREENLY: Roy just said that the foreman is the teacher and he has been elevated to that particular job because he knows more than anyone else in that organization. Would you go along with that statement 100 per cent? In other words, he might be selected for the foremanship job because he knows more about a job. Well, how about all the jobs within a department?

MR. BOGGESS: It seems to me that Mr. Bonsib is speaking of an ideal. Ideally the supervisor, the foreman, is a teacher; but he is made foreman primarily because of the information he has and not because of his ability to impart that information. He certainly has come up in the usual instance from the gang, knows the work and knows material, but he doesn't necessarily know men at all. He may never have been educated in the technique of handling men, and that is what we need—how to teach those men not to have accidents, how to instill and impart the information necessary to keep them from having accidents.

MR. BONSB: I question this matter of the ideal state. I do not think it is ideal. I think it is just good common sense. If a foreman has been able to get along with people sufficiently to be selected as the foreman of that job, then he certainly knows his stuff and he certainly should know how to get it across. If he doesn't get it across he is not going to be able to get his work done. How is he going to get his work done if he does not have ability to tell the man how to do the job? The point is, he should

do that job economically and efficiently. I am going to keep repeating that because I do not like to see safety set off in a division by itself. It should be woven into and made an integral part of that foreman's job to get results and he cannot get results if he neglects to do anything to make up that job.

MR. BUSHNELL: I can see that the foreman is in for a ride this morning. I have never heard a meeting yet talk about safety or safety training, or any other kind of training, that the foreman didn't get ridden down the highway. But I disagree with what Roy said about the foreman having won his place because he is a better man, because he has demonstrated that he can get along with people. We can hang a few signs, perhaps, on the management for the way they have picked their foreman, it seems to me. I know that in our industry we have some mighty fine foremen and we have some other foremen too.

A good illustration of what I am trying to say is the story of a certain football coach. As I have heard the story, Zuppke, of Illinois, never did make a first team. He wasn't a good football player but he is a mighty good coach; and I think there are a lot of all American football players running around who couldn't get jobs teaching high school football teams because they do not know how to teach, but they are good players.

Now we transpose that situation into industry and we have exactly the same truth. There are some mighty fine mechanics who are foremen now but they should still be expert mechanics. They would be doing the company and themselves a lot more good and all the men at work around them, it seems to me. Because foremen once were competent workmen and still are competent workmen that doesn't make them teachers. In this modern day and age we need teachers.

We have gone through an evolutionary period. We had working foremen, foremen were brought up because they could drive and get the work out and they did work themselves, and now we have industries where we have non-working foremen. They are simply supervisors and they should be teachers, but ability to work is not necessarily ability to teach.

MR. ALBERTY: In the process of your foreman's doing his work properly there are

some jobs that are more important at times than others. I do not believe that a mere blue print is sufficient. A superintendent who knows his foremen has some foremen who are better than others, as has been stated. However, in the important jobs that come up occasionally, not constantly, I think one of the most important things a superintendent can do is to tell the foreman he is going to have a certain job to do and then ask him how he is going to do it. Then if there is any part of it that he has left out, or that can be improved upon, call the foreman's attention to it and then have the foreman repeat again what he is going to do, to make sure that he has a full understanding of the importance of that job.

I speak of this as a necessity particularly in the gas business where we deal with extremely high pressures and immense chances for something to go wrong. Even the slightest thing might cause a terrible accident.

Problem of Company Time

CHAIRMAN GREENLY: I should like to throw out another thought. We have had a great many safety meetings, with foremen responsible for holding safety meetings after working hours or during working hours. I want to ask the panel whether or not they want to suggest some ways to overcome the difficulty we are facing, where the Wage and Hour Bill has given us some trouble about holding safety meetings after hours. Or does the foreman just pat the worker on the back and say, "Work safely today because tonight when we are supposed to have our safety meeting we have to pay you time and a half if we have the meeting." Would anyone like to grab hold of that point and see what the technique is of having safety meetings held?

MR. ALBERTY: I might start some ideas about this. I believe that if in holding the meeting off time there are outside speakers and entertainment, the situation is relieved. I believe that it is becoming more and more necessary to consider safety in industry. At the beginning of safety work some years ago most meetings were held off time, but I believe that now most meetings are held on company time because of the importance that has been given to safety.

CHAIRMAN GREENLY: Is there any company represented here that does it differently? Do you hold your safety meetings on company time or after?

MR. BUSHNELL: We have no choice. We hold them on company time; furthermore, we consider it part of job training. We do not separate safety, it is part of job training; and if a company does not want to accept the responsibility for training its own men I do not know who should do it. The men can't.

CHAIRMAN GREENLY: Well, I think possibly we pretty well agree with that, but I wonder now if they are going to carry on as part of their duty as supervisors or whether it is just going to be happenstance. You see, we want to get down to the disagreeable truth if we can.

MR. BONSB: I have gone on record that I believe in not setting safety as a thing apart. It should be a part of job training, and that can be done either by the supervisor or in the group meetings which practically every company has with their foremen.

CHAIRMAN GREENLY: On company time?

MR. BONSB: On company time.

CHAIRMAN GREENLY: Production stops.

MR. BONSB: Their subordinates are supposed to look after things while they are gone. I do not think it would be good business to stop all production just to have a meeting; however, the meeting should be held as job training. I think that everybody should be interested in accidents off the job. Industry has done a grand job of safety on the job, but the accidents off the job are the accidents that cause the trouble. You can lose a man's services just as quickly if he is killed off the job as you can if he is killed on the job; therefore, safety meetings that have to do with the man's safety off the job and the safety of his family can be held off the job, but safety on the job should be a regular part of job training. Don't for one instant let him think that safety is not part of the job, but that it is good business to get the job done effectively, economically and efficiently.

The Training Program

CHAIRMAN GREENLY: If we are going to do it on the job, how are the supervisors very definitely instructed what to offer? Is there a continuity of instruction, is there a yearly program, and so on?

MR. BOGGESE: The one particular way that we do it may not be applicable to all types of industry. In the oil producing business we have our men congregate near a point where the work is to be done that day, where the work is laid out, and the men are instructed. This gives us an ideal opportunity to tell those men—for instance, we are pulling a well today, we are pulling it with certain equipment. Then definite and specific instructions as to routine and proper handling of that equipment is given at that time and becomes a part of the job itself.

CHAIRMAN GREENLY: Who does that?

MR. BOGGESE: The foreman. He is instructed and told how to do it in the foreman's meetings.

CHAIRMAN GREENLY: And the foremen then are instructed by whom?

MR. BOGGESE: In supervisors' meetings by conference panels and by rules and instructions and every other way. He gets that as a constant source of information in monthly meetings.

CHAIRMAN GREENLY: Do you do it any different from that?

MR. BUSHNELL: Yes, we do it differently. We haven't gotten that far. In our industry we have a twenty-four hour operation seven days a week. We can never shut down unless all business stops, and we have some operations that we just cannot shut down, meetings or no meetings, training or no training. It is a source of considerable anxiety as to how to properly instruct. I would say, to add the instruction after the original training period and keep these men properly informed. But we haven't found the solution yet. In many of our operations we do shut down for these meetings, we shut down departments and sometimes we shut down whole plants, but in our cement manufacturing we cannot shut down the whole plant, we can shut down certain departments. It is a problem I do not know how to handle.

The way we are trying to approach it is through the foreman, by properly instructing the foreman, but we haven't developed, to my satisfaction at least, a proper check on how that foreman is translating and imparting whatever information we are getting over to him. I think that one of the weak links in our own chain is checking on the

teaching techniques for which the foreman is responsible.

MR. BONSIB: The Humble Oil Company has developed a very efficient training plan. The safety director is here and I think that this group would be much interested in having Mr. Roaper tell us some of the things that they have done. I know that they have been very efficient in the training of their field personnel.

Training Field Personnel

R. B. ROAPER (Humble Oil Company): I do not think that our technique is much different from anybody else's. Of course, our first approach is through our foremen. We have monthly supervisory conferences that are held on company time, for which a prepared program is sent out from the Houston office, our headquarters. Those conferences are conducted by leaders who are selected from within the organization, and they have to do primarily with leadership and personnel problems and the handling of men. I might say that we promote our foremen, not necessarily from the standpoint of their ability or knowledge, of the job, but more from the standpoint of their ability as leaders and men who can get the job done. We have found that we have plenty of experts in the business in the way of mechanics and others, who can do the job if they have the proper leadership; and, approaching it from that angle, we have these monthly supervisory conferences in which these problems are discussed by the men themselves and the conclusions that are reached are then passed on to each individual foreman in the form of a supervisor's manual. The content of that manual is the result of the conferences that are held with the groups.

Now then, getting down to the employee, in addition to having monthly meetings of all employees—and, incidentally, we hold them on their time as we have for twenty years and I do not think that it conflicts with the Wage and Hour Bill, because I believe it has a provision in it that any program on safety that is sponsored by an organization such as the National Safety Council or the American Petroleum Institute is permissible. In addition to those monthly meetings of employees which the foremen also attend—and, incidentally, we work twenty-four hours a day—we hold for that group every day, on every shift and every tower, a five, ten or fifteen-minute

safety meeting, that is conducted ordinarily by the supervisor in charge but by the employees also. At those meetings specific jobs are discussed, safety rules and safety codes are discussed or anything having to do with the job is discussed, and we have found that that has been really effective.

MEMBER: How often do you hold those meetings?

MR. ROAPER: On every tower, that is, three times a day. We change towers every eight hours, and on every one of those towers one of these meetings is held. Whether it is in a machine shop or boiler shop, or wherever it may be, the foreman in charge when he starts the tower (we will say at seven o'clock), has a safety meeting of five or ten minutes and sometimes they last even longer if they get into an argument about how to do a certain job.

MR. BONSIB: I want to emphasize the value of that five-minute meeting at the beginning of the tower or shift, because the men are coming in, they have been off the job, they have been out of the rhythm, the swing of the thing, and the fact that they have that meeting right at the beginning of the shift starts them off right. It is very effective.

Merit Rating System

CHAIRMAN GREENLY: I want to ask now, just what place the merit rating system has in the safety program?

MR. BUSHNELL: You probably are a lot more familiar with it than I am. We have been very cagey about introducing the merit rating system because we did not feel that our foremen were ready for it. We feel that any merit rating system that cannot be properly administered is much worse—I want to emphasize that—than none because there are all kinds of pitfalls. So for the entire past year in our foremen training meetings we have discussed merit rating plans, procedures, techniques, and methods. As yet we have not decided on a merit rating plan, but we have gotten a tremendous lot of value, we feel, out of the discussions with the foremen because it is something that they really tear into; they get quite excited about being put on the spot to rate any man. When they get into subjective factors, like attitudes and the like, we have some good discussions and they all realize that they are judging their men differently.

The best thing we have gotten out of it in the year we have talked about it is the realization on the part of the foremen that they do judge their men, judge everything that they do, and that they allow a lot of prejudicial thinking to come into their judgment and none of them judge the same way. It has given them an awareness of that fact which in itself is extremely valuable.

CHAIRMAN GREENLY: Have you had any experience where the merit rating system has been equated and then evaluated as far as the factors involved are concerned, so that you know more definitely where the training of your workers should have its beginning? In other words, if you have rated your man you know whether he is accident prone, whether he has low production levels, and so on?

MR. BUSHNELL: We have a lot of opinions about it, on the part of individual men. Through the foremen there has been agreement on certain factors on which they think they need training. My approach is to tell the foremen that in going through this procedure and program we are trying to find the first, most vitally important thing that we need to teach and to concentrate on. The next step will be how to teach them.

CHAIRMAN GREENLY: Mr. Alberty, have you had any experience in your plant with merit rating and how it affects safety?

MR. ALBERTY: The only thing we do that might be termed merit rating is about once a year to chart each employee. That is done by the district manager in conjunction with the superintendent. Merit rating of another kind, that we do about once a year, is to put on some sort of a campaign. The last one was a campaign with the slogan, "If I were boss," and every employee was given the right to tell what he would do if he were boss. They brought in a lot of valuable suggestions; and some pertinent criticisms too. Some fellows were told just about what they were thought of. We gave cash bonuses for suggestions that came in that were acceptable.

Another thing we do that may be considered merit rating is to give each driver who has earned it, a "No accident" driver's certificate at the end of the fiscal driving year and also a merchandise award. When first taking up the certificate idea it was learned that it might fall flat, but those certificates are highly prized. If you ever want to find

out how much grownups are like children just skip a merchandise award to one of the employees who is entitled to it, and you will find that he will be right after you.

CHAIRMAN GREENLY: Mr. Boggess, do you want to elaborate on that at all?

MR. BOGGESS: We have been very cautious about adopting any merit rating program. As far as we go now is to give a dinner once each year to certain groups who have piled up a certain number of accident-free hours. We feel generally that the business of giving prizes, etc., is treacherous, that you can get results without it and that it may involve you in a lot of criticism that you can otherwise escape.

CHAIRMAN GREENLY: Have you had any experience with it, Mr. Bonsib?

MR. BONSI: That is something we have been studying a long time and I do not think we have the answer yet because, as Henry says, there are a lot of pitfalls. Some of our units have tried various things but as a whole we have not adopted it as a general policy.

It seems to me that the best way of rating a man is his record. You can kid your wife and your boss but you cannot kid your record, and I think that is the basis upon which any merit system should be founded. But we are still studying it. We have a lot to learn about it.

MR. BUSHNELL: We have, of course, kept individual files on every man and a record of every accident or injury or near injury, from slight scratches on up to lost-time accidents. We have felt for a long time that it would be quite unfair, even extremely unjust, to rate any man on the number of first aid injuries he has had. We haven't gotten it very well under way as yet, but we are going to adopt a system of rating every injury case, or rather, classifying every injury case. At the end of the year or two years, we can look at the man's card and we can say that that man was in the first aid dispensary fifteen times; ten of those times with things that weren't at all significant, that did not indicate anything about his attitude or about his willingness or his ability or skill or anything else; but five of them that did. We might find that a man has made only three visits to the dispensary because of some minor injuries but all three of them are very significant in de-

termining his skill on the job and his safety on the job.

Formulating Objective Tests

CHAIRMAN GREENLY: I should like to step out of my chairman's role for a moment and suggest a technique to you. We have had some fun with it in two or three plants with which I have been working where we tried to discover what it is that the foreman as well as the worker really knows about the safety practices as well as the policies of the company. We have formulated objective tests, using either the true-false or the multiple response question. These tests were presented at our group meetings at the beginning of the meeting. The persons in attendance were asked to check the right answers and then the person in charge would give the right answers to the man who checked the particular test. From that point on our instruction would begin. Individuals can confer for hours and get nowhere (as is often times true of panels). You get together and you find that you have not decided on any specific problem. With the testing technique you know where you should start because of what your audience knows and what they do not know. I may say that it has created a great deal of interest on the part of those who attended the meetings.

I think that you will find an article in next month's *Personnel Magazine* which will give an analysis of that technique and some of the test questions.

Now I should like to go on a little farther, and ask the panel members regarding the way they are checking up on what their employees do know about the safety problem within their plant, whether there has been any remedial work or any checking to know whether they have done anything that is worth while. Has any man on the panel done anything about that or are you letting your records speak for themselves?

Safety Consciousness

MR. ALBERTY: In one plant where we changed the head of the safety committee, which we do at various intervals, we found that so many things of a minor nature had been overlooked, we went in for everything possible that could be found. For instance, a boulder in the grass or a board in a walkway that might be slightly uneven. Those reports were made by the employees who

saw them, also by committees that were selected to make these inspections. The reports were made on a report that we call "Unsafe Practice and Conditions Report." Almost five hundred of these minor things were found, most of which have been corrected. In the process I think we imparted a great deal in the way of safety consciousness to all of the men at the plant.

MR. BOGGESS: There is one particular thing that we started about five or six years ago that may be under the category of checking up. In holding meetings we have tried to bring up specific operating problems. I have before me one particular questionnaire on internal combustion engines that we used in all of our employees' meetings a few years ago. Questions that are involved in the operation, in the starting and in the care of those engines, are asked and those men who did not know the answers got a good checking over. Their supervisors instructed them individually on the points involved.

You might be interested in some of the questions. For instance: "Name the two types of internal combustion engines and describe the strokes, whether two-cycle or four-cycle type, and describe the mixing and introduction of fuel." Right into the specific safety problem, for many of those things do result in accidents. I mean the failure to know the timing of engines, etc.

When we found men who were bluffing their way through on the job as to the proper procedure then the foremen went to work on them.

MR. BONSI: One of our New Jersey plants has been issuing a quarterly questionnaire that has been very effective, because those questions are carefully phrased so that they cannot give a "yes" or "no" answer. In most cases an answer has to be given that requires some thought. I am very much in favor of those quarterly questionnaires. They are a good check-up.

Another good check-up is a careful review of your safety committee reports. They also show you whether or not the ideas are getting across.

CHAIRMAN GREENLY: I have here a question or two that we have formulated on that technique. Here is one that is representative of the questions that are used in conferences on unemployment compensation,

for instance: "In Indiana the limit of benefit which employees can obtain in one year under the Employees' Compensation Act is \$325. Is that true or false?" Here is another one: "If an employee reports for work in your department under the influence of intoxicants, should you send him to the hospital for observation; notify the superintendent or supervisor of plant protection; ask him where he got the liquor; wait until he sobers up and then send him home?"

Now, it is rather interesting to find out how those questions are answered. This particular questionnaire was prepared by a training director in one of the industries in Indiana. The men as well as the superintendents are agreed that such questions make their meetings much more simple and specific. Also you will find that it gives you something around which your conference can be built.

I am also particularly concerned this morning in finding out whether there is any difference of opinion as to where the safety director and the training director of a plant fit into a merit rating system. Have you had any difficulty there, any member on the panel?

MR. BUSHNELL: Our safety director and training director and all those other directors are all one or two guys; that is what I meant when I talked about the small plant.

CHAIRMAN GREENLY: Do you have any differences there, Roy? When you have a training director as well as a safety director, is there any conflict between the two?

MR. BONSI: There should not be, but I do not think that the safety men should be asked to get in on the rating business.

CHAIRMAN GREENLY: Mr. Boggess, have you had any experience on that?

MR. BOGGESS: Well, I got into an awful argument last month down in Dallas, Texas, on the same question. Some of those hecklers who caused trouble there are sitting here on the front row. Maybe we had better not get into it too deeply.

CHAIRMAN GREENLY: What I am trying to ask here is: Should the training director be responsible for setting up a training program for safety?

MR. BOGGESS: I think that would depend upon the policy of your organization. I see no reason why he should not.

MR. ALBERTY: We have both a training director and a safety director. The training director gets up the programs for training and the safety director follows through to see that the work is done properly. At least, they try to do that. In other words, the refinement of the work is safety work. It is that over and above just doing the job. It is doing it absolutely correctly.

CHAIRMAN GREENLY: We have been throwing out some hints on what is being done by the members of the panel. I think possibly we will get a great deal more from this meeting if we now throw it open and ask you folks in the audience if you have questions you would like to raise? I should like now to entertain a question that comes from the floor.

Attitude Training

CHAS. S. BOWDEN (The Ohio Public Service Co., Alliance, O.): I should like to ask what training has been done in the matter of attitudes? I wonder what the gentlemen of the panel would say about getting the men to do the things they already know how to do. The second thing is I think it is a little dangerous always to consider training as a matter of meetings. I think that we should recognize that maybe the ideal situation for training, as the old educator said, is a student here and a good teacher here, both of them sitting on a log, working together.

CHAIRMAN GREENLY: Mr. Boggess, have you done any attitude training? Will you define what you mean by "attitude"?

MR. BOWDEN: Attitude is the desire on the part of the individual to carry on what he knows or thinks he knows about the policies of the company which pays his salary.

MR. BOGGESS: Do you mean, sir, to get back to the fundamentals and the rudiments of whether or not a man is yet sold on the safety program, whether or not he has the right attitude toward it, whether or not he is willing in his own mind to adopt the policies and rules and regulations that you present to him, that you want to sell him? Is that what you have in mind?

MR. BOWDEN: As an illustration, when the man goes to work, as was brought out here, he is very open-minded, he is very receptive, his attitude toward training is good. Ten years from then his attitude perhaps is changed. He has been exposed maybe to the virus of some of the other fellows who

think that maybe you do not have to study so much. What I should like to know is how do you keep them pepped up on the subject of safety? How do you keep their minds open and receptive for all of this stuff that you are putting out to them.

MR. BOGGESS: I think in the first place that that is only an assumption, that his attitude is all right when he first goes to work. It may appear that his attitude is all right and he may accept everything you say, but at the same time it may not be. I think the best way to keep men pepped up on this question of safety is to give them a part in the formulating of the codes and in deciding on the methods to be employed in doing the job. That has been our experience.

Keeping Them Sold

CHAIRMAN GREENLY: Now the other part of the question that you raised is, what is being done to keep them sold, to keep them pepped up?

MR. BOWDEN: I think the gentleman's answer is the one I wanted to bring out. I should like to have your opinion as a trainer. Is not the ideal situation in training not to have training but just to have man-to-man intercourse?

CHAIRMAN GREENLY: I might say that where we are setting up training in industry, we are particularly seeing that top superintendents are brought into the advisory committees. If the top superintendents are not sold you can do nothing else about it, and it is surprising to find that top superintendents are somewhat difficult to sell in many instances. If the foremen give you the reactions they want to give you and nothing is done at the top, they say, "Why hold these meetings anyway? We told you about that long ago. You have the wrong group in this meeting. Bring the big hats in." We have heard that more often than I can tell you, and therefore I will no longer start a meeting in industry until I have had a series of meetings with the top superintendents. After all, they are the group of men who should be making the money and be interested in the safety of their men. If they take it without too much concern, I am doubtful whether the men down the line will come through.

R. L. STAGGS (Commonwealth Edison Co., Chicago, Ill.): I do not believe that the gentleman's question was completely answered a moment ago. I want to add to the

answer. We have programs identical with the program that the gentleman heckler injected a while ago, identical programs, but part of our program is telling the foreman what we want him to know, and another part of our program is finding out what he wants to know and giving it to him. Now, in these programs we have a two-way flow of information; one down to the supervisor, and in our other program, the fifteen-minute program that he presented, down to the employee; but we also make certain that the information that he wants comes back to us through a tear-off slip or through the means of the meeting. We give that just as much attention as we do that information that we want to get down to them. So I would say in answer to this man's question, make certain that you know what your employees want to know and give them that also.

CHAIRMAN GREENLY: I think that is a very fine contribution; I appreciate it because I think you are right down to the grass roots.

R. L. CONWAY (United Gas Pipe Line Co., Shreveport, La.): I should like to know if any organization represented in the audience has used panel discussions and has had supervisory meetings exactly as this is being conducted here today and as most of us have seen at various other times? I want to differentiate between this and the usual conference method, as a great many of us have been using it.

CHAIRMAN GREENLY: I will try to answer part of the question from my own experience. I like to use the panel method, and have used it rather successfully, when we want to impart to the audience a certain amount of information. It is rather difficult when you want to get expressions from the audience, particularly when you have a large audience.

I had the experience a few years ago of trying to help sell an insurance policy for a large company. We had each member of the panel so schooled that he presented one special part of the policy to the men in the audience. I think that the panel method is more of information giving than it is anything else.

I might say to you that I have had 150 copies of the panel method that I have been utilizing mimeographed. If any of you would like to have a copy you are welcome to it.

Would anyone else like to express his experiences on the panel method? Roy, would you like to say something about it?

MR. BONSBIB: Yes, the panel method is very effective, as Russ says, with small groups because you will find that the average superintendent is not used to talking to large crowds and most people get sort of jittery when they get before a group. The fact that they get jittery interferes with clear thinking. However, the panel method has been very effective with small groups, and Mr. Roaper has mentioned one that has been used very effectively in a small group but not in a large group.

MR. MARRS (The Kellogg Co., Battle Creek, Mich.): Mr. Bushnell said that he is entertaining the idea of establishing a system of keeping some sort of a record of the number of times employees report to the hospital. If employees get the impression that every time they go to the hospital it is going to be put down in a little black book, how can we overcome their reluctance to go to the hospital for minor accidents which may develop into more serious conditions if not reported immediately?

The "Big Stick"

MR. BUSHNELL: As I understand it, you think that if the employee knows that you are keeping a record of his first aid cases or his injuries, his attitude may be such that he will try to avoid going down there?

MR. MARRS: That is right.

MR. BUSHNELL: My only answer to that is that we haven't found it to be so. For two years we have been following the system of making written reports on every dispensary case. One copy comes to my office immediately and one copy is sent to the foreman, and the foreman is expected to contact that man, even if it is only as much as a scratch, officially and sympathetically and find out exactly what happened. That in itself gives us a tremendous base of training. I mean between the foreman and the man. It brings up all kinds of things. We cannot stand aside and wait until somebody is badly hurt before we do any advising. We go on the theory that any accident is evidence of something gone wrong in procedure. So we are not concerned about the injury except when it comes to the end of the year and we have to tell our president how much our insurance costs. We are

not so much concerned with the injury itself as we are concerned with the circumstances of its happening, the thing that is evidence that an injury can happen. That evidence can come from a scratched finger or a turned ankle or anything else. It reveals all kinds of things to us about the mechanical equipment that has been overlooked, the little things. It reveals a lot of things to our foreman about attitudes. It gives our foreman an opportunity to talk personally to the man and get his reaction. Sometimes, it is a rather sullen, snarly one. You want to know that, if that is his attitude; and you will never know that he has a wrong attitude until your foreman approaches him and finds out.

In the two years that we have been keeping such a record and have talked in safety meetings about first aid cases, I think that we have convinced our men that we are not holding it against them and they are not afraid to come in. However, I am frank to say that we do have a big stick, because the first rule that a man learns when he comes to work for us is that he must report every injury under penalty of discharge for failure to do so. Well, we have never used that big stick, but it is there nevertheless.

We were told when we started keeping these records, "You cannot talk about first aid cases because you will chase all of the men out of the dispensary." But in the two years that we have been keeping them we have found that not to be so. We have found that keeping these records has afforded us innumerable opportunities for the foremen to get close to the men and discover the things that this gentleman calls "attitudes" as well as physical defects.

S. O. LAURHAMMER (Chain Belt Co., Milwaukee, Wis.): Have you generated among your employees sufficient enthusiasm so that they go to the first aid room every time they have a scratch?

MR. BUSHNELL: Yes, I think so, generally speaking. We are not satisfied, of course. We find individuals once in a while who have a tendency not to report, and that reveals attitudes. The foremen uncover them once in a while; they discover men who haven't reported for injuries, and in some instances infection set in and we found it out later. We have had cases of a man getting a little dust in his eye; he has tried to treat it at home and it has gotten sore

and he has had to come in. We handle all of those cases individually. We haven't meted out very severe discipline to date, but I think that the men know that we mean business about it and on the whole I think that we get very good voluntary response.

Our foremen are very alert to this, too, and they encourage the men to go to the first aid room. As far as I know, our foremen never reprimand any man when he says that he has to go to the first aid room, no matter how busy he is and under what pressure he is working. It seems to me that the attitude of your foreman is tremendously important in this question.

Our dispensary cases have increased tremendously in the last two years. Now that may be evidence that they are doing more voluntary reporting. It may be that we are having a worse situation. I do not know. It is one of the two. I should like to think that the tremendous increase is due to a spirit and an attitude of cooperation and voluntarily wanting to do something and to find out about it. I think that it has also had the effect of some men doing their jobs a little differently and avoiding minor injuries.

CHAIRMAN GREENLY: Would you say that it is partly the way they are treated when they go to the dispensary?

MR. BUSHNELL: That is right. Our safety man of our St. Louis plant is in the audience, and I want to say, for his benefit, in his plant particularly I think that is very true. The way they are treated in the dispensary is extremely important as regards attitude and the way you take the information down. We make every man describe what happened, the injury and the treatment and sign the form. Nothing about it is hidden. He knows that a full report is made of it. I think that it would be a terrible mistake to make a report and have it circulated around the organization and get to the foreman if the men didn't know about it. This concerns the very essence of good employee relations.

MISS LILLIAN STEMP (Lever Brothers Co., Hammond, Ind.): You mentioned before about working with the top superintendents. I am wondering, to avoid friction, how you are going to get to those top superintendents. Do you advise getting an outside man in, for instance, like yourself, much as they used to do with efficiency experts?

Executive Cooperation

CHAIRMAN GREENLY: The question is now raised from the floor, "How can we get these superintendents to come together without having friction and do we go outside and bring a man in?" In instances of a plant with an absentee owner, the safety director of the company may bring them together, and in many instances, of course, I come in from the outside and, therefore, that would be part of that answer. I find that where the company does it themselves, we have men rotate on the committee and each superintendent is asked to hold a meeting at which he presides. By so doing we make each man partially responsible for the job of the committee.

C. L. BURNS (E. I. du Pont de Nemours & Co., Waynesboro, Va.): There is a danger, we feel, in discouraging men from reporting injuries to first aid. Our company has adopted the practice of classifying very minor injuries as subminor injuries and those injuries are not held against the persons who suffer them. Those injuries are investigated and if there is any reason we should correct the hazards which caused them—and usually there is—the corrections are made.

A. E. PETERSON (Commonwealth Edison Co., Chicago): In our company we have both safety men and training men. Fortunately, the training program follows very closely that of the safety program. First we have safety and then job training. To emphasize training in public contacts, we separated that from regular job training. Then later we considered the job. So at the present time, so that you may understand the relationship between the safety man and the training man, all our safety work in group meetings and conference meetings is under the training group. However, any question pertaining to safety is always cleared through the safety director. If there is any question on safety operation, the safety man comes in. The same way, if he has certain special safety meetings and there is a question on procedure, he calls my group in, the training group. I personally think that if that is clearly understood by the group there should be no question.

CHAIRMAN GREENLY: Mr. Alberty, a member of the panel, has a point of view that he wants to present.

MR. ALBERTY: It might be well to re-

mark that in bringing the employee in to report small injuries, we have impressed upon him that if he does not report a small injury, later it may grow into something very significant and become a dangerous injury. We have told them that they should report all injuries so that we can get their cases before the Industrial Commission adequately. I think that has had a good effect in bringing in small injuries.

J. A. DOWNEY, JR. (Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.): Only one opinion has been given in regard to the time that the safety training meeting should be held or can be held. In a group like this I think that we can get a quick cross-section, and I should like to ask how many still do their training on the men's time?

CHAIRMAN GREENLY: The question is, "How many persons in this audience represent industries that carry on their industrial safety training on the men's time and how many do it on the company's time?" (Mostly on company's time.)

MR. DOWNEY, JR.: Under the old system of our company (and we work with 65 per cent colored labor) we did a remarkable job of reducing our accidents, getting a figure of 890 down to 700, down to 600, down to 112. Then we stopped our community safety meetings at which we gave away pigs and baskets of food, and the number has gone up. I need some help.

Training by Participation

E. C. FORSYTHE (Marsh & McLennan Co., Indianapolis, Ind.): I think that the foreman's part in the training program, the selection of the foreman, etc., have been brought out very forcibly. But there is another question and that is, should education or training be by participation? I want to ask first your opinion as to whether that is advisable, and if you think that it is and that it is a good method of training, what methods and what procedures do you follow? A man is more interested in a program and he learns more about it if he has a job in it and is doing some part of it. Do you skip the foreman sometimes and go down to the rank and file and make the workman himself a part of the program by giving him a safety job to do?

CHAIRMAN GREENLY: All right, Mr. Boggess, do you want to take that one over?

MR. BOGGESS: I think that question has been partly answered by this panel, to the effect that some of us are using questionnaires: in meetings either of supervisory groups or of employee groups, where the employee is specifically asked the question and if he does not know the answer digs it out, and if he does not know the procedure is instructed in the procedure.

MR. BONSBIB: A plan that has worked very effectively is to assign meetings to teams. A group of three or four men will be responsible for the next meeting and for making up their own program. If they want help, they can get it on request, but there is no interference. It is very interesting to see the interest that is aroused, because of the old competitive instinct, to put on a better program than the previous group has done. That gives them participation and it works very effectively.

CRYMES PITTMAN (United Gas Pipe Line Co., Shreveport, La.): We got the idea of using the panel discussion method for a roustabout meeting of eighteen men. Three or four boys in that roustabout crew would not work right. I put them on the panel and they had to learn safety in order to serve.

DOMINICK COMOSA (Aluminum Company of America, Edgewater, N. J.): In order to reach the rank and file, in the plant where I work, which has ten departments ranging from 50 men to 950 men in each department, we have established safety meetings of the employees themselves in each department. That is in the Edgewater, New Jersey plant. We used to have departmental meetings with foremen and supervisors, and department heads would preside over them, but we found that it was difficult to get to the bottom and to get the safety across to the rank and file. So we have instituted the practice of appointing safety committees throughout the plant, each department having its own. They have a chairman, an assistant chairman, and a secretary, and they conduct their own meetings. The department heads or foremen can be in there if they want to, but they have no say. We have found that so far we have gotten very good results.

The chairman holds meetings once a month and writes a report to the department head and a copy is sent to the director. They make suggestions, which go to the chief

engineer of the plant, and we take immediate steps to correct the defects which they point out about machinery. But the main point of those committees is to teach the men on the job, and we feel that the employees themselves have more chance to contact their fellow workers.

W. J. DENNISTON (Hyath Division, General Motors Corp., Harrison, N. J.): In the area from which I come we follow the general system of having what we call safety cabinets, and in our plant of 2,000 we have one to every ten workers. The Newark Safety Council, of Newark, New Jersey, has training courses for these safety cabinets, and each year the men in the various plants are sent there, and are given some training. They are given more in the plant, and they are assigned to certain groups for which they are more or less responsible, thereby taking a very active part in the training program.

CHAIRMAN GREENLY: Are there any more questions?

How Convert the Foreman?

JOHN J. BURGER (W. J. Dickey & Sons, Inc., Oella, Baltimore County, Md.): I should like to ask the panel what to do with a foreman or a supervisor, who is a first-class production man, who is a cracker-jack as regards efficiency, but who thinks that safety is a lot of so-and-so? Are you going to put the heat on him? Are you going to take him out and buy him a beer, or how are you going to bring him over to your side?

MR. BONSBIB: I cannot conceive of a foreman in these enlightened days who would think that, and I will bet that that foreman's costs are high and he is inefficient, because a man cannot have that attitude and be an effective, efficient foreman.

CHAIRMAN GREENLY: Is that a satisfactory answer?

MR. BURGER: No.

MEMBER: I have been in safety work one week. I spent twelve years with J. Edgar Hoover in the Federal Bureau of Investigation, and I am now in safety work. I do not propose to say that I know much about it, but I believe that we are beginning to solve that question at the Weirton Steel. We moved our safety program from the industrial relations building over into the producing department. We charge each man-

ager with the accidents happening in his plant. We charge him like we charge him with labor. We charge him like we charge him with material. He is tearing his hair to keep the number of accidents down; therefore, he will have some results and hang the responsibility on his foreman to put the educational program across.

CHAIRMAN GREENLY: Does that help you?

MR. BURGER: No, not yet.

CHAIRMAN GREENLY: I am going to ask whether Mr. Weatherstone, of the General Mills, is here. Will you answer that question and give us a little dope on how you get down to the employee?

C. J. WEATHERSTONE (General Mills, Inc.): I believe the question is: How to convert the foreman? Well, men, I think in the first place you must bring that foreman in with other foremen who are interested and gradually sell him your ideas on safety. You cannot do it overnight. We run into many cases that are discouraging to the supervisor of safety. But if we will be patient, if we will show that man records proving that years ago in that very department there were many more injuries, and that through constant effort on the part of the company the record has gradually been improved, that man can't help but be convinced in time that the safety program is worth while. I feel sure that if you will just work on that man and work with him, not necessarily putting the heat on, but patting him on the back and telling him that he is doing a good job, letting him know that he is a good production man and that he is capable of doing this other part of the work that you are expecting of him, you will get results.

O. L. WEBBER (Gary Works, Carnegie-Illinois Steel Co.): I should like to answer that question. I believe that if that foreman were involved in a lost-time accident and he were required to go over to the injured man's home, any time during the day or the night other than the man's regular time to be home, and impart the information to his family that he isn't coming home, if you cannot sell him on safety then he isn't human.

M. L. WURMAN (Bayak Cigars, Inc., Philadelphia, Pa.): Gentlemen, maybe I am one of those so-and-so's. I am a general superintendent, and I tell you that the an-

swer is to have your general superintendent insist that that foreman get into line.

CHAIRMAN GREENLY: Now we are getting down to grass roots.

R. H. LUCKENBACH (Philadelphia, Pa.): We all work for a boss. He tells us to go to certain meetings. He pays the bills. He also has what are called "budget meetings." We all know what that means. A foreman spends 98 per cent of his time with production and 2 per cent with everything else, time cards, production cards, safety and what not. Let's try if we can to take that 2 per cent and make it rubber, pull it out so that we can put some safety into it.

Let's take these foremen that we feel do not know anything about safety and call them into what we call an accident court, after they have had accidents. Call in also the men who are directly connected with the accidents, the helpers, even the men who are injured if they are able, the safety man and the superintendent and, if possible, the vice-president. That is the first step. Let each one have his say. I believe the foreman's face will be red.

Then at the end of the month let's have our budget meeting. Normally a foreman is not invited to the budget meeting. It is the superintendent who has to do with the costs. At the end of the budget meeting, so that the superintendent do not know anything about it, the safety man should, if possible, invite two or three of the foremen in who have rotten records. Keep them outside the door, if you care to, until the time comes and then invite them in and discuss in front of the management, including the vice-president and the superintendent, the accident which have been had during the past month, the number of days lost, and what you suggest be done about it.

I say the foreman's face will again become red, as well as the safety man's, because he is not excusable at all times.

MR. DOWNEY, JR.: I want to give you the answer to that one and save you a lot of money. Bring that man with you to one safety conference and you will save yourself a lot of time. He can pick it up right there. He will be exposed to it, and if he doesn't take it, you are wasting your time to keep any foreman in your organization who has that attitude. Bring him up, if the boss won't bring him. That is the way I came to my first meeting.

CHAIRMAN GREENLY: I think our time has elapsed. We will take one minute to sum up what was done this morning. It seems to me that in safety training we must teach something about many things and many things about something, and if we are going to reduce the accidents and the hazards of industry, it is going to be done just like the Kingdom Come. It is going to depend on just what we do as safety directors for each and every individual under our supervision.

We have discussed the human element in safety, emphasizing that teaching is learning, that to make safety a working proposition the foreman must *learn* the worker and the job. We have heard from small and large plants, the human element is the same in all. We have talked of the panel as a method of getting information to and from the foremen; as a clearing house for complaints and as a place for the building of safety codes by the men themselves.

We have emphasized the importance of a right beginning of the safety job and the

worth of a whole-hearted follow-up by the foreman or supervisor. One plan discussed was to break a job down into its elements and analyze them—to have the men themselves agree on the safe way and the foremen to see that that way is adhered to. We agreed on the value of this plan. We decided that the foreman does not become a teacher and a learner of men just by virtue of his promotion but must be trained to teach and to learn.

We found that most safety meetings are conducted on company time. We spent much time in our consideration of the place of the merit rating system in a safety program; we decided that rewards are effective in motivating men to safety practices. The matter of reporting injuries received due consideration. The meeting ended with a lively discussion of what should be done with the foreman who though extremely efficient in all other matters would not cooperate in safety. Your chairman wishes to thank fellow members of the panel and questioners in the audience for making this a profitable meeting.

ADJOURNMENT

Visual Education

THURSDAY MORNING SESSION

October 10, 1940

The session devoted to a discussion of problems in visual safety education was called to order by E. I. Woodbury, Director, Poster Division, National Safety Council,

who presided. Mr. Woodbury welcomed the delegates and made a brief statement of the plans for the meeting. He then introduced the first speaker.

The Practical Application of Photography to Safety

By C. L. WAGNER

Director of Safety, Duquesne Works, Carnegie-Illinois Steel Corporation, Duquesne, Pa.

One of the major problems in safety education is that of developing the most effective way of presenting pertinent information, ideas and safety suggestions to employees. This instruction must be conveyed in a manner as to enable them to understand the principles we are stressing and to retain the ideas presented.

Even though verbal instructions, job training, and written information may seem to be sufficient, we must remember that all men do not grasp or retain the printed or spoken word with equal ease. Consequently, we have done some experimental work along the lines of pictorial presentation and are convinced that graphic presentations are highly effective.

Technically trained men respond at once to graphs. They see at a glance essential facts that would require considerable time and study to develop from written facts and figures. The average workman, however, is not a highly trained technician, and a still more simple presentation is necessary to reach him—something dramatic, that he can understand readily with little thought.

Volumes of descriptive matter can be written about accidents and unsafe practices, yet how can you expect a workman in the plant to read even a single page? These volumes may be condensed into charts, figures or bulletins, and still not attract the worker. But when you illustrate the point by an actual photograph, you catch your

man's eye. A dramatic picture, a short descriptive headline or caption, and the reader makes up his own story around the idea you have planted.

As an example, consider an article on safety. If it carries illustrations it catches your eye as you leaf through the magazine. You stop and glance at the pictures; your mind immediately grasps the situation; you actually see the hazards as they exist; and then you read the article to see how the author solved the situation. But the chances are that immediately after seeing the pictures you may have answered the problem in your own mind. Now—as a mental exercise—try to reproduce the pictures by a word description which would tell the shop worker the same story!

It is a safe bet that the illustrated article will have more punch and put over the intended message in far less time, and with far greater effectiveness, than your printed story. That is one reason why I am going to use a series of slides in connection with this paper.

Our first venture in using photography at Duquesne Works was to re-enact, where possible, all our lost-time accidents. These pictures were projected from a film on a screen at our monthly supervisors' conferences. Each accident was described in detail, and in many cases the discussion would suggest corrective measures. This made a good start, but we did not like the idea

of using only lost-time accidents for our subject matter. Another objection was that the use of films was limited to the supervisors and consequently did not reach far enough down the line.

We had been using home-made posters at Duquesne Works for several years, but were not entirely satisfied with our results. As the new method of photographic presentation seemed to be working so well with the supervisors, we decided to try a modification of the film idea and use reproduced pictures on the bulletin boards.

The new poster, captioned "The Camera's Eye," is printed in attractive color combinations and is 20x26 inches. It appears sometimes only once a month, but usually twice a month, as the collection of suitable material warrants. From four to eight photographs are reproduced on each poster, illustrating unsafe practices selected from the supervisors' "Unsafe Practice and Safety Accomplishment Report."

Subject matter selected for photographing

is confined to practices not too dangerous to re-enact and of types most frequently reported. These photographs are reproduced on the posters with suitable captions briefly describing the unsafe practices. Some are humorous, others satirical, and some of a subtle nature. Catch words and slang phrases of the day are used, and the poster has "caught on" to a gratifying extent. In fact, the posters are followed closely and we feel that every employee in the plant reads them as soon as they appear.

The originality of the idea, the snappy and different manner in which the unsafe practices are brought to attention, and the attractive appearance of the posters, all combine to make them both popular and effective.

At first we attempted to confine each poster to some particular occupational, departmental, or group hazard. However, we discovered that more interest was aroused by more diversification, so we are now following that practice.

The Use of Visual Aids in Accident Prevention

By JOHN H. LEE

Resident Engineer, Liberty Mutual Insurance Co., Rockford, Ill.

Reduced to simple terms this is the problem on which we are burning the midnight oil: "That John W. Workman may go home to his family at the close of each day with all of his fingers, both eyes, no broken bones and a whole skin."

That is the cornerstone of the National Safety Council, and all of the local safety councils and safety programs.

Every day in every city of any size John W. Workman and several of his brothers leave the plant *before* the close of the day—or the close of the shift. But they do not go home. They go to the hospital—sometimes they are taken to the morgue.

If ever we are going to keep John on the job until the close of the day, or shift, we are going to have to talk to *John* about it. He is the fellow who gets hurt. The man behind the wheel is the one who stands the truck on its nose in the ditch.

Up to date we haven't said much to the man-on-the-job about it.

Always, from the beginning we have been

preaching to, selling and telling the "Big Man" or the management. Of course, we must first sell the management. But management has long since been sold on safety. They will furnish anything, do anything they can to prevent accidents.

The foreman—bless his heart—what a chopping block, what a punching bag he has been for safety speakers! We have been harping, hounding and pounding on the foreman for years. We have held him directly, personally responsible for all of the blood, bones, widows and orphans grieved out in industry.

The foreman *can* help. He is closest to the man on the job. But the foreman can't do it *all*. He has *other* things to think about and talk about. His big headache is *production*. In spite of all the "Big Man" and the foremen can do, accidents pile up.

And so, at long last, we are waking up to the fact that the man on the job is the man to reach. The less talking and the more showing we do, the better. Not that he can't

understand what we tell him. It's just that it goes in one ear and out the other.

"Apt Illustration Saves Lengthy Explanation."

The best, or most effective, method of illustrating is with the stereopticon slide.

I use a projector with an attachment for film strips. The 500 watt lamp will *not* burn the film because the light passes through the water filled bulls-eye and you may hold the picture on the screen as long as desired. Also you may shoot from the back of the room, if screen is large enough, plenty of light. A quick change from film strip to slide may be made by tilting the attachment to one side.

The advantage of the individual slide is that you can change the sequence of the illustrations.

Caution: Be very sure that the picture is absolutely true to the mechanical set-up of the situation as it was when the accident occurred.

The minute a certain picture came on the screen out in one of our furniture plants a man spoke up: "Look", he said, "the guard is tied back." "Yes," I said, "and that is why he lost that finger." I then went on to explain that the man took hold of the leg too close to the unguarded knives and ran the leg against the cutting head until this end reached the stop clamped on to the end of the table and, of course, his fingers reached the knives before the end of the leg reached the stop.

Up jumped the plant superintendent and he says: "Wait a minute with that picture. It couldn't have happened that way. That man is using the right hand head. You can see the other head at his left. The right hand head always runs counter-clockwise, he couldn't have been pushing that leg toward the stop."

Then the machine room foreman walked up to the screen and with his lead pencil pointed out the way he thought it should be. Someone in the crowd suggested that the slide might be turned around in the projector. The young man at the projector promptly turned the slide around. They said "Ah—that's more like it."

That helped me wriggle out of a tight place. But, gentlemen, the picture was right in the first place. I was wrong. I should have said that the man placed the end of the

leg against the stop *first*, then ran it along the knives until the cut ran off the end of the leg. Visual aid, in this case was indeed most effective. It stimulated interest and brought out a profitable discussion.

It was as though I had taken that group of machine operators over to the north end plant of B. X. & Co., taken them right into the machine room and grouped them around the shaper where they could *see* the what, why and how of it.

You just can't beat the old stereopticon, or still picture. If the set-up is true and you *know* what you are talking about.

Better be sure of both.

Another thing—be sure that your illustration is *apt*. Show something definite and specific, something that has to do with the hazards incident to the operation of the machinery in the plant where you are showing the pictures.

Don't waste time and effort showing a punch press set-up to the men employed in a wood pattern shop.

We continue to speak of Visual Education. Well, that's all right for the school classroom. I'd go easy on that word education when you set up your screen in the mill room. Avoid giving the impression that you are coming in there to *educate* Mister Workman. He won't like that. He will resent that.

Movies

The movie moves too fast. "Off agin—on agin—gone agin—Finnigin." No one set-up remains on the screen long enough to register, unless the action is repeated in slow motion. And a movie without an explanatory narrative is useless; the action is gone before the man has time to "figure out" what is right or wrong.

I said a moment ago that our illustrations should have to do with the hazards of a particular line of work. It would be impossible to give a satisfactory illustrated safety talk to this gathering on the hazards of your employment because no two or three of you are engaged in the same line of work.

But—every man in the room drives a car. For the purpose of this occasion we will assume that we are a group of delivery truck drivers. We all drive for the "Consolidated Laundry Corporation." We have to go places, pick up and deliver. Let's just suppose that I am the route supervisor—or

whatever they call the fellow that must answer to the big boss for all the jams you fellows get into. Things have been going haywire, we have had four crack-ups this month, all four have happened at intersections. We have all the known facts in each case but we are not going to spend too much time on a lengthy explanation of each accident. (I will show several pictures.)

Look, Walter, there is the coupe that you smashed up. You were edging away over there on the center line inviting the coupe and the rest of the traffic to pass on your right. This fellow had every reason to suppose that you were going to make a left turn—or at least keep straight on. Just as the coupe started to go by you, what do you do but come this—right square in front of him. (X) marks the spot. A right or left turn from the wrong lane is packed with dynamite.

Look, Norman, you were all set to make a left turn—over here in the left lane. O.K., but you were coming too fast. Didn't you see Susie coming into the crossing, edging over the line to turn left also? Your skid marks show that you were going too fast to stop when she cut in front of you. You didn't slide far—but far enough to tear off the bumper. Left turns are always difficult.

Eddie, you should know better than to cut

corners like that. That four horse, hay-maker turn that he was making was not so good either but that doesn't help you off the spot for cutting corners. Doctor says he is getting along all right but he won't be driving again for a week or ten days.

Charlie, will you tell us what you were thinking of—or what you were looking at when you cut that caper going around the corner of State Street and Second Avenue? Did a piece of paper blow up in front of the truck and scare it—yeah, made it shy like a young horse. Anyhow you crowded the car passing you over the center line and he went into the island and wrecked a front wheel.

As you probably guessed these slides were made from diagrams found in an instruction book. I have suggested to the author of the booklet that he have an animated cartoon made up as a regular talkie movie to show the actual movements of the cars making the improper turns. The talkie part of it to be the clear, distinct voice of a narrator. The movement of the cars to be shown first at normal speed and repeated in slow motion.

No funny stuff—no Pop Eye or Mickey Mouse.

The slides to be used first for instruction, detailed information and round-table discussion.

Safety Posters—Their Development and Use

By E. I. WOODBURY

Director, Poster Division, National Safety Council, Chicago

There is nothing so stale as last week's posters hanging askew with frayed edges, torn and covered with dust on an ill-kept bulletin board. The conglomeration of messages, colors and titles do not even attract the attention of the casual passer-by; let alone convey the safety message intended. However, the plant bulletin board, in the right hands, can be made one of the most powerful factors in the prevention of accidents. I firmly believe that a plant safety man can do more good with the bulletin boards at his disposal than through any other medium.

The proverbial question, "What comes first, the chicken or the egg?" certainly applies to posters, the simile being "What

comes first, the poster or the bulletin board?" It would be safe to say that a topnotch poster has little value on an unattractive bulletin board. This is an old story—one, which we of the National Safety Council have been preaching for a long time—and yet the problem still exists. *Not enough attention is given by safety men to the effective display of safety posters.*

I recently visited the factory of a large manufacturing company. I saw bulletin boards on the plant grounds and within the various factory buildings. The outside boards needed paint and repairs; the posters were small, faded and poorly placed. The inside boards were dirty, poorly lighted and poorly located. The management of this

company is carrying on a safety program at considerable expense—paying good money for safety posters and wasting them on inferior display boards.

Why does this wasteful condition so commonly exist? I feel it's because a few safety men are not yet convinced of the value of safety posters, nor are they aware of their fundamental purpose.

Safety, after all, is a matter of moulding minds. This business of interesting people and arousing their enthusiasm is as much a mass job as it is an individual one. It calls for the building up of favorable sentiments. Where one may lose out in an effort to convert an individual, he may succeed in converting the majority of a group, and with that accomplished, complete victory is not far away.

Business has recognized that fact for many hundreds of years. Only in business, it is referred to as advertising. Today, you can advertise and sell almost any product, intangible as well as tangible.

Posters and the bulletin board are your advertising vehicles in selling safety. It isn't a case of "safety must be sold"—it is a case of "safety can be sold." Posters do the same thing for safety that newspaper and magazine ads do for commercial products; they bring your product to the ultimate consumer. In the case of industrial safety, the ultimate consumer is the worker.

In discussing the purpose of safety posters, it might be said that they are the "shock troops" of the forces that are fighting against accidents. They are meant to break resistance by instilling safety consciousness in the worker's mind; they open the way for the other units of the "army," such as job instructions, safety contests, safety engineering, etc., all of which produce a receptive mood and willing assistance from the men in the plant.

Since the ultimate in this hypothetical battle is to save lives and prevent injuries, it should follow that the real purpose of safety posters is *indirect*. Occasions in which a safety poster was directly responsible for the prevention of an accident are naturally rare. That is one of the elusive things that never finds its way into concrete figures. On the other hand, by incessant bombardment, posters accomplish what few other safety activities can; namely, the creation of an acceptance of safety, prestige to the cause

of accident prevention, and a hearty spirit of cooperation in the work undertaken to eliminate the hazards which precede the accident.

Creating safety posters today is a vastly different proposition than it was in the early stages of the safety movement. It is as essential here as anywhere else to keep pace with the modern tempo and its high-keyed emotional appeal. It is not sufficient to portray an idea in black and white and hope that it receives ready acceptance from those who see it. An idea must first be simplified, emotionalized, given the necessary copy or slogan to tell the story effectively, and then illustrated.

If the incorporation of these fundamentals successfully portray the original idea, the chances are that it will be an excellent safety poster. The first-class poster must have one or more appeals to a varying number of emotions in order to have the story remain after the reader gets past the bulletin board. Eye appeal must be a permanent consideration in getting the attention and frequently this is done by the use of color. If romance can be worked into the scene, so much the better.

For example, let us work on the likely hypothesis that the average workman is interested in the score of today's ball game. Under such circumstances, would a sheet of paper with the two words "BE CAREFUL" be as effective as a clever slogan incorporating the same words but carried through by a baseball or football illustration that is dynamic and forceful with action? The answers are obvious, because engrained in the mental makeup of every human being is the urge of adventure, romance and excitement.

In the honest effort to urge employees to take precautions for their own welfare, we must never lose sight of the fact that we can't tell a man something and be certain that he has retained it. It is usually necessary either to enforce your point (which is undesirable) or else sell him on the idea. Since safety is an extremely difficult and intangible thing to enforce, the problem boils down to that of directly merchandising the idea by methods of visual education.

Our poster production has become a highly standardized procedure. For purposes of an example, let us assume that the need for a poster dealing with the hazard

of falls has been relayed to the poster division by the reviewing committee.

The job is turned over to a copy man whose first action is to delve into the well-stocked files of poster data. After consulting all available information, he consolidates this technical knowledge into a more concentrated form. From this point onward, it is necessary to consider the lay-out and adapt the technical message to a "streamlined" presentation which will most effectively portray the original idea as well as adding necessary details either for illustration or attention getting values. The copy is then turned over to the artist for his layout comprehension. If possible, the artist is given free range in illustrating the poster idea.

Our poster layout sketch illustrating falls, along with the other posters for the month's circulation, is then reviewed by a poster committee, made up of engineers, journalists and advertising men. It is the function of this committee to give technical criticism and suggestions on the relative merits of the poster as a sketch. Following this analysis, the finished drawings are completed, and after the engraving and printing, the poster is ready for issue.

Long experience in developing safety posters has taught us several very important rules. Among them, that of avoiding the use of a negative appeal, unless absolutely necessary. Always unwelcome is the continual "Don't do this" or "Don't do that" phrase. It tends to breed resentment more rapidly than any other fallacy in human relations. Sooner or later it sets up a negative and resistant attitude in workers' minds and safety becomes a "pain in the neck" instead of the protecting friend that it should be.

Experience has demonstrated that there are two emotions inherent in men that are easy of access and which act as excellent sounding boards in appealing to a man's sense of reasoning. These are pride and family love. If a man can be stimulated to take pride in being a safe worker, one of the most valuable jobs in safety has been accomplished. Posters on "success through safety," "safety records," or "score sheets" are an excellent approach to the sense of pride.

In appealing to a man's love of his family, you undoubtedly touch one of the things in

life most dear to him. "Heart appeal" posters, picturing the hardships and suffering endured by the wife and children of an accident victim are always powerful enough to cause a man to think more than twice about the results of rashness or carelessness. We must bear in mind, however, that this approach must not be overdone, as it will lose its force more rapidly than any other form of appeal.

There is a general trend these days to use more and more cartoons on posters. Cartoons on posters tie-in perfectly with the use of action pictures and they are extremely popular. There is a psychological reason for this, in that the average workman is the type of person who dislikes formality and undoubtedly absorbs information presented in a down-to-earth fashion. Of course, it must be considered that anything humorous will always demand attention and is retained.

Another important trend is the growing demand for the incorporation of patriotism in safety posters; which brings up the very timely question, "What is a good patriotic poster?"

In the first place, it must be *inspirational*; in other words, highly dramatic, colorful, and powerful. In the second place, it must *explain its purpose*; that is, it must tell the reader what the poster is attempting to accomplish and what the reader can or should do in this attempt. This simply means that the thought should be worded in the form of a challenge or plea. Thirdly, the patriotic poster should *create a desire for action*—it should stimulate the reader to *do something* about the situation!

Bear in mind that the result of all these essentials must be simple and brief, yet cleverly presented—patriotic posters are no exception on that score! Patriotic posters, tying together safety and national defense, have a vitally important place in industry these days and it will be well to remember how these indispensable requirements create results.

In many instances the illustration on a poster is often of greater importance than the wording itself, and it is usually the part of the poster that draws the eye first. This is due mostly to the fact that the effectiveness of a poster depends upon its intensity and simplicity. For this reason, a good poster illustration must be unique in treatment. It must incorporate qualities of boldness and

be colorful and direct; and if possible it should be full of action. All too frequently clever and valuable safety ideas are smothered by weak or complicated illustrations.

Last year the National Safety Council distributed well over four million posters. Most of this circulation was confined to the North American continent. However, a great many of them went to all corners of the world. The very fact that our members have given these posters such a wide acceptance seems to be indisputable evidence that they are justified and that this method of visual education is being utilized and its importance recognized.

So far this year, the average monthly poster circulation has been close to four hundred thousand. Let us assume that ten people read each poster (and that is probably a very conservative estimate); then

these posters reach approximately four million people every month. It is only natural to assume that the National Safety Council posters have the greatest coverage of any similar safety medium in the world today, and we feel certain that such wide coverage is of tremendous assistance in the education of people in the ways of safety.

Thousands of workers in industrial plants see these posters every day; motorists on the highways and the lone forest ranger miles from civilization, sailors on ships at sea, miners at 1,000 feet below the earth's surface, children at school and people in all walks of life are taught safety through the medium of these posters.

We're selling safety to *four million people* every month, we must recognize the importance and purpose of this medium, so that it may accomplish the big job intended!

ADJOURNMENT

Aeronautical Section

Officers 1939-1940

General Chairman—C. R. SMITH, American Air Lines, Jackson Heights, L. I., N. Y.
Vice-Chairman—MAJOR R. W. SCHROEDER, United Air Lines Transport Corp., Chicago, Ill.
Vice-Chairman—JEROME LEDERER, Civil Aeronautics Board, Washington, D. C.
Secretary—EDWARD T. PAXTON, Pan American Airways, New York, N. Y.

Officers 1940-1941

General Chairman—MAJOR R. W. SCHROEDER, United Air Lines Transport Corp., Chicago, Ill.
Vice-Chairmen—TOM O. HARDIN, Transcontinental & Western Air, Inc., Kansas City, Mo.
JEROME LEDERER, Civil Aeronautics Board, Washington, D. C.
Secretary—EDWARD T. PAXTON, Pan American Airways, Inc., New York, N. Y.

WEDNESDAY AFTERNOON SESSION

October 9, 1940

The session was called to order by Major R. W. Schroeder, Vice-President for Safety, United Air Lines Transport Corporation, Chicago, who presided. After commenting briefly on the objectives of the Congress,

and especially on the participation of the airlines of the country in the nationwide campaign for accident prevention in all industries and pursuits, Major Schroeder introduced the first speaker.

Uniform Airport Traffic Control

By MAJOR JOHN BERRY

Manager, Cleveland Airport, Cleveland, O.

Uniform airport traffic control must of necessity be Federal control.

In 1929 there was installed at the Cleveland Airport, over the objections of the Airlines and the Department of Commerce, a control tower whose primary purpose at that time was to prevent collisions on the airport and to expedite the landing of transports for plane-train connections.

As traffic built up we developed a system for coordinating and distributing information along the airways which centered at Cleveland. A record was kept of the ships on these airways, the altitude at which they

were flying, their destination, arrivals at their terminals and in a limited way carrying out the functions which have since been developed by the Airway Traffic Control Section of the Department of Commerce.

The primary function of an Airport Control Tower is to supply information to the pilots of the various airplanes landing and taking off from an airport. It provides the order in which planes are to take off, whenever such action is necessary, and of necessity determines the question of priority.

The increase in numbers of privately operated airplanes, coupled with student flying

activities, has presented many problems to the busy Airport. The transports, with their larger craft and their use of a wider range in landing or in circling to land, should at all times take precedence over any type of flying except in cases of great emergency.

The question of a definite line of demarcation between the functions of the Airway Traffic Control operator and that of the Airport Control operator is still undefined.

The approaches and the type of construction of the airports of this country vary to such a degree that in many instances a uniform control will work a hardship.

At Cleveland, with an area of 1040 acres, all flyable, and with no hazards existing within 20 miles of the port from all directions, we are subjected to the same ceiling and visibility limitations as any other ports that do not have such natural advantages.

The efficient control tower operator is an extra pair of eyes for the pilot, in that his vision is unobscured, and it is within his power to discriminate which of several approaching ships he given priority in landing.

The information, not only of traffic in and about the port, but of weather conditions, altimeter settings, time checking are all available from the control tower to the pilot about to leave.

Many claims have been made that the private flyer is given little consideration in the matter of approaching and landing on major terminals. This perhaps is true to the degree in which the private flyer has prepared himself to accept the facilities of a control tower.

Radio equipment (and I am not prepared to state whether or not the two-way radio he compulsory) must be installed as part of the regulation on every airplane turned out from the factory. For without the facility for receiving instructions the pilot not only is handicapped, but is jeopardizing his fellows who may have equipped themselves to receive instructions and are approaching a given airport at the same time.

The smaller cities faced with the operation of a control tower are greatly handicapped, not only in the cost of its operation but in providing the necessary funds for the building of the tower and its equipment, despite the fact that a control tower is as

essential to the small city where private flying, student training and transports jointly use the field, as it is for the major ports.

Mr. Fred Smith, in his address to the State Aviation Officials at New Orleans last year, cited the following essentials for Airport Traffic Control at all active airports:

1. Radio communications between the airport and aircraft on the ground on the airport or in the air in the vicinity of the airport.
2. Visual signals, light, flag and panel if necessary, for communication with aircraft not equipped with radio on the airport or in the vicinity of the airport.
3. All the equipment necessary to enable the operator to give the pilots of aircraft information on wind, direction and velocity, altimeter setting, and, of course, a structure from which an operator can observe traffic so as to be in a position to give pilots correct information or instructions relative to the use of the airport.

I take exception to the visual signal. As you know, for many years the National Air Races have been held on the west side of Cleveland Airport without interference with movements of several hundred transports daily during those three days. This is made possible solely by two-way communication.

The visual signal, or light, thrown in the air in the direction of two or three approaching ships for landing has been misconstrued by each approaching pilot as applying to him, with the result that narrow escapes from collisions have occurred altogether too frequently.

The question of separating flight instructions from busy airports and confining it to small fields sufficiently removed is one well worthy of great consideration, as well as the licensing of airports so close as to require opposite means of approach. For example the Kansas City Municipal Airport and Fairfax Field. One airport will require clockwise and the other airport will require counterclockwise landing to avoid collision.

There are sufficient rules in effect under the Air Code to provide uniform method of control, if these rules are properly enforced; but the question of enforcement is too often not considered a primary local responsibility.

With large numbers of your young college students taking advantage of the civil training course offered by the Civil Aeronautics Authority, congestion on the smaller fields is a problem.

I am fully in accord with the theory that spiralling and the figure eight's, which are part of the training course, should be segregated from all transport fields. But the question of the amount of traffic, whether it be private or transport, basically depends upon the facilities offered by an airport in its area and its available landing space.

For years, despite the great authorities on airport design and construction, I have contended that the building of runways, whether 150 or 1,000 ft. in width, limits the available area to one ship for landing, and if dual runways are built we are still limited to two ships.

In Europe the allway landing area is still in use. At Cleveland we have retained and made available the entire 1,000 acres for landings and takeoffs—innumerable, simultaneous landings are made daily. *Again the question of uniform airport traffic control becomes a question of uniform airport design.*

The city of New York has recently developed a very elaborate and beautifully designed major terminal, but because of conditions in the metropolitan area sufficient land for the allway type of field was impossible to secure in the location in which it was desired to build the airport. Despite the fact that many millions of dollars have been spent on the construction of this port, and that it is in operation less than one year, congestion is so great, even though limited to airline operations, that it is deemed necessary to provide additional ports in the metropolitan area for airline termini.

The holding of aircraft at various altitudes over a given port awaiting the clearance of a landing area does not make for safety.

The personnel of a Control Tower determines its efficiency. It is necessary for the man who is directing traffic to have a thorough understanding of the clearances, speeds, gliding angles and maneuverability of the various types of aircraft, particularly those used for air transport. The question of phraseology is vital in efficient operation.

Conversation should be limited and should be standardized.

The Airway Traffic Control in operation under Federal control has performed an outstanding aid to air navigation and the liaison between Airport Traffic Control Tower and the airway control operator must of necessity be exceedingly close.

The Airway Traffic Control Tower operator on a busy airport is not competent to direct landings and takeoffs because of the multiplicity of airway matters which require his attention, and too, the Airport Control Tower must be given the responsibility for the landings and takeoffs of ships.

In many cities privately owned airports have been established adjacent to terminal fields and are operated without any supervision and with little or no regard for the problems of the major terminal. No regulations as yet seem to apply, despite the fact that under instrument weather all private craft may be grounded on terminal port, a ship descending through the overcast landing may encounter a plane from the smaller field directly in his glide path and some day too close to be avoided.

These small fields are generally beyond the jurisdiction of the terminal manager and fall under the Civil Aeronautics Authority supervision because of their location on a Federal airway. Yet despite the fact that they are a definite hazard there seems to be no rule or law which would eliminate them.

The co-operation of pilots is also vital—no ship, even when cleared by its dispatcher, should start taxiing until given a clear signal by the Control Tower. The operator with unobstructed vision is in better position to determine the safety of moving the craft, and even after clearance has been given the pilot should stay tuned to the tower until he is well removed from the zone of local traffic.

Many of the private operators feel that the installation of a radio in a ship is sufficient to comply with local rules. A receiver which works but part time, due to lack of maintenance, is a greater hazard than no radio at all, due to the fact that though instructions may be given him he is unable to follow them.

Regulation of the Charter Operator

By JEROME LEDERER

Director, Safety Bureau, Civil Aeronautics Board, Washington, D. C.

The following letter, altered to eliminate names and places, was received recently in Washington.

"One day in August I wanted to take the evening plane from our local airport, but found that there was no plane available. Late in the afternoon the man in charge of reservations suggested that an arrangement be made with a company which, he said, operated under a special charter for carrying passengers and employed licensed pilots, saying that he could arrange for myself and associate to be delivered in Newark before dark for the sum of \$50.00, provided we were at the field by 5:30 o'clock, Eastern Standard Time. We accepted this arrangement and were escorted to a four-passenger plane, which took to the air about twenty minutes later.

"After we had been in the air a while, it became evident that the pilot was not sure of his course, at one time circling over a river. He traveled at such a low rate of speed that it was dark before he reached Princeton, at which place he dropped down to an open space behind an industrial plant, where he inquired the way to the Newark Airport. They told him that the railroad alongside of the place where he landed would take him straight to the Newark Airport. When we raised the question whether he was sure that he could land us there, he insisted that he could be there within fifteen minutes. Later on, he frankly admitted that he did not know where he was but apparently, finally, got near enough to the Airport to land us, unexpectedly, in the marsh at one side of the landing field. Both the other passenger and myself were injured seriously enough to require to be taken to the Hospital, where we were confined for eight days.

"I am writing to inquire especially, how it could happen that the lives of two passengers could thus be risked in the hands of a pilot who evidently did not know his way in a plane which had no means whatever for communication with the field or for enabling the pilot to ascertain his whereabouts and leaving him entirely dependent for his direction upon what he

could guess from what he saw below him."

While this type of operation is not typical of the service offered by the better charter operators, it does discredit them and when considered with several fatal accidents that occurred in charter operations within the year it points out a definite weakness in the framework of safety regulation which has been erected by the Government to protect the air traveling public. A review of these fatal accidents revealed that they resulted from inadequate training and equipment or lack of restraint by the pilots in the face of bad weather.

Therefore, it would seem to be the responsibility of the Government either to disclose to the public the safe operating limitations of pilots and ships used in charter services or to impose restraint on charter operators by regulations.

Special ratings or certificates, prominently displayed to show passengers the safe operating possibilities of aeroplanes and pilots would set the charter operator apart from all other aircraft operators. These would not necessarily restrict an operator to the limit of his qualifications. In the event of a bona fide emergency he should be permitted to take risks if he is willing to do so and if he takes the responsibility of informing his passenger of the risks and if the public safety is not endangered.

This procedure would merely be a disclosure of limitations to give the public an opportunity to weigh the risks of chartering an airplane. But perhaps more definite regulation is necessary. Charter operators are offering the public a growing medium of air transportation which might be considered in the same regulatory category as a chartered launch or fishing boat but which is of a far greater utilitarian value and is infinitely more dependent on the experience and skill of the operator, and on the quality and adequacy of equipment. The airplane charter operator should receive at least the same distinction in regulation that is given the operator of chartered boats. Both are offering their services and equipment to the public for a reward and the public has

a right in turn to expect special precautions to protect its safety.

Qualified operators should welcome the distinction of special ratings or regulations, since it would offer them greater prestige, it would strengthen the public confidence, it would put them in a better position to invest in special equipment and to provide better maintenance facilities, since all operators would be required to conform to the same minimum requirements, thus reducing the opportunities for cut rate competition. The charter operators would have an opportunity to build for themselves a safety record which would not be affected by accidents in other forms of miscellaneous flying. Life insurance restrictions which have been a retarding factor in development of charter business might then be eased.

Proposals—General

As a basis for discussion, I propose first certain fundamentals which in my opinion should be the basis of regulations of the charter operator; and secondly, some ideas on definite procedures which have been suggested or have been in use at some time heretofore. I am offering these as my own suggestions and not those of the Government.

Every flight undertaken for charter purposes should have a written clearance to show:

1. That a responsible mechanic certified that the airplane and its accessories were in airworthy condition shortly before take-off. (Note: A standard form listing the items to be checked with a definite system of fixing responsibility would be necessary.)

2. That the pilot was competent to make the flight. (Note: For example, a pilot with little cross country experience should not be allowed to engage in cross country charter flights. His experience should not be gained at the risk of endangering the public.)

3. That the airplane was adequately equipped with accessories and supplied with fuel, oil, maps and other material necessary for the flight, considering the wind and weather conditions and unpredictable contingencies. (Note: For instance a flight off the airways is not likely to have the advantage of accurate weather reports and the contingencies that may arise should be considered in the flight plan.)

4. That the weather conditions reported from reliable sources shortly before flight—let us say 60 minutes—were good enough to assure successful completion of the flight, taking into consideration the kind of flying equipment and the experience of the pilot. (Note: For instance, only an airplane with an operating radio receiver and transmitter and the necessary instruments should be allowed to depart into instrument conditions and then only in accordance with certain minimums in regard to ceiling, visibility or icing conditions.)

5. That the airplane was correctly loaded and that passengers were not in such condition as to interfere with the flight. (Note: For instance, intoxicated passengers must be left on the ground.)

6. That the flight was approved and cleared by a responsible person in the organization. (Note: A flight plan showing the weather conditions, fuel and oil supply, destination, alternates, intermediate stops, estimated time of arrival, cruising speed and altitude etc. should be made up and signed in duplicate, one copy remaining at point of departure.)

7. That, where emergency flights must be undertaken, through hazardous conditions, the passenger is informed of the hazards that are likely to be encountered, the qualifications of equipment and personnel to meet them, and agrees in writing to undergo them. (Note: The public too often assumes that a willingness by the operator to undertake a flight indicates it is safe. If instrument conditions are to be encountered, the prospective passenger should be told.)

Proposals—Specific

Attempts to control the activities of charter operators have been made before. Several years ago the Board of Aeronautics of one of the states issued privileges to charter operators who fulfilled certain minimum qualifications, as follows:

Charter operators who comply with the following requirements may apply for and receive an approval certificate stating that they have complied with the requirements for such approval:

"Aircraft: Aircraft must be cabin type properly certificated by the U. S. Civil Aeronautics Authority and equipped with two-way radio, full complement of blind

flight instrument, night flight equipment, suitable cabin heaters and ventilators.

"In addition, planes shall have a sufficient fuel supply aboard at time of take-off, considering winds and other weather conditions forecast for the period of the flight, to

"(a) Complete such flight to the point of the first intended landing and thereafter,

"(b) Fly to and land at the alternate airport designated in the approved flight plan and thereafter,

"(c) Fly at normal cruising consumption for a period of 45 minutes.

"**Flight Equipment:** On cross country flights, pilot shall have following equipment:

"(a) Maps of all territory within 200 miles of the line of flight.

"(b) Latest tables of radio ranges and weather broadcast schedules.

"(c) Hand flashlight.

"(d) Air sickness containers, chewing gum and cotton.

"(e) Equipment required by the Civil Aeronautics Authority.

"**Pilots:** Must be certificated by the U. S. Civil Aeronautics Authority as a commercial pilot with necessary rating the weight class he is flying together with an instrument rating. He must have a minimum of 1,000 hours of certified time of which at least 700 hours shall have been cross country and night flying experience minimum of 100 hours.

"Operators shall keep on file with the State Department of Aeronautics a list of all pilots in his employ, either part or full time, showing the names, addresses, pilot certificate numbers and ratings held by each pilot and shall notify the Department of any additional pilots employed, or any pilots dropped from employment.

"**Insurance Requirement:** Operator must carry passenger liability insurance in the amount of \$10,000 per passenger seat, public liability \$10,000/\$25,000 limits and property damage in the amount of \$5,000.

"**Statement:** The operator shall furnish to the State Aeronautics Department a certified statement from his insurance company setting forth the following: That the operator is insured by that company in the kind and amounts stipulated under 'Insur-

ance Requirements.' That they, the company, will notify the State Department of Aeronautics in writing of any lapse, failure to renew, or change in the insurance which would effect the operator's agreement with the State Department of Aeronautics and/or any special agreements regarding the effectiveness of such insurance.

"**Operation:** Where operation is along a federal airway, operator shall file a flight plan and designate two alternate airports, and conduct his flight according to all now known safety standards.

"**Rates:** Approved operators shall adhere strictly to their published rates, a copy of which must be filed with the State Board of Aeronautics.

"**Maintenance:** All aircraft, flight instruments and equipment shall be maintained in an airworthy condition at all times.

"**Inspection:** Approved operators shall have their aircraft inspected and recertificated by the U. S. Civil Aeronautics Authority inspectors at such intervals as may be required by regulation, and in addition, shall make their equipment available at all times for inspection by insurance company inspectors and the State Department of Aeronautics.

"The operator shall at all times keep his books and records available for inspection by any duly authorized representative of the State Board of Aeronautics."

Another suggestion recently submitted represents some ideas of a pilot with twenty-two years' experience who has given the regulation of charter operation considerable thought.

"Each person engaged in non-scheduled interstate air commerce must possess a certificate of competency issued by the Government.

"This certificate should be based upon the competency of personnel and the adequacy of equipment, maintenance and operation.

"Certificates shall be issued after inspection and approval of an operations manual provided by the applicant. The manual shall set forth:

"1—Single engine equipment shall be restricted to day-light contact flight only.

"2—All aircraft shall be equipped with two-way radio and vacuum driven flying

instruments. (Equipment and accessories should be listed.)

"3—Aircraft approved for instrument flight shall have two or more engines and additional instruments as follows:

"**Pilots:** All pilots shall hold instrument ratings and radio telephone operators' licenses.

"**Maintenance:** All flying equipment shall be maintained by an approved repair station operated by the applicant or a station located at the applicant's operating base.

"**Operation:** A flight plan shall be made for each flight—duplicate to be kept in the flight plan log-book, available for inspection.

"Instrument flights shall be made only when the destination has a ceiling permitting airline operation at that point and the flight plan must include two alternatives with a ceiling of 1,500 feet and conditions steady or improving.

"The flight plan should also contain other information pertinent to the operation.

"**Non-Conformity:** In the case of a real emergency, such as the delivery of medical supplies, transportation of physicians or persons forced by necessity, the rules regarding the type of equipment and weather minimums may be disregarded provided that within twenty-four hours following the flight, the pilot shall report by letter to the Administrator of Civil Aeronautics explaining the conditions under which the flight was made and giving the names and addresses of the passengers."

A charter service organized a few years ago operated with an excellent safety record under the following stipulations:

Flight Rules

"(a) Pilot shall obtain all available weather information along proposed route before taking off.

"(b) No flights with passengers shall be made unless latest reports indicate a minimum ceiling of 1,000 feet (1,500 feet for night flights) and minimum visibility of 3 miles, with no probability of icing conditions, with conditions steady or improving; throughout the line of flight.

"(c) Pilots holding NSIR or SAT instrument ratings, and no others, may make intentional instrument flights with passengers, under conditions in (b), above, if

planes are equipped with sensitive altimeter and radio transmitter. They may make *contact*, but not intentional instrument, flights in conditions less favorable than in (b) above, within limits agreed upon by Operator and A.C.S.

"(d) The above conditions shall not apply to emergencies, when qualified pilots may go on instruments, but no take-offs shall be made unless conditions are within those in (b).

"(e) Pilot shall fill out a flight plan for all cross country flights before take-off. One shall be filed with field management when possible, and with own office or other responsible person in other cases. File PX when practical, or required.

"(f) Make necessary intermediate stops to insure reserve at destination of one hour's fuel in clear weather, two hours in other.

"(g) Check ignition and motor R.P.M. before each take-off.

"(h) Fasten all occupied seat belts before take-off or landing.

"(i) Night flights only between lighted airports not more than 50 miles from lighted airways.

"(j) No flying more than 10 miles from shore, seaplanes not more than 10 miles from water suitable for alighting, and not more than 10 miles from shore.

"(k) No flying more than 100 miles beyond the boundaries of the United States

"(l) Either Operator or Pilot shall cancel flight if either regards conditions as unsuitable for the flight contemplated.

"(m) All Federal, State and Municipal rules shall be observed.

"**Flying Practice:** Treat passengers courteously, follow their wishes as to heat, ventilation, and altitude and other matters, provided their requests do not interfere with safe operation or are contrary to these rules. Descend gradually, avoid steep banks, and avoid rough air, even though some ground speed is lost in doing so.

"**Planes and Accessories:** Shall be modern cabin planes with night and blind flying equipment, and with radio receiver. Radio transmitter shall be installed on planes when required by A.C.S.

"**Flight Equipment:** On cross country flights, pilot shall have following equipment:

"(a) Maps of all territory within 200 miles of the line of flight.

"(b) Latest tables of radio ranges and weather broadcast schedules.

"(c) Hand flashlight.

"(d) Air sickness containers, chewing gum and cotton.

"(e) Equipment required by the Bureau of Air Commerce.

"Maintenance: Operator shall maintain planes in accordance with the requirements of the Charter Service and its inspectors, who shall have the right of inspection at any time.

"When requested by a Charter Service inspector, Operator shall withdraw plane from service for repair, and shall not operate plane for hire until repairs have been completed and approved by Charter Service inspector.

"Plane shall be kept clean and neat, tanks shall be full and plane otherwise ready for immediate cross country flight, except when in use, or undergoing necessary servicing or repairs.

"The Charter Service may withdraw approval of any specific plane or pilot, and thereafter said plane or pilot shall not operate under Airlines Charter Service name.

Proposals for Safe Regulation of Charter Operator

By O. J. WHITNEY

O. J. Whitney, Inc., New York City

Charter has been the title used for many years in the airport industry for practically all flying operations which were neither scheduled airline nor instruction of students.

There has never been any attempt to set down a classification of charter flying, and it is my belief that before regulations of any kind can be made pertaining to this work, it must be defined and classified as that part of the total aviation transportation system.

It has long been my desire to change the name from charter operations, and rather to call it non-schedule. It seems to me there is a closer relationship in the wording, and also it seems as if a closer relationship between that part of the total transportation

"Pilots: Shall have 1,000 or more hours' flying experience. Shall only fly passengers for hire under weather conditions specified in classification assigned pilot by A.C.S. Shall use every opportunity, when not flying for hire, to perfect or maintain blind, or instrument, flying technique, so that in emergencies they will be able to resort to this method of flight."

The Pilot Problem

To the more responsible and successful charter operators these suggestions, rules and methods of regulation are not new. They practice them every day. Presumably each one is faced with the problem of selecting pilots with sufficient experience and resourcefulness to meet the exigencies of Charter Operators. That is a problem which may be solved by certain changes in pilot training which are under consideration. While this is not the time to discuss that matter, I might say that hours of flying are not sufficient criteria to judge a pilot. His cross country experience, type and variety of airplanes, background of training are more important. A pilot with 200 hours given under a planned program of training may be a better pilot than one who has had 1,000 hours flying around an airport. Better training will require less regulation.

system is arrived at in this wording; also if it is to be regulated it should be classified as a commercial enterprise and identified alongside of the schedule airlines, and as a supplement to their operations.

In the past, anyone who wished to hire an airplane would go wherever a plane or pilot was in existence, and hire the owner or pilot at a price for any particular flight which he wished to make.

There was no attempt on his part to find out whether or not the operator or owner of the plane had had any past experience in cross-country flying, or whether his equipment had been thoughtfully prepared to cover the various types of flying which would be asked of it.

the person hiring the airplane believed himself perfectly safe in that the airplane was licensed by the Department of Civil Aeronautics, and that the pilot carried a commercial license.

On the face of it, this should be sufficient. Our experience in charter work, in which we have specialized for the past 15 years, has not led us to believe that this is true.

Very few private owners see to it that their aircraft instruments or radio equipment, or any other miscellaneous parts of the airplane, are kept in A-1 condition, because they do not anticipate flying except in the best of weather; and if any of the equipment should not be in perfect trim, they will have it repaired at their convenience.

Very few of the miscellaneous commercial pilots are privileged to do a great deal of cross-country work and, consequently, do not become acquainted with the various airports throughout any particular district or area. If a person hires one of these airplanes, the chances of his completing a successful trip are rather questionable.

I do not mean to say that it will necessarily be unsafe; but we do know of many cases where this type of equipment has been hired for a flight of approximately 100 miles, and where the flight has been extremely longer than necessary because the pilot was unfamiliar with the territory, did not know the location of the airport at his destination, and generally speaking the whole operation was one of hazy and uncertain procedure.

There are in the United States a few organizations which make it their business to charter airplanes, and in their setup they have organized operations necessary to gather the information and keep up with the changing conditions, so that when a ship is dispatched to its destination, it goes with the assurance of completing a flight in the shortest possible time. The pilot will know the location of the airport. He will know its condition, size and many features which are not published in the general CAA information. He will know the general characteristics of the territory he is flying over, and will be flying with equipment that has been kept in readiness for him at all times.

I believe that a word concerning our own setup might be in order here. We have a department which looks after all ground transportation possibilities at all the airports

within a radius of 300 miles of our operating base. This department looks up information concerning telephone numbers of the airports, who to contact, who to make arrangements with for night landings (where lights and night facilities are not available). It is this department's work to have several automobile transportations available who know the shortest routes to the airports in our own city.

All of the operating personnel, except mechanics, are required to take stand-by periods during the week. A schedule is made up for each month, naming the person who is responsible to answer phone calls for any particular day. Contact is available 24 hours per day.

A check is made of each telephone call, and a record of all information requested is kept.

Once a contact is made with a private clientele, a hotel, a club, or a business house, a record is made and a running contact is maintained.

The operating base at the airport is under the charge of the chief pilot, who is responsible to see that the planes are kept ready to go at all times, so that in the event of a call, it is only necessary for the pilot who makes the flight to roll the ship out and shove off.

It is the chief pilot's responsibility to see that all pilot's brief cases, which contain maps, radio information, airport information and all other miscellaneous information pertaining to flights, are kept up to the last minute, so that the pilot has only to grab his particular bag and leave immediately, feeling confident that whatever information he needs is in the bag.

It is easy to see that if non-schedule flying is carried on with a serious intention of making a business of it, that it requires much more than a licensed airplane and a licensed pilot. In fact, it can be said that the licensed pilot and the licensed airplane merely do those things which are already planned for them to do, and the work which they actually do becomes merely a small part of the total.

Now, if charter or non-schedule transportation is to be identified with schedule operations and is to have a classification, it will be comparatively easy to set up regulations for their operations. It seems to me

that the question resolves itself into whether or not anyone who possesses a licensed airplane and a commercial pilot's license will be allowed to solicit business without having set up an organization to cover all the other things which I have referred to.

I would not advocate restricting the chartering of airplanes only to those who have a complete organization. But I do believe that a distinction should be made between an organization which is prepared to render service to the general public, and merely an owner of an airplane.

The point is that the general public does not know and should, therefore, be protected against the chap who merely flies charter to gain more experience.

It seems to me that the general public should be assured that when he reads an advertisement of a charter organization, he has reason to believe this organization has made a business of charter flying and that this business is supervised more closely than the average private owner may be.

I would like to cite a particular instance in a large city, where a certain organization advertises itself as the charter organization doing the greatest amount of charter flying in that city. This, of course, is a misstatement. The fact is that this organization does not own any airplanes, and except for a few times in the life of its chief executive, none of its personnel has ever ridden in an airplane. The organization actually is a ticket office which sells airline tickets, theater tickets, and now has thought of the idea of selling charter work also.

When that organization is fortunate enough to sell a charter flight to an unsuspecting public, it then telephones the various private owners at the airports to find out who will go the cheapest; and when this is found out, they inform the pilot where to pick up the passenger. Needless to say, there have been a great many disappointments and a few narrow escapes from disaster.

I would propose, therefore, that a classification be made for charter operators and that certain standards of equipment, pilots and organization be required and maintained, and that only such organizations as live up to these minimum requirements be allowed

to advertise themselves as being capable of carrying passengers for hire. It seems to me that it might be well to list these as being certified operators.

However, I do not believe it would be advisable to prohibit a person from hiring out his airplane to anyone who wishes to pay him for the use of it, provided no advertising material or attempt was made to promote such business. It would then be the responsibility of the person hiring the plane to know whether or not he was hiring the best available.

The largest charter operators undoubtedly are the airlines themselves. They would come into this latter classification as operators who would offer to hire, but not be privileged to promote this type of work. It would be ridiculous to prohibit the schedule airlines from chartering equipment, as in many instances people who have large insurance policies would be prohibited from flying with any operator except a scheduled airline.

If a classification of non-schedule operators were put into effect, it would be possible for them to obtain the same status on insurance as the schedule airlines now have; and if this were true it would merely be a question of equipment between the non-schedule operator and the scheduled airline. If the non-schedule operator wished to purchase equipment as large as the airlines have, he would undoubtedly find the airlines only too willing to turn over each and all charter calls coming to their attention.

In our experience we have found the airlines themselves our biggest source of business.

In conclusion, I would propose a classification of non-schedule operators, a minimum amount of flying experience for pilots exceeding that required for a commercial license, a minimum of equipment in the airplane to cover various types of flying conditions, a minimum of organization other than pilot, mechanic or airplane, and a minimum amount of liability insurance.

If these requirements were lived up to, a supervision over the operations by the insurance companies and the government would assure the general public of as safe ride as he could hope to have on any airline.

Copilot Material and Their Training

By OTIS BRYAN

Chief Pilot, Transcontinental & Western Air, Inc., Kansas City, Mo.

An important business man recently told me that if his factories were wiped out over night by fire he could regain the loss and rebuild them with the minimum delay; but on the other hand, if he lost the personnel of his organization it would take years before they could be replaced. This indicates the importance of proper selection of personnel and proper training.

Many of the operations men and supervisory personnel of the airlines were at one time copilots. A copilot on the airline today may be the man responsible for the safety of the airline tomorrow. Consequently, the importance of selection and training of these men cannot be overestimated.

The men that are available for copilots on our airline today fall into two distinct classes: the service trained men who have been trained in the army or navy training schools; and the commercially trained pilots who have received their training commercially. Due to unusual world conditions at the present time, there are not many of the service trained pilots available. The army is not releasing any of their pilots to accept commercial positions and only recently the navy and marine corps ordered their reserve officers to stand by for immediate mobilization. Due to the indicated length of the unsettled conditions at the present time, it is apparent that the preponderance of our copilots must come from the commercial field.

Ten to fifteen years ago the procedure in hiring a copilot was to pick from the group of known pilots and select the best man available. In the early days of airline flying, this was probably satisfactory; but things have changed appreciably since that time.

We require of our present copilots a far greater knowledge of the equipment used, navigation methods, and judgment than previously. This has no doubt had a very important bearing on the safety record that airlines have recently established. This has been attained from constant and rigorous selection of copilots and by training them to the highest degree. Yearly this problem becomes more difficult. The problems of airline flying have become more complicated,

and the demands on the pilots have increased.

Our first problem is to be sure that the men we select as copilots are capable of becoming captains and possess the qualities that will enable them to maintain airline flying at its high stage of efficiency. In selecting a copilot we give consideration to many items. The tangible ones are intelligence, ability to learn, general education, health, professional training and such things are fairly easily measured or tested. The intangible qualities such as judgment, stamina, leadership, initiative, tact, cooperation, ability to function under adverse circumstances, are qualities which are far more important than the first mentioned ones, but are much less easy to determine. Of these items it is my opinion that perhaps judgment is the most important of all. We can teach a man to fly, but we cannot teach him to develop good judgment. The man must learn that himself.

The copilot, after he is selected, must accept his job as one that requires constant training and development in order to qualify himself for the additional responsibilities that are sure to be his. An analogy may be made between the individual pilot and a group of pilots; neither is a static body. Both are always changing, either going ahead or backward. My company has taken steps toward such selection and training. We do not feel, by any means, that these steps are the final answer. There are many things that we would like to know about the problems that present themselves, and we have certain plans for solving these problems in our selection of copilots. While the group of pilots is not a static body, neither is our training program. We are continually revising and bringing it up to date in order to meet the high demand of our service.

We conducted an interesting experiment in our training department at TWA in regard to training, selecting, and grading First Officers. In a class of 11 men, partly military, partly commercially trained, we gave a so-called intelligence test when they first entered our service. We gave them a series of examinations before giving them any training. These examinations covered

general education, airplanes and engines, instrument flight, navigation, and meteorology. We averaged the grades obtained on these preliminary examinations by each man. Then we proceeded with our routine pre-employment training of these men and averaged the grades attained during these classes.

I sat in the class for one or two hours and observed their action, personality, etc., in the classroom. After these data were collected, we arranged the group in order, first, as to their grades in the intelligence test; second, in order of the average grades of the preliminary examinations; third, in order of the average classroom grades; and fourth in order of their apparent value from inspection in the classroom.

We were much surprised to find that the group arranged itself in exactly the same order in all of these classifications excepting for two individuals who were in the center of the group, whose places were reversed in some instances. Since this experiment was conducted, we have watched the progress of these men on the line, and find that fitness reports being rendered by captains with whom these men have flown are falling nearly into the same arrangement as did the other groupings.

This leads me to believe that there is an inherent quality which measures an applicant's desirability. I should like to see a simpler and more direct method of estimating this ability, whatever its name. For the present, it seems to me that the most important item in this connection is the ability to learn, coupled with an age young enough to be sure that the man has ample time for seasoning before he is permitted to be in charge of a passenger plane.

Training of the First Officers now being employed must be more extensive than was necessary before. The opportunity for the large numbers of pilots the airlines are hiring to get training and experience in the type of flying necessary in airline work is very limited. A man with a thousand hours of time in "Cubs" and "Aeroncas" around a single field has little or no conception of the needs of airline flying. Even militarily trained men, although they are much better prepared than commercially trained men, have been doing work of such different character than is required in the airlines that considerable training is necessary.

Training of the new copilots in the pro-

fessional subjects, such as navigation, meteorology, instrument flying, etc., is comparatively easy since it is only a matter of presenting the information in a systematic manner and seeing that it is properly assimilated by the students. To this end we have classes which run for five weeks before the new First Officer is assigned to line duty. During this time we teach them Civil Air Regulations, our company's Operations Manual, company rules and regulations, the geography of our system, the characteristics of the airplanes we use, etc. Practice training and drill is given during this time in the use of the radio communication circuit, instrument flying in the "link trainer," instrument flying in our instrument flight airplanes, in the mechanics of navigation as it is done on our line, and the use of the direction finder, etc. After the First Officer's assignment to line duty, he is required to complete satisfactorily a comprehensive program of training in navigation, meteorology and instrument flying.

Our navigation course is handled principally by correspondence, using a text prepared in our own company. Meteorology is handled principally by lectures, demonstrations, and classroom work scheduled to occur on the First Officer's day off. This consists of approximately 60 meetings. The instrument flight course is completed by the average co-pilot in approximately 20 hours of "Link Trainer" flying, and approximately 15 hours of work under the hood in the instrument training airplane. Additional flight practice is given in regular schedule.

At present we are depending almost entirely on the experiences that a copilot gains through riding with older pilots, in order to determine whether he possesses the so-called intangibles, such as judgment.

They are observed very closely for actions that would indicate that they do not possess these intangibles. It is our opinion that if a man is closely observed during his work for a number of years as copilot, it can definitely be determined, before he is placed on the left hand side of our planes as a regular first pilot, whether he possesses all the qualities we desire or not.

Throughout all of the training of a pilot the importance of safety is never forgotten. It is my opinion that in developing the airline pilots today we are developing a new type of individual.

Training Mechanics for Safe Air Transport Operation

By T. J. HEALEY

Supervisor of Apprentices, American Airlines, Inc., New York City.

Two years ago American Airlines, Inc. seeing the need for trained mechanical personnel inaugurated an apprentice training program starting with 40 apprentice mechanics. Today there are 138 apprentice mechanics in training.

Apprentice programs vary in elapsed time from three to six years depending on the trade involved, number of working hours per month, etc. American Airline's apprentice training program is a four-year plan. Credits for past experience, not to exceed one year, are extended those employees who have had prior training and/or experience in the military services of the United States or training in any one of the various approved aeronautical schools throughout the Country.

A sound training program of this nature starts with a careful selection of the individual. If a young man is in sound physical condition, single, between 18 and 24 years of age, an American citizen, a high-school graduate, is inherently mechanically inclined, is not afraid of hard work and is ambitious, has good appearance, possesses a fair share of common sense, has some originality, is willing to learn and, in addition, has a good family background, he meets our minimum requirements. After the applicant has been interviewed by the personnel director and the supervisor of apprentice mechanics, he is then given a thorough physical examination by the company doctor. There is a surprising number of young men who appear to be in good physical condition and are otherwise good material for our program but who have to be rejected because they cannot pass the requirements of this examination.

We try wherever possible to place the new employee in a particular phase of the trade for which he feels he is best qualified. There are four classifications of apprentices:

The Instrument Overhaul Apprentice Mechanic receives his entire training on the overhaul, repair, inspection, adjustment and calibration of all types of aircraft, flight and engine instruments from the lowly oil pressure gauge to the very remarkable and

almost human automatic pilot. There are a total of 44 gauges, instruments or indicators in a modern Douglas 21-passenger Flagship and it goes without saying that in this work the apprentice must have the patience, skill and precision of a master watchmaker. As a matter of fact some of the apprentices in our instrument shop today have completed courses in horology of from two to three years.

The Engine Overhaul Apprentice Mechanic receives his entire training in the engine overhaul department on the complete overhaul procedures required for our modern high-powered American-made radial engines and accessories. During his apprenticeship he receives work experience on the disassembly, inspection, repair, overhaul and final test of the complete engine and its sub-assemblies as well as the various accessories involved such as carburetors, magnetos, starters, generators, governors, hydro-matic propellers, etc.

The Radio Apprentice Mechanic. Inasmuch as there are in each Flagship four radio receiving sets comprising a company receiver, marker receiver, beacon receiver, and auxiliary receiver as well as the various power units involved, plus a transmitter and an automatic direction finder, it is obvious that this apprentice has his hands full acquiring a thorough knowledge of the methods used in reconditioning and keeping in top shape these various types of radio equipment.

The General Apprentice Mechanic represents the majority of our apprentices. We have about 100 in this classification. His work experience and training is directed toward making him a seasoned line mechanic and is secured by rotation through all of our various shops and departments with the exception of radio. His basic work schedule in the various shops and departments is as follows:

Fifteen months are spent in the line maintenance department covering daily and periodic ship and engine inspections; periodic accessory changes; equipment modifications; maintenance of the de-icer, heating, ventilating, electrical and hydraulic systems;

ship repairs; landing gear checks; etc. It might be interesting to note at this point that there is a larger variety of wires in one of our modern 21-passenger Flagships than there is in the average 10-story office building. This young man's work, therefore, consists of the general maintenance of the aircraft and its engines between the time these major units are completely overhauled.

Ten months in the Airplane Overhaul Department is the next step. This involves metal structure repairs; hydraulic systems; interior refinishing and repairs; control systems; electrical systems; general repairs; etc. It takes 24 days to completely overhaul one of our Flagships and we have three airplanes constantly in the process of overhaul. There are 115 men in this department, 30 of whom are apprentices.

Then, nine months are spent in the engine propeller and accessory overhaul departments. This work includes the disassembly, overhaul, final assembly and test of the engine proper, in addition to the overhaul, repair and test of the various mechanical and electrical accessories previously mentioned.

Nine months are then spent in the manufacturing and repair parts department covering the inspection, repair, overhaul and test of the various component parts of the aircraft. This includes ailerons, rudders, wing tips, gas tanks, hydraulic units, etc., right on down the line to fleet service equipment such as thermos bottles, food boxes, mattresses, pillows, sheets, etc. It can be readily seen from a cross-section view of this department that in addition to the airline's providing safe and reliable transportation—the comforts and enjoyment of the passenger also come in for their share of consideration. In addition, in this department various parts, assemblies and units are manufactured for installation on our own aircraft—to increase the margin of safety of operations, improve passenger comfort and simplify maintenance procedures.

Three months are next spent in the engine installation department installing the newly overhauled engine in its mount and securing the various accessories in place so that the complete unit-engine, propeller mount and all can be installed in the aircraft as one assembly with a minimum of elapsed time.

Two months are spent in the instrument overhaul department. This time is sufficient only for the apprentice to receive a general idea of the principle of operation, construction and repair methods used in the overhaul of the various aircraft accessories and indicators. We fully realize this man is not capable of learning to overhaul instruments in this short period of time as compared with the man who spends four years in that department but we do know from experience that he has a very healthy respect for and a good idea of why instruments play such an important part in modern safe airline transportation. This young man, however, is fully qualified to make replacement of any instrument, indicator or automatic pilot unit in the aircraft. The old unit is then returned to the instrument overhaul shop for complete reconditioning at that point.

Although in nearly all cases the apprentice is working with a mechanic or a senior mechanic, we feel his sense of responsibility is enhanced if given the assignment of doing jobs by himself. This unquestionably will develop his confidence. Our mechanics as a general rule are very unselfish in helping the apprentice in every way possible by sharing their valuable experience with him as they realize that in this young industry of ours there is bound to be more expansion, that mechanics will grow old and pass on and that some one has to replace them. They also have to be trained and that training is the airline's job.

Our apprenticeship is unique in that it is nation-wide. It is not at all a rare occurrence for an apprentice who has completed his apprenticeship in one department or shop in New York, for example, to be transferred to Fort Worth, Texas or Burbank, California for part of his training at that point.

The daily work experience in the shops is further supplemented by related classroom instruction in the evenings for all apprentice mechanics. Each apprentice receives a minimum of approximately 16 hours per month. This instruction is given in some cases by instructors employed from outside the company and then again by our own lead mechanics and foremen. In other words, we feel that our mechanics are better qualified to instruct on certain phases of engine accessories, for example, than an employed

instructor, inasmuch as some of this equipment is on restricted lists and, therefore, not available to the general public and then again some of it is rather expensive for the average aeronautical school to purchase for instructional purposes.

Our apprentices receive a salary sufficient to support themselves. Their starting wage is approximately \$90 per month and in the last six months of their apprenticeship they receive approximately \$135 per month. In addition, they are paid their regular hourly rate for attendance at related classroom instruction.

In addition to the selection and training of apprentice mechanics, we in the maintenance department of American Airlines, Inc., also have the responsibility of training apprentice engineers for our engineering department. These young men receive a condensed one year's training in our various shops and departments working with the regular mechanics. This practical experience plus their fine technical backgrounds place

these young engineers in an excellent position with respect to opportunities for rapid advancement.

Further, the maintenance department conducts instructions for all new flight officers in the intricacies of the mechanism of the aircraft and its engines as a part of this pilot's intensive three month's training program given him by the Company before being assigned to a regular run as a First Officer.

Each employee of our maintenance department carries on his person a condensed pocket booklet outlining briefly certain rules and regulations on safety precautions, company procedures, etc., to better remind him of the constant need of this "preventive maintenance" which is so vital to the safe transportation of the airline's human cargo. The fly leaf of this booklet contains the following inscription: "*Aviation in itself is not inherently dangerous, but like the sea, it is terribly unforgiving of any carelessness, incapacity or neglect.*"

Training Mechanics for Safe Air Transport Service

By ROBERT J. SMITH

Vice-President, Braniff Airways, Inc., Dallas, Texas

Because the air transport industry has developed so much more rapidly during the last five years than qualified and experienced workmen have become available, it soon became apparent that if satisfactory personnel was to be had, it must be developed by the industry itself.

In 1937 Braniff Airways realized the need for an employee training program to meet these demands for qualified maintenance personnel. Five young men were selected and employed as apprentice mechanics and a systematic training schedule was instituted. By 1940 our five apprentices had become 26 apprentices and we had reorganized our entire program to give this larger group the thorough training required.

A joint Apprenticeship Committee was established, consisting of two members appointed by the company and two appointed by the employees. The function of this committee was to supervise all of the workings of the apprentice group and to assist in bringing about refinements in the training program, which would work to the mutual

advantage of the group and the company.

In addition, a supervisor of apprentices was appointed, in whom was vested the responsibility of organizing the text material and the practice work to be carried on, and of keeping the course records and checking the progress of the apprentices.

The Apprenticeship Committee and the supervisor of apprentices realized, of course, that airline mechanics must be broadly trained in all of the mechanical aspects of aircraft overhaul service and repair, and with this objective in mind, they have endeavored to develop a system that will give each apprentice mechanic an opportunity to participate in a well planned program.

This program provides for a four-year training period, during which the apprentices attend classes three nights a week for two hours each night nine months of the year. These classes are conducted by airplane mechanics and engineers who have had years of aircraft experience and who are qualified as instructors by the State Board of Vocational Education. Some of

the subjects in which courses are given are: shop mathematics, physics, materials and methods of aircraft inspection, C.A.A. rules and regulations, aircraft radio, internal combustion engines, etc.

Each apprentice is at the same time carrying on his regular work schedule in the shops; is assigned to assist a qualified licensed mechanic, and his classroom work does not interfere except to the extent that he is excused from the shops if a class in which he is enrolled is conducted during his work shift.

An apprentice's work assignments are arranged so that the work he is doing at any given time is closely related to the subjects he is studying in class; likewise, the entire training program is set up to provide for an apprentice spending a given number of months in each department of maintenance.

As the program has developed, the problem of selecting capable and dependable persons to place in the apprentice training school has itself become somewhat difficult, because the persons selected must possess the intelligence and mechanical aptitude necessary to master a highly technical craft, as well as the stability, energy, and perseverance to complete a four-year training program. Persons placed in this school who do not have the tenacity to see it through, represent a rather substantial loss in time and money.

Experience has indicated that those applicants who perform best are those who have had at least a high school education with some mechanical training and experience. Further, it is found that those applicants from families mechanically inclined generally prove more satisfactory.

Keeping these things in mind, Braniff Airways carefully selects from the rather large group of young men who apply, those

who seem to possess most completely these qualifications. In a further effort to place only the best in the school, arrangements are made to administer dexterity and manipulatory tests to each of these men in an effort to secure some indication of his true mechanical aptitude and intelligence. These tests are so inclusive and broad in scope that they require eight hours to administer, and were chosen upon the recommendation of experts in vocational guidance and employee selection.

The applicants finally selected are employed as stockrunners or cleaners, where they have the opportunity to familiarize themselves with the various airplane and engine parts. They serve in that capacity generally for 10 or 12 months, at which time they are placed in the apprentice mechanics' training school.

All shop supervisors who have apprentice mechanics working under them, make a periodic report to the supervisor of apprentices and the Apprentice Committee concerning the apprentice's rating on appearance, cooperation, conduct, health, initiative, quality of work, ability, and desire to learn and actual performance.

Throughout the entire four-year training program, the apprentice is taught theory and principle in the classroom and has practical instruction and experience in the shops. Though Braniff Airways has found that this method of selecting and training potential mechanics requires a considerable amount of time and some expense at the outset, it has likewise found that the persons so selected possess the necessary qualifications to capitalize on this extensive training program and that in the long run, a considerable amount of time and money is saved and a more highly capable airplane mechanic is generally produced.

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TUESDAY EVENING SESSION

October 8, 1940

The Annual Meeting of the A.S.S.E.—Engineering Section of the National Safety Council convened with F. W. Braun, Employers Mutuals, Wausau, Wisconsin, General Chairman, presiding. All reports had been mimeographed and copies were available at the meeting.

Mr. Braun gave a brief resume of the section's activities during the past year, following which he called up Mr. C. B. Boulet for the report of the Nominating Committee. Mr. Boulet presented the report on behalf of other members of the committee, including R. E. Donovan, Chairman; D. L. Royer, C. W. Smith, and A. S. Regula. The committee's list of officers, as elected, is presented elsewhere in these pages.

The General Chairman then presented the speaker of the evening, Dr. Phillips Thomas, Research Engineer, Westinghouse Electric & Manufacturing Co., who spoke on "New Horizons of Science," demonstrating and illustrating his address most effectively. The resume given below is a summary of his points, provided for this record by the publicity department of the Westinghouse organization.

New Horizons of Science *Photo filed: No 2120 1940*

By DR. PHILLIPS THOMAS

Research Engineer, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Death rays that protect life and laboratory tools that guard against mechanical defects have demonstrated that industrial research is building a safer world on this side of the Atlantic and is helping defend our gains.

Dr. Thomas used a one-man traveling laboratory to buttress his assertion that peacetime research is a major defense line in the American pattern of life. "Many recent developments of the laboratories," he said, "are so closely related to military defense that they cannot be revealed, but it can be said that practically every important peacetime engineering achievement of the past 10 years will have an important, if indirect, bearing on our national defense, enabling this country to build stronger and better designed defense weapons."

Death Ray Guards Health

Dr. Thomas flashed upon a screen a magnified view of ultraviolet radiation in action killing teeming microscopic life in a drop of water. Striking faster than lightning, the radiation literally exploded its victims.

At one moment, onlookers saw swarms of tiny ovate organisms known as paramecia, scurrying across the lighted screen. Then, with a sharp report, a "Sterilamp" hurled ultraviolet radiation at the organisms. In less than a thousandth of the time required to blink an eye, they were dead.

"The Sterilamp," Dr. Thomas explained, "was developed by Westinghouse to produce ultraviolet radiation of a wavelength most

fatal to bacteria." In the demonstration apparatus, electrical energy is stored in a condenser until it jumps across a spark gap with a loud crack. At that instant, the stored up energy is released through a special Sterilamp, concentrating its radiation in one powerful shot.

Sterilamps are now used to reduce infection by killing air-borne bacteria in hospital operating rooms, to preserve the cleanliness of utensils and glasses in restaurants, and to retard mold growth on food. They have made possible a short-cut process in tenderizing beef by controlling mold growth and reducing the aging or ripening time from several weeks to a few days.

Using the rays from a flashlight to play a set of chimes, the lecturer demonstrated a possible means of secret communication over short distances in war maneuvers. In the demonstration, visible light energized photo-electric cells, but he said it would be possible to use invisible infra-red light. Infra-red rays can be made to vary in intensity with the sound waves of a spoken message, transferred invisibly over space, and then reconverted to sound waves at the receiving end, he pointed out.

Atom smashing is another field of research which is already producing peacetime benefits, and may prove to be important in future defense plans. "By constant experimenting," he said, "physicists are learning better to duplicate nature's work and change one element into another. Thus they are able to create new products and processes."

With a model resembling a giant toadstool, Dr. Thomas demonstrated how the 60-foot "atom-smasher" generates its tremendous voltage for bombarding the atom and producing radio-active materials.

A direct current generator provided electrical charges for the miniature "atom smasher" used in this demonstration. These charges were deposited upon an endless belt and carried up the "stem" of the model into a hollow copper dome at the top. The accumulation of charges increased continuously and passed to the outside of the dome, from which they were shot into the air. Dr. Thomas estimated that the model is able to generate 100,000 volts.

Balls Lose Bounce

A recent research development was described as taking the bounce out of electrical relays and reducing wear on electrical control equipment. Dr. Thomas contradicted one of the rules of gravitation by making two steel balls of identical weight and size roll down an incline at different speeds. The research engineer explained that the friction of loosely packed powdered tungsten inside one of the balls absorbed part of its energy of motion, slowed it to a walk. Westinghouse engineers, he said, have used this principle of energy absorption to prevent electrical relays bouncing apart when they are closed.

Magnetism was put to work in another kind of energy control. Vibrations in a nickel rod were damped or silenced as long as the rod was not magnetized. But as soon as Dr. Thomas placed the rod in a magnetic coil and turned on the current, it resounded clearly when struck with a hammer. This phenomenon was explained by the presence in the rod of countless invisible magnetic particles, which are in disarray as long as the rod is unmagnetized. In this state they

offer resistance to vibrations, but when the rod is magnetized these miniature magnets line up in an orderly fashion and let the energy from the hammer blow pass through the rod, causing it to vibrate.

Dr. Thomas next shortened and lengthened a nickel rod by talking through it, converting it into a microphone. He held one end of the rod in his mouth, and as he talked the mechanical force of the sounds changed the rod's length. The amount of magnetism induced in the metal by a permanent magnet surrounding the opposite end of the rod was also changed, generating a sufficient voltage in a small electric coil to "broadcast" Dr. Thomas' words through a loud speaker.

In another spectacular demonstration of a scientific tool now performing important routine work in factories, Dr. Thomas focused the flashing light of a "Stroboglow" lamp on a disc rotating 1,800 times a minute. At this speed, a complicated design painted on the disc appeared to stand still, because the light was timed to flash every revolution of the disc. By doubling the number of flashes of light, Dr. Thomas made two designs appear in place of one. The Stroboglow, he explained, is used in industry to study the operation of rotating machine parts in motion.

Then, to show electricity in a playful mood, Dr. Thomas literally blew out the electric lights—and blew them on again. This, he explained, was not magic, but simply the application of a breath relay. A specially prepared surface on which moisture of the breath is condensed does the trick, providing a partial conductor for a small amount of electrical energy so that currents can flow. This device lights a cold cathode glow tube, which causes a relay to put on the light or turn it off.

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*Past General Chairman

WEDNESDAY AFTERNOON SESSION

October 9, 1940

The opening session was called to order by General Chairman J. C. Bower, Supervisor of Safety, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., who presided. The opening remarks of the General Chairman included a welcome to delegates and guests, and dwelt briefly upon the activities of the Section and of

Sectional Committees during the past year.

The report of the Nominating Committee was presented, and officers of the Section for the coming year were formally elected, the list appearing elsewhere in this record. The Chairman then introduced the first speaker.

Specify the Safeguards

By C. THIEDE

Chief Tool Engineer, Chrysler Jefferson Plant, Detroit

For many years we have been stressing the importance of safeguarding the operators of machinery. Although we still have serious accidents I am very glad to say that the number has been greatly reduced, due to the persistent work of the National Safety Council and to the fact that the causes of these serious accidents could easily be traced because the reasons for them were obvious. Great efforts were put forth to reduce these expensive accidents through specifying adequate safeguards.

But unfortunately our accident reports still show thousands of injuries to operators' hands and arms, due to faulty design in fixtures, tools, faulty methods of piling and handling stock, etc. The majority of these injuries are scratches, small cuts and abrasions. We have instructed the operators, time and again, to report to the First Aid Department to have these small injuries dressed; but we all know that these instructions are not followed, and the total time and money that are lost, due to these small injuries becoming infected, is tremendous. These conditions will continue if we do not put forth as much effort in specifying the safeguards for equipment and other sources that are causing these small injuries as we did in specifying the safeguards for equipment that was causing the major accidents.

A point that is often overlooked by machine designers and should be examined closely by the purchaser is the accessibility of the cutting tools. The machine should be designed so that all tools can be readily

changed when they become dull. If it is difficult to change tools you are building a hazard into a machine, because the operator will, sooner or later, injure his hands in changing tools and he is also likely to leave the tools in too long.

There are always some parts on a machine that are subject to wear or adjustment. The machine should be so designed that the parts that have to be replaced or adjusted are readily accessible to the repairmen. Here again, if it is difficult to repair or adjust a machine, necessary repairs are delayed, adjustments are made haphazard, and accidents will result. We have all seen an operator prepare to place his work in a chuck and then the chuck starts to revolve. The reason for this was because the adjusting screws or collars on the clutch were hard to get at and a poor or hurried adjustment was made.

All outside corners of machines and fixtures should have a liberal radius to remove sharp corners that have been responsible for accidents in the past. The machine designers lately have gone further than this on some machines. They have closed up the entire column to give the machine a streamlined appearance. In order to repair or adjust the mechanism inside the column, openings have been cut in the column and these openings have neat fitting covers that are held in place by a row of bolts around the cover to make an oil tight joint.

Some of these covers are quite heavy and they should be fitted with a hinge so that

when it is necessary to work on the machine, the cover can be swung to one side. This will prevent the repairman from removing all the bolts but one at the top. Swing the cover up and try to hold it at that position with one bolt. There should be sufficient clearance between the hinge and hinge pin to permit pulling the cover up oil tight with the bolts provided for that purpose.

Particular care should be paid in designing fixtures where it is necessary for the operator to load the fixtures by hand to see that sufficient room is allowed to load and unload the fixture without continuously hitting the sides of the fixture with the hands. To design a fixture that is easy to load, the first thing to do is to ascertain where the operator can, or will, hold the part to load it. Sometimes this can be learned by observation in the shop on similar parts or by talking to the foreman.

Where hand clamping is employed, especially set screws for holding tool bits, efforts should be made to have all the heads the same size so that one wrench can be used to tighten all screws. When the operator has more than one size wrench to use, he will get hold of the wrong one to tighten a screw. The wrench will slip off and he will probably injure his hand. Operators become so accustomed to a certain size or type of wrench that if they use a different type, even if it is only longer or shorter, accidents have resulted. Therefore, it is important that all wrenches appear on the operation sheets to prevent the tool supervisor from replacing worn out wrenches with tools with which the operators are not accustomed.

When "C" washers are used in the clamping arrangement and the "C" washer is very large, it should not be a loose part. It is safer to fasten an arm to the "C" washer and pivot the arm at the opposite end at the proper height so the "C" washer can be swung into position. After the operator has handled a loose heavy "C" washer for 6 or 7 hours his hands become fatigued and he may drop it on his feet.

The old familiar five pointed hand knob has stayed with us a long time and has caused many sore hands. It is seldom that you see a hand knob on a fixture that has not been wrapped with rags or tape, or the operator has a flat bar with three pins set in it to fit between the points so that he can tighten the part securely in the fixture. If

you cannot use air or hydraulic clamping, then use a fixture lock, but be sure that the designer understands how to adapt it to the fixture. These locks are very efficient and safe if the proper size and type is selected for the work it is assigned to do.

Where special tools are required on an operation and after a suitable tool has been developed, a drawing should be made and a tool number assigned to it so that it can be identified and duplicated.

On horizontal automatic screw and chucking machines, there are always tools and bars that are underneath the upper tool slides. The screws that clamp these tools and bars are more or less difficult to get at, due to the construction of these machines. Usually there is plenty of room to get in with a standard wrench but, due to the fact that the operator cannot see what he is doing, there are many slips that cause small cuts and abrasions.

By all means a special tool should be developed to get at these screws even if it only requires an extension to a standard wrench to get the operator's hands clear of any adjacent cutting tools. Tools of this type, that are required to adjust cutting tools or assemble various parts on production lines, should be developed in the shop by the tool trouble men, and as soon as a satisfactory tool has been developed he should request a drawing and tool number so a record can be made of this tool for future replacements.

Accident reports still show injuries to operators' hands in moving or turning over large parts. A careful study should be made of the sequence of operations to reduce the number of times required to turn a part while it is being machined and, if the part is heavy or awkward to handle, provide turn-over fixtures or turn tables where it is necessary to reposition the part for the next operation.

Many accidents are caused by the careless use of hand tools, horseplay and willful disregard of instructions. To reduce the number of injuries caused by the thoughtlessness of some people, I believe that if a contest were arranged to determine which department, or division, had the greatest amount of lost time, due to either carelessness or disregard of instructions, and a sign put up in that department showing the number of hours and the wages lost by the men in that

department, this would give both the foremen and the men themselves a common interest to keep that sign out of their department.

The foremen would automatically become more conscious of these hard to control accidents and make it a point to see that all of the men in their divisions were properly instructed.

We are living in a war jittery country that is in the process of greatly expanding its armed forces. The various branches of the Army and Navy will require a tremendous amount of ordnance to equip them, and to produce this equipment, it will be necessary to build and equip many new factories. Due to the shortage of skilled work-

men, much of this equipment will be built and operated by inexperienced operators.

This means that during this rush to obtain this equipment, it will be more important than ever to specify the safeguards, and after the equipment is received, it should be inspected and tried out to see that it is safe to turn over to men that have little or no experience in handling machinery. If we don't, accidents will increase by leaps and bounds. It is going to be interesting to watch these new armament plants start up and examine their accident reports to see how well we have succeeded in preventing accidents, not only by specifying the safeguards, but by insisting that we get and use the safeguards that are specified.

Preventing Power Press Accidents Through Periodic Machine Inspections

By J. C. McDONALD

Safety Director, Fisher Body Pontiac Division, General Motors Corp., Detroit, Mich.

Periodic machine inspections is a method of industrial accident prevention which is gaining worthy consideration because through it industrial accidents caused by "machine factors" or "machine failures" are being greatly reduced.

Power press departments, particularly in the automobile body plants today are comprised of more types of machines than just presses; specifically they also include square shears, rolls, scrap balers, paper cutters, all the various machines used in the manufacture and repair of tools and dies and automatic electric welders making one individual spotweld to those making as many as 172 spotwelds at one operation. Also included are conveyors and cranes of various kinds together with electric and gasoline driven motor vehicles. These equipments must be kept in safe operating condition at all times to insure a steady flow of fabricated parts to the assembly divisions.

To accomplish this, the use of various forms and reports acts as a helpful medium in carrying out the basic principles of the press maintenance inspection and repair system which can be divided into three major groups; namely, Mechanical, Electrical, and Valves or Air Control. Some of the forms which can be used are as follows:

Mechanical Press Inspection Form CF 1246, size 5x8; and *Form 964-MP*, size 8½x11 inches. These forms list the major parts of the various types of presses and the parts to which the greater number of breakdowns can be traced together with the parts which require constant adjustments, specifically speaking, the brake and clutch assemblies.

Electrical Press Inspection Form CF 1246A, size 5x8 inches; and *Form 962-MP*, size 8½x11 inches. These forms list the major points in the electrical control and power circuits together with sufficient other items to make it necessary for an inspector to make a complete inspection of the electrical system in order to complete his report.

Ross and Clark Valves, Electrical and Mechanical Inspection, M-957, size 8½x11 inches. This valve inspection report lists the major parts of the standard control valve now being used on our presses. Space is provided for the listing of valve parts on air control presses which may require renewal or repair.

Crane Maintenance Mechanical Inspection Report 1246-C, size 5x8 inches. This report covers the main items on parts which are considered important in crane operation and although more items may be listed than

seems necessary, the fact that an inspector is required to check so many different items again makes it necessary for him to make a rather complete inspection before being able to complete his report. The same thing applies to the:

Crane Maintenance Electrical Inspection Report, 1246-D, size 5x8 inches.

Press Repair Time Schedule Order, 986-MP, size 8½x11 inches. Summarizes the items to be repaired, when the work is to be done, shows an estimate of the man-hours which will be required, and contains a section showing when the job was started and completed, together with the total man-hours actually required for the job.

Conveyor Inspection Report, size 8½x11 inches. Lists the items necessary to insure the best possible operating efficiency and again sets up enough items to require an inspector to do a thorough job before being able to complete his report.

Press Maintenance Master Record. This is designed to give a general report summarizing the performance of any given press over a period of a year. It is believed that the information contained on this sheet is of value in checking the efficiency of the inspection and maintenance repair service and furnishes a basis for an adequate cost record of the maintenance effort required for any given press.

Monthly Report of Production Strokes, size 8½x11 inches. This sheet is furnished by the Production Control Department and lists the total number of production strokes of key presses during the month. This acts as a guide when considering whether a press is being inspected often enough or not. It has been very interesting to note the differences in operating efficiency on comparable presses in the total number of production strokes over a period of one year. In some instances this has amounted to quite a figure.

Press Maintenance Inspection and Follow-up Schedule, 25 wide x 39½ inches long. This schedule is maintained on a wall board and serves the purpose of a visual report as to the status of the various presses in the plant. It is very easy through the medium of this report to discover which presses have not been inspected and on which presses the mechanical or electrical repair work is lagging.

Miscellaneous Equipment Follow-up Schedule, size 12 wide x 40 inches long. De-

signed to take care of the various other machines which may be deemed necessary to inspect on a periodic basis.

Press Inspection and Repair Quota Chart, size 26 wide x 34½ inches long. Designed to show in graph form the progress of electrical and mechanical inspections and completions and has proven very effective as a stimulus for the inspection service to maintain a wide enough margin between their work and the maintenance report work which might be termed as being in the position of always trying to catch up to the inspection service.

Work Progress Sheet of Press Inspections, size 16½ wide x 11 inches long. This sheet shows the work results of mechanical and electrical inspections and repair of presses during the previous week for a four-month period, and since it is a weekly report, its purpose is to serve as a guide to all people concerned as to any work that may be lagging and should be brought up to date, and at the same time prevent a duplication of inspection effort during the month when there are still other presses which have not been previously inspected during that month.

The inspection system of which I speak today provides for two mechanical inspectors and two electrical inspectors—one each of whom works on the first shift in order to observe the machinery in operation. The other two men work on the third shift in order to study the machine while not in operation and with the operating controls locked out to insure their personal safety while performing their duties. The findings of these inspectors are reported on the previously mentioned sheets which are designed to ask certain specific questions and yet provide adequate room for individual expressions as to any condition found on the machine by the inspectors at the time of inspection.

The material contained on these inspection reports is transferred to a master sheet with sufficient copies being provided for those interested parties. In this case, they would be the plant engineer, who receives two copies—one of which is used as a work sheet and the other as a follow-up sheet, the manager of the press department who is thus afforded an accurate knowledge of the condition of the machinery under his supervision and helps him to schedule production

in a more efficient manner through contact with the production planning department. The safety director is furnished a copy which serves as a guide as to the day by day machine conditions in the plant.

On the various inspection reports which in the case of the copy to the maintenance department constitutes a repair order and work sheet, the workman who makes the repairs is required to place his signature opposite the items he has taken care of. Then the foreman's signature is required on the sheet to show that all work has been completed, upon which it is turned over to an inspector for checking. Should the inspector find all work completed in a proper manner, he adds his name to this report; then a memo is sent through the system advising all those concerned that a certain machine has been inspected and repaired and is to all intents and purposes in good operating condition.

Inspectors so designated have authority to stop any machine on finding a hazardous condition, and are required to report directly to the plant engineer of their action. This eliminates them from being subject to criticism by the foreman of the department in which the machines are involved and further removes any fear they may have as to whether or not they should take the measure of shutting a machine down or not due to unsafe working conditions.

Typical conditions found by the inspector are as follows:

1. The flywheel hub was cracked across the center. This was something that could

not be seen until the clutch had been pulled apart.

2. Limit switches were found to be full of iron shavings from holes drilled above these switches by workmen installing other devices.

3. A cracked flywheel was observed constantly over a period of time sufficient to enable the machine manufacturer to replace this flywheel with a new one. Time required to change the flywheel was rather negligible in comparison with the time that would have been required to replace the flywheel if it had broken and another one had not been available for immediate replacement.

In order to do a good job of maintaining the continuous operation of machinery with the efficiency which is required in automobile stamping plants today, the maintenance department supervisor is faced with a multiplicity of conditions which constantly arise. Many of these conditions appear for the first time and are of a type not ordinarily expected. Some others are beyond their control. It is at this point that efficient machine inspection systems can be of great assistance to the maintenance department supervisor in assuring the continued and efficient operation from a production standpoint of the machines under his supervision. This, in return, will assist the production departments due to the fact that machines are operating with less loss of production time which is sometimes known as "down time."

Accident Prevention Measures

By DAVID MOULD

Public and Industrial Relations, General Motors Corporation, Detroit, Mich.

Under the General Motors decentralized set-up, each plant develops its own safety program designed to fit the particular type of manufacturing or assembly operation. Generally speaking, all of the safety programs are based upon the broad policy of the corporation which was stated long ago by Mr. William S. Knudsen: "Safeguarding our employees from accidents is in my opinion the greatest and most important task before us at all times."

This policy has been further defined by Mr. C. E. Wilson, acting president of Gen-

eral Motors, in his Five Principles of Safe Plant Operation:

1. Interest in safety on the part of top management.
2. Good housekeeping.
3. Mechanical safeguards.
4. Safety education.
5. Periodic safety stimulation.

Through the monthly safety report which each plant is required to send in to the central office, together with write-ups of any severe accidents, and periodic visits made

at the plants, we are able to keep our fingers on the pulse of the programs in the plants. In this manner, we can devote special attention to a particular problem which might be troubling us at a certain time. Through these reports, write-ups and visits, we have come to the conclusion that most of our serious accidents result from what we call "human failures," rather than "mechanical failures."

The primary approach to licking this problem of "human failure" accidents is through the medium of safety education. However, beyond this, any manager or safety man has a definite responsibility in building equipment, dies, etc., in such a manner that the chances of "human failure" accidents are reduced to an absolute minimum.

We in the automobile industry have a little different situation in that we have a yearly change-over for new models. While this often dismantles a guarding program which we have worked all year to complete, on the other hand it gives an annual opportunity to profit by experience in safety methods.

In the larger plants, there is a contact man between the tool design, die leaders, tool and die repair and production departments. The job of this contact man is to coordinate the experience of these departments so that improvements can be made in safety and production through improvements in design as a result of operating experience.

Since most of our major hazards are in the press room, a great deal of attention has been given to die design and production methods in the press metal departments.

All of you will agree that the ideal press room would be one in which no one would have to put his hands under the dies at any time. That is the goal towards which we are working.

I want to describe several devices designed to eliminate the necessity for employees to reach into the die when operating a press.

The first is a draw operation on a two-slide toggle press. We employ a mechanical device which is operated by a toggle action mounted on the upper and lower part of the die. The operator places a blank on the device and as the ram goes up, the device drops the blank into position in the die.

This eliminates the necessity for the operator to place any part of his hand in the die. The operator stands at the side of the press and he has two buttons to control the press.

After the draw operation is completed, the part is ejected by a similar mechanical device working in reverse order as the ram goes up. The part falls on a moving conveyor which takes it to the next press operation. This device eliminates the hazard which usually exists in removing a part from the die.

The second is a loading device for a draw operation on a two slide toggle press. The blank is loaded onto the mechanical feeder which is operated by a toggle action from the upper and lower shoe of the die. The operator must have both hands on safety control buttons to operate the press. An air cylinder ejects the part from the die after the draw.

Another device is a mechanical unloader on a draw operation performed by a two slide toggle press. The arm of the unloader is operated from a large cam on the crankshaft. Two air cylinders operated by a cam on the crankshaft operate the clutching device for picking up the pieces. The parts drop onto a moving conveyor.

Another device is provided on a multiple forming operation on a Bliss double crank press with three operators on the front of the press. Each operator has two safety control buttons and all of them must have both hands on the buttons before the press will operate. A cam on the crankshaft is so adjusted that all of the operators must hold down the buttons until the ram is within approximately two inches of hitting bottom on the down stroke. This eliminates the possibility of any of the employees beating the press after the ram starts down. If any employee removes a hand from any one of the buttons, the press will stop in any position on the down stroke. After the ram is within two inches of bottom, the press will complete the cycle after the hands are removed. Without this cam device, the buttons would only be starting buttons and it would be possible for one of the employees to beat the press on the down stroke.

We have another device on a heavy duty crank block clutch press. There is an air control device for tripping the press. The original weight was removed and replaced

by an air cylinder with a spring return. The cam on the block was redesigned and two cams were installed instead of the original one. This makes it necessary for the operator to hold down the air control levers until the second cam is passed or the press will stop. This eliminates the possibility for the operator beating the press on the down stroke because the press is within two inches of hitting bottom when the second cam is passed.

We have a special safety die block for use under the die during repairs. The block is a jack made of four-inch steel pipe with a screw insert. In this case two extra spacer blocks were also used to bring the block up tight against the ram. A second jack is on the opposite side of the press diagonally across. This device has eliminated the familiar excuses for not using blocks, such as not being able to find them, etc. The jacks are a fixed part of the press operating on a swivel from the side of the press. The electrical circuits for the operation of the press are broken when the jacks are swung under the die. The press cannot be started until the jacks are removed from the press.

We have another type of die block mounted on the side of the press. The blocks are attached to the air circuit which operates the press and when the blocks are removed for use under the die, the air circuit is open and the press cannot be operated.

We have devised standard cage guards

for fast short stroke presses where it is not feasible to install electric or air controls. Most of them consist of two standard sized side baffles and a front baffle made especially to fit the contour of the die. The side baffles are usually mounted permanently on the side columns of the press and are adjustable to fit almost any die. The front baffle is a part of the particular die and remains bolted on it when it is removed. Each die usually has its own front baffle, fitted to its peculiar shape. The front baffles are so constructed that it is usually impossible for the operator to get his fingers under the die.

For a common square shear for cutting sheet metal, a guard was designed to prevent the operator from putting his hand under the blade at any time. The clearance between the guard and base is approximately $\frac{1}{4}$ inch. The guard is on the outside of the hold downs and is bolted permanently to the side column of the shear. There are sheet metal pockets built into the guard which permit the operator to cut short stock (strips as small as $\frac{1}{2}$ inch) without getting his fingers under the blade. The treadle extends across the full length of the shear so that it can be operated from any position.

We use a tying truck for stacking stock containers as high as 15 feet. An overhead guard protects the operator should any of the stock spill or fall from overhead. There are toggle joints which allow the mast to be tilted as necessary.

THURSDAY LUNCHEON AND AFTERNOON

October 10, 1940

Joint Meeting with the Power Press Section

Human Behavior and Safety

By VERNON G. SCHAEFER

Pennsylvania State College, State College, Pa.

How does the human being behave, and how can we make him "safety minded?" The solution of this problem promises the most fruitful results in accident prevention.

When we talk of making a man "safety minded" we must mean that the man will

not only think about his own personal safety and that of his fellowmen, but that he will engage in correct and safe practice in the activities of every area of his life to the best of his ability and knowledge.

If he has the proper attitude toward acci-

dent prevention, he may yet lack knowledge of safe practices, or he may lack the ability to do some things safely, or he may have well-established habits or specific unsafe practice. In such case he must be given the facts which will help him to increase his knowledge. He must be placed on a job within the limits of his ability to operate safely. He must be restrained in such a way that old unsafe habits are eliminated and correct ones developed.

This all requires diligent effort on the part of some one who is responsible for the safe living of the individual. This someone, be he staff officer or line supervisor, must study human nature in general and the specific working of it in individual cases.

Let us get clearly before us the fact that we cannot command human beings into a state of "safety mindedness," or into specific safe practices, nearly so well as we can bring them to the point of proper attitude and correct practice by good leadership, which is capable of setting the scene so that human beings wish to follow in the direction they are being led.

This requires a rather complete knowledge of what human beings are and how they act. It requires a knowledge of how they should act and of how to present the stimuli which will best get the response desired. It requires a carefully planned method for presenting the stimuli and careful study, experimentation and checking to determine if the methods used are obtaining the best, or even satisfactory results. It requires, further, the development of personal qualifications on the part of the leader, which will make him so acceptable and so esteemed that his followers accept his ideas and suggestions and cannot "let him down" in their actual performance any more than they can in their lip service to him.

"Safety mindedness" is developed through training under good leadership, capable of setting the scene so that knowledge will be acquired and attitudes and practices developed, rather than under "driveship" which commands. Of course, to be such a leader, more than a fine attitude and a desire to be useful in the world are necessary; you must know what to do and how to do it. To lead human beings into safe practices, you must know what human beings are like, how they act, how you can change their actions to those desired; and you must know

safe practice not only in general but for individuals in specific activities.

So far, we have been talking of the development of attitudes and habits of safe practice, as if both workman and supervisor were individuals possessing nice general characteristic traits which could be molded into a definite pattern if and when the leader knew enough concerning:

1. The nature of his follower.
2. The end result to be attained.
3. A definite method and plan for taking the nice, plastic follower from where he is to where the leader wants him to be.

How about looking at the prospective leader as an individual with some preconceived notions and considerable pride as concerns the methods he has been using; and at the prospective follower as an individual with a set of habits, attitudes and practices which have been firmly established for many years, and by which he has lived even though not too safely? Now ask that leader to change that follower and you have a real problem.

To face this problem effectively, we must consider every accident not only as a result important in itself, but also as a symptom of faulty conditions which caused it. The study of accidents from this approach will reveal causes of two general types:

I. Physical, such as, physical hazards, poor housekeeping, defective equipment, unsafe buildings, and inadequate temperature, ventilation and lighting facilities and regulation.

II. Supervisory, such as, faulty instruction, improper planning, poor discipline, unsafe practices, and mental, physical and emotional maladjustments or unfitness.

The physical hazards are not to be neglected, but we are chiefly interested at present in those which involve the human element, whether or not the physical conditions are properly adjusted.

The supervisor is responsible for the selection and placement of workers so that they fit their jobs. This may require a new job analysis and specification, which consider the human requirements of the job as well as the technical skills and abilities which are involved.

Suppose that you find a workman with ten years' service on his job but engaged in un-

safe practice. Close observation may show you that the unsafe practice is established as a habit. In this case, it is not likely that the workman will change his well-established habit just because you tell him he must do so. The fact is, he may be irritated if you tell him too forcefully. He has a habit which must be changed. How will you change it?

The first step is to be sure that you have a planned way which is better—safer—than the method now being used. Present this plan with sufficient good reasons calmly, patiently and frankly, pointing out such advantages as he may be able to grasp. Give him the total picture in a view which is extensive in range and in time.

The second step is to avoid emotional resentment on the part of the person whose habit you wish to change. Whenever we have an established way of reacting to a stimulus, that way requires less energy and attention than any new way, even though the new way may later prove to be the easy way. Thus in response to a given stimulus we tend to follow the habit pattern already learned and established. If the established pattern is blocked and no new way established, there is a general diffusion of nerve impulses, so long as the stimulus persists. Unless a way to satisfy that stimulus is found very shortly, a state of emotion is generated.

The individual may become angry at the thing or person who blocked his usual reaction, in which case he finds a way to remove the blocking object or person and establishes more firmly the old habit. He may only resent the fact that he cannot respond smoothly. This resentment soon attaches itself to a nearby object or person. Once a man has become resentful, he will not accept the ideas of another, be they ever so good. He usually finds a way to continue in his old practices; if these are thoroughly blocked, he finds some other way, any other way, than the one proposed by the one he resents, of responding to the stimulus.

To avoid emotional stress a worker should be shown the total picture in such a way that the old response is exposed as an incorrect way and a new one definitely planned, which will be within the limits of his ability to attain as he views it. Then he must be encouraged to attempt the new

way under sympathetic guidance, with reward and praise for his accomplishments, and not too much blame for his failures. If you goad him to perfect performance at his former rate of speed on his first attempt, he may become confused and emotional; then he will resist the change.

The third step is to establish a high regard and esteem on his part for you because you are respectable and considerate, because you know how to instruct and have an understanding of human qualities. Of course, this step is to be established before you ever attempt to make changes in habits. If you have established this relationship with the worker, he cannot "let you down" when you ask him to change. He would rather take all of the punishment of increased attention and tensions required by the new method of performance than destroy his respect for you, if it is firmly established. However, you can expect him to show such respect for you only when you are respectable and when you give him the total picture and promote his attempts at the new way like a gentleman, rather than like a dictator who must be obeyed.

Now, do not get the idea that all this demands a spaghetti spined condition on the part of the supervisor. On the contrary, workmen like supervisors who are firm and just, precise and sympathetic, frank and understanding, demanding but respectful, authoritative but dignified—supervisors who know what to do and how to do it because they understand and consider the human beings they supervise.

Once the man has accepted the idea of the change of habit and has been encouraged to attempt a new method, he is on the way to learning a new habit. The scene must be set so that any progress along the line of establishing the new habit will provide its own reward, and failure to progress provide its own punishment.

Thus we see that in the solution of the problem of developing safe habits we must in most cases consider not only the man with preestablished habits, but also the supervisor with all of his human traits.

The problem of developing attitudes is not so different from that of developing or changing habits. Men pay attention to things which have attention-getting value and learn the things to which they attend; they eventually become interested most in

the things to which they most often are attentive. When this channel of interest becomes canalized to the extent that it can be symbolized by an object or a name and stated in an understandable fashion, we say an attitude has been formed.

Of course, it is possible to accept ready-made attitudes by accepting the symbols or language used by someone else without having generated the attitude which should underlie it. The difficulty is that too often the real meaning of the symbol is not understood and the attitude is valueless when the leader loses his power.

It is much better to have such an attitude toward safety by mere acceptance than an attitude against it. However, it would be even better to have developed in each individual an attitude toward safe practice in which the symbols and language would have full meaning to him.

Sometimes we face the problem of changing well-established group attitudes rather than developing new ones. How can the attitude of a group be changed?

It is not likely that talking to the group will be very effective. Habits of thinking in individuals must be changed in the same manner and by the same methods as habits of physical practice are changed. It is possible, however, to change every individual in the group, as far as his expression of attitude to you is concerned, without having the slightest effect on the group or on the individual while he is with the group.

After a sufficient number, including some or all of the key individuals of a group, have changed in their expression of individual attitude when not with the group, you must get someone to express to the group the new attitude as being the attitude of the group. Then even those who have not changed their private attitudes must accept what the group accepts as its attitude, to remain a member of the group. Sometimes the designated leader of the group has influence enough to express the group opinion and attitude. Sometimes he must back off and pick someone who is the accepted key man of the group to do the job of attitude expression. Sometimes men will be persuaded better by a leader from their own ranks, who understands both them and the boss, than by the boss himself.

Of prime importance, however, is the need for carefully pointing the attention of each

individual in the right direction until he develops the proper interest in safety. Then name and symbolize his interest. Be sure it is his interest which is being symbolized; if it is yours and not his, he may not form the attitude you wish him to form.

This human being whom we wish to keep safe must be motivated to follow correct practices individually and in the group to which he belongs. His individual motivation will depend to a great extent on the level of morale of the group.

Because of the biological nature of the human being, there are specific needs such as food, shelter, sex, etc. These needs prompt or motivate him to action. Superimposed on these fundamental drives are patterns of action developed through the history of the race and handed down through training. These superimposed patterns become the motives of our daily life. Through education and propaganda, other specialized motives are developed.

Biologically, every organism tries to preserve its own existence and attempts to promote its own continuance—even at the expense of others, if that becomes necessary. You may develop any motivating pattern which you choose so long as it does not deny too long the fundamental needs of the individual or interfere too extensively with the promotion of his own interests. You may even propagandize the acceptance of a hollow motive for a time and enforce it by drastic punishment for failure to produce results; but sooner or later, the superimposed motivators which deny fundamental principles of human life and behavior are doomed to failure.

All men are by nature interested in promoting their own safety when other accepted motives do not interfere. One of the tasks of a supervisor in motivating safe practice is to remove the other interfering motivators.

A group of men swore that they were not interested in safety and by their actions seemed to prove the point. On close observation, it was discovered that the men were vitally interested in their own well-being and safety, but were so annoyed by the methods employed in the promotion of safety in their department that they were motivated to defend themselves against it. Safety had become the symbol for the disagreeable circumstances which defeated their self-interest in other areas of life. Safety is not one of

the superimposed motives which denies the fundamental factors of human existence, but safety, as promoted in some places, does deny these factors and is thus often rejected.

Call a group of workers together at the end of a shift and harangue them for an hour on safe practices, belittling everyone present and ending up by showing what a boon it would be to you to be cited at a safety congress meeting for a good record if the numbskulls before you would wake up, and you have motivated a desire on the part of the group to kill you and everything you represent. They can't kill you and get away with it, so they proceed to kill safety as you try to promote it.

On the other hand, call the boys together during shift, ask them to suggest ways to improve the physical conditions about them and how to get at the problem of changing over to safe habits of practice and attitude. Give them a chance to promote their own self-interest while they are promoting safety, and you have used a double motivator for safe living. First, you have given the drive for self-preservation an opportunity to function, and secondly, you have given each man a chance to be noticed for the good he can do no rather than for the evil.

Low group morale usually promotes unsafe practice. How can the morale of a group be kept at a high level or raised if it is too low?

Level of morale is determined by commonness of purpose of the individuals of the group. Wherever all members of the group subscribe to the same common purpose and do not deny to other members the right to promote that common purpose, the morale is high even though an outside observer may say the end result of the group effort is unacceptable. Thus, there may be high morale among a group of cut-throat bandits. However, when some individuals do not subscribe to the common purpose of the group or are denied the right of promoting self-interest in the promotion of the common purpose, the morale is low, and disgruntled members not only do not promote the safety of the group but often maliciously plot to destroy the conditions which promote safe continuance of other members.

Let us then find a common purpose to which every member of the group can subscribe. Let us name and symbolize that common purpose in such a way that every

member understands the full meaning of the name or symbol. Then provide a means for each member to be noticed for his efforts in promoting the common purpose. Finally, after morale is high on the level of the common purpose chosen, raise the level of the common purpose through the efforts of the individuals of the group slowly enough so that some individuals are not trampled underfoot in the attempt of others, including the leader, to rise. There is no place in such a scheme for personal glory, except as it is reflected by the desire of the group.

The interesting point is this: safety promotion and accident prevention itself may become the very focal point or common purpose of the group by which high morale is attained. Any safety promotion which moves so fast or points to glory for the company or the safety director at the expense of the members of the group is likely to disrupt the group. The morale decreases, the common point of interest becomes the thing to be defeated, and unsafe practice follows because of poor morale.

When the morale is high there is a respect for the accepted leader of the group, which tends to make acceptable what he has to suggest. It is wise for the safety promoter to find a way to be an "in" member of the group in which he promotes safety.

All this points to the fact that personality is an important factor in selling safety. We tend to buy commodities or accept ideas from the person who is personally acceptable to us. This is a principle upon which successful salesmen have functioned for many years.

Ours is the job of selling safety to those above us and to those below us. They all want to be safe; they all are interested in safety; but we have planned programs for promoting the safe practices in industrial groups to sell. They may not understand or want to buy our specific plans.

First we must show that what we have to sell is useful to and useable by the specific individual. Next we must be acceptable if our ideas are to be accepted.

An investigation of the factors involved in acceptable personality among workers in the Pittsburgh district reveals that the workman likes his boss and attributes good personality to him when the following things are true:

1. His intellectual habits are slightly above the average, but not beyond the grasp of most of his workmen if they try to attain higher standards.

2. His physical habits are better than the average of the group he supervises.

3. His moral habits are above average but he is not a moral prude and does not try to reform or condemn his workers.

4. His emotional habits are such that he keeps "an even keel" but can show righteous indignation or shed a tear of human sympathy when everybody knows the situation demands it.

5. His dress and appearance is neat but not out of keeping with his job. (In some mills a foreman must wear a suit of clothes rather than overalls.)

6. He speaks with his men rather than to or at them in a language marked by correct diction, enunciation, and pronunciation. (He may swear at them if he smiles when he does so.)

7. He is a good judge of proper performance and knows how to direct it, but he loses respect if he insists on showing that

he can do every job better than his best men.

8. He exhibits intent to be fair in every decision. (He will be forgiven if he fails to exhibit fairness only if it does not happen too often and there is never any evidence of intent to be unfair.)

The range of each of these qualities is determined by the way the group thinks. This may seem too low for some of us. One supervisor said, "If I must have my personality attributed to me by that bunch, then I don't want a personality." Maybe that is why his 86 men disliked him and why he had a very bad record of efficiency and safety of production.

The fact is that unless you are willing to have your personality attributed to you by the group you lead, you have no right to be called the leader. Not only do you have no right, but you actually will not be the leader, even though you may be designated as such. If and when you are personally accepted by the group to whom you must sell your ideas, you will sell them if they promote efficiency on the part of the individuals.

ADJOURNMENT

Cement and Quarry Section

Officers 1939-1940

General Chairman—P. N. BUSHNELL, Missouri Portland Cement Co., St. Louis, Mo.
Vice-Chairman—R. A. DITTMAR, Universal Atlas Cement Co., Hudson, N. Y.
Vice-Chairman—O. M. GRAVES, The General Crushed Stone Co., Easton, Pa.
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Publicity Committee Chairman—DAVID ADAM, Lawrence Portland Cement Co., Northampton, Pa.
Statistics Committee Chairman—W. W. ADAMS, U. S. Bureau of Mines, Washington, D. C.
Members at Large—
 TH. AVNSOE, Lone Star Cement Corp., New York, N. Y.
 *W. H. BAKER, J. E. Baker Co., York, Pa.
 E. D. BARRY, Universal Atlas Cement Co., New York, N. Y.
 J. R. BOVD, National Crushed Stone Assn., Inc., Washington, D. C.
 *R. B. FORTUN, Pennsylvania-Dixie Cement Corp., Nazareth, Pa.
 *ALEXANDER FOSTER, JR., Warner Co., Philadelphia, Pa.
 *F. B. HUNT, Dewey Portland Cement Co., Davenport, Iowa.
 S. W. STAUFFER, National Lime Assn., Washington, D. C.
 *F. E. TOWN, Medusa Portland Cement Co., Manitowoc, Wis.
 *A. L. WORTHER, The New Haven Trap Rock Co., New Haven, Conn.

Officers 1940-1941

General Chairman—R. A. DITTMAR, Universal Atlas Cement Co., Hudson, N. Y.
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Vice-Chairman—W. M. POWELL, Medusa Portland Cement Co., Cleveland, Ohio.
Secretary—A. J. R. CURTIS, Portland Cement Assn., Chicago, Ill.
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 *W. H. BAKER, J. E. Baker Co., York, Pa.
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 *Past General Chairman

- J. R. BOYD, National Crushed Stone Assn., Inc., Washington, D. C.
 *P. N. BUSHNELL, Missouri Portland Cement Co., St. Louis, Mo.
 *R. B. FORTUN, Pennsylvania-Dixie Cement Corp., Nazareth, Pa.
 *F. B. HUNT, Dewey Portland Cement Co., Davenport, Iowa.
 S. W. STAUFFER, National Lime Assn., Washington, D. C.
 L. P. WARNER, JR., Warner Co., Philadelphia, Pa.
 *A. L. WORTHEN, The New Haven Trap Rock Co., New Haven, Conn.
 *J. B. ZOOK, Great Lakes Portland Cement Corp., Buffalo, N. Y.

*Past General Chairman

WEDNESDAY AFTERNOON SESSION

October 9, 1940

The opening session was called to order by General Chairman P. N. Bushnell, Manager, Safety and Personnel Department, Missouri Portland Cement Company, St. Louis, who presided. Chairman Bushnell welcomed the delegates, and made a brief report of activities of the Section during the past year. He commented upon many of the hard-working committees, and urged an

increase of teamwork for the heavy times ahead, in which cement companies will have large opportunities for cooperation for safety and national defense.

The list of officers for the coming year, as recommended by the Nominating Committee, was presented and formally endorsed by the delegates. Chairman Bushnell then introduced the first speaker.

Analysis of Cement and Quarry Industry Accident Experience

By I. F. LeGORE

Safety Engineer, Portland Cement Association, Chicago

Uppermost in the mind of every one of us are two vital safety problems: (1) The emergency problem of national defense, and (2) The perennial problem of industrial accident prevention.

In a time of stress it is essential that things go smoothly at top speed. In such a time, delay is dangerous—accidents that cause loss of time, damage to equipment or spoilage of materials might be called unintentional sabotage. The war on occupational injuries which we have waged in the past has been good training for the streamlined war we are going to have to wage to conserve men, materials and time in the year ahead. The tax program necessary to pay the cost of the national defense program will not take into account waste that adds to the cost of doing business.

We all know that effort and funds expended for accidents—for medical attention, for compensation to injured employees, for

machinery repair and materials spoilage—are time and funds thrown out the window. Accidents are pure waste; there is no return on expenditures required to repair damage that could have been and should have been anticipated.

Accident prevention means conservation of vital resources. Measures taken for the prevention of accidents, whether for guards, personal protective equipment such as goggles, hard hats and safety shoes, for improved machinery and equipment of safer design, and for better processes that enable work to be done with greater ease and dispatch, represent investment in material and personnel resources on which there is an important return. Not the least important dividends are returnable in the improved morale that is bound to result from the intelligent, competently administered safety program. No one in business, in national defense activities, or any other endeavor

can expect to get maximum results unless the conditions and the attitudes that make for maximum performance are provided.

Effect on Safety Work

Industry faces severe tests in the new conditions bound to arise as the result of today's great stresses and responsibilities. Equipment is being returned to service in a hurry that has not seen service in years. Augmented working forces are taxing working facilities and sanitary facilities.

Chief among the problems facing industrial safety forces is that of labor turnover. High levels of production will bring back old employees whose skill has been dulled by periods of idleness or employment on other kinds of work, and new and unskilled workers who have little, if any, knowledge of the hazards of their new jobs. Conscription may magnify this problem even though the government is expected to carry on its plans for military training activities with the least possible interruption to industries engaged in defense production.

The problem of education and training to increase the average skill and knowledge of personnel, with regard for the needs of the plant, is highly important. Education and training provide an opportunity for self-development by the employee which is a requisite for both real interest in his job and competent handling of the work he has to do, and does much to develop and maintain morale.

Morale, which I interpret as proper attitude not only towards the job to be done but also towards the whole setting in which the task is placed, is a condition of complete cooperation and is as important to the successful safety program as is adequate skill. Skills, motives and attitudes are the forces that make for success in any undertaking.

Modern warfare makes new demands upon the human mind and character. Already, the distractions caused by news from war-torn countries where some employees have relatives and friends, by prospects of conscription for military training, and by the general bustle and uncertainty have contributed to a rising accident trend in the country generally and are conspiring to reverse the favorable trend the portland cement industry has been able to report for several years. During the first seven months of 1940, all accidental deaths in the United States had increased 7 per cent over the

same period last year. Home deaths had increased 8 per cent, traffic deaths had increased 5 per cent, and occupational deaths had advanced a whopping 14 per cent.

In this emergency, industry must take advantage of the latest developments in personnel methods produced by extensive investigation and research. Application by industrial plants may include the making of job analyses and job classifications, the development of job specifications and rating scales and tests for selection. It is equally desirable that analysis of relations between functions, physical factors and human facilities be made by small plants as well as large.

Cement and Quarry Industry

In World War I the portland cement industry was considered non-essential. Fuel was rationed and the cement business marked time while other industries were operating full blast to supply war materials.

In the present program, however, our industry can perform an essential service in our country's defense.

We have at our command the latest, most powerful weapons for the war on accidents—new developments, new findings, new experiences, new tactics. The swimmer has been to selectivity and specialization; the rifle method rather than the shotgun.

The aim of the selective program is to narrow the problems of hazards, both environmental and human, and to strike hard at the important ones first. For three years the Accident Prevention Bureau of the Portland Cement Association has hammered relentlessly at the nine fundamental causes of accidents and the four causes of severest injuries. They have been spotlighted repeatedly in every publication sponsored by the Bureau, in the revitalized June No-Accident Campaign, in conferences on safety for supervisors, in regional safety conferences of top plant leaders throughout the country.

That this program has been effective is evidenced by the fact that injury frequency and severity rates were reduced almost one-half in the three-year period since 1936. Decline in those rates for the third successive year established 1939 as the safest in the 27-year history of accident prevention in our industry, with 4¼ men injured per million man-hours worked and a severity of about 2 days lost per thousand hours

worked. Or, to put it another way, there were 17 men injured in the course of each one-half million 8-hour shifts and two days' time lost on account of injury in each 125 8-hour shifts.

Last year the National Safety Council again proclaimed cement the safest heavy industry, stating that improvement in each injury rate since 1926 has easily exceeded the average for industry as a whole; that the frequency of fatalities has dropped 89 per cent during the last 13 years; and that only the frequency and severity of permanently disabling injuries is above corresponding averages for all industries.

1940 Experience Unsettled

The story for 1940 is not so gratifying, however. In the first eight months of this year, 130 portland cement plants reported exactly the same number of accidents as 125 plants reported during the same period last year. According to the U. S. Bureau of Mines, cement production for that period was only 4 per cent greater than for the eight-month period in 1939. Shipments were up only 2 per cent.

The accident total was down 10 per cent to the end of June, with production up 5 per cent and shipments off 1 per cent. Then in two months, July and August, the gain was wiped out—and production increases certainly were not responsible.

In eight months 6 fatalities have been reported compared with 5 in the same period last year. There were 6 deaths in the industry all last year, but with two reported in September total fatalities for the nine months of 1940 are 8, one-third more than in 1939. There have been fewer permanent injuries this year than last and this year's permanent disabilities have been far less severe than previously. But with more fatalities, it is not likely that the injury severity rate can be held at last year's level of 2.00.

Study of data supplied by Mr. W. A. Adams, supervising statistician of the U. S. Bureau of Mines, shows that the heavy and the crushed stone industries have essentially the same problems in accident severity that the cement industry has. The four most dangerous spots, or causes of severest injury, in those industries are the same "Four Horsemen" we have for several years emphasized in the cement industry—high places, moving machinery, electricity, and

railroad or haulage equipment. Their experience shows as does ours that when an employee tangles with any of the four, the odds are great that his injury will be severe.

Data for both the National Lime Association and the National Crushed Stone Association are compiled annually, however; consequently no figures for 1940 are available. The lime and stone industries have been participating in national safety competitions sponsored by the Bureau of Mines with notable results. In 1939, 41 plants in the lime industry produced an injury frequency of 25.1 and a severity of 3.5. Twenty-two plants have competed during the five-year period of the contest, and an indication of the value of safety competition may be seen in the fact that in 1939 their frequency rate was 16 per cent below the rate for the first year of the contest. And it was 35 per cent below the rate for all plants participating in 1939. Fifteen lime plants completed the year without a single injury.

By way of encouragement to our friends in allied industries to cooperate in safety competitions, we might report that in the 16 years the Portland Cement Association safety trophy has been offered for calendar years operated without disabling injury, 131 plants have operated 488 calendar years in perfect safety. In that time the frequency rate has been reduced 90 per cent and the severity rate 63 per cent.

Mr. Adams states that the improvement in accident frequency rate of quarrying and allied work in 1939 was due to progress in accident prevention in 1939 in cement mills and quarries, lime kilns and quarries, and limestone quarries including crushing and finishing work. No reductions in rates were reported by granite, marble, sandstone, slate and traprock.

Quarries, mines and clay fields have so far this year contributed to the cement industry's accident total a smaller proportion of injuries than last year, although these operations still top the list of departments in number of accidents reported. Two fatalities have been reported by quarries, however compared with only one all last year. Increases in percentages of total injuries in both crushing and raw operations have brought the proportion of injuries for the entire raw side to 41 per cent of total. Cement storage and packing and shipping accidents have held about the same level as last year at 13 per cent of total. Together,

raw and shipping have contributed 54 per cent of total accidents while working less than 40 per cent of total man-hours. It is obvious that these departments are contributing more than their "share" of injuries and that they must be watched with increasing care.

Need for Better Training

Safe operation of a cement plant requires competent, experienced workmen. We all know that workers become competent and experienced with the help and training of skilled fellow workers as well as with the training and supervision of foremen.

But data for the first eight months of 1940 show that more than 18 per cent of the men injured had less than six months' service with their companies, and this is a 50 per cent greater proportion than at any time since 1936! Even more arresting is the fact that one-third of all the men injured so far this year had been doing the work on which they were injured less than six months. They were either new or recently transferred workers.

Every time a new man comes into a department a need for training arises, even though he may have worked elsewhere in the plant for years. But the record shows that too often the new man is "expected" to be familiar with possible hazards and with correct and safe practices. Trained men should have the ability to size up a dangerous situation instantly and either correct it at once or warn whoever may be endangered. An important problem is that

of getting experienced men to live up to their responsibility.

Of all the single things we can do to get ready for our program of industrial preparedness, the thing that we can do the most for us is training.

Causes of Accidents

As might be expected, the proportion of accidents due to lack of knowledge and skill is at a higher level this year than last. So is the proportion of accidents which include as one of their causes improper attitude.

The greatest behavior cause of accidents last year and this has been improper attitude toward safety, characterized by distraction, abstraction, failure to give or to follow instructions. Improper attitude was named as a contributing cause 2.5 per cent more often during the first eight months of 1940 than during the same period last year.

The greatest environmental cause was unsafe working procedure, which is largely determined by attitude. Unsafe procedure may stem from the individual's failure to keep his safety foremost in planning and performing work, or it may result from management's failure to develop safe methods for specific operations and to train employees to observe them faithfully. Unsafe procedure was named as a contributing cause 2.7 per cent more often during this year than last.

Lack of knowledge or skill is 2 per cent greater this year than last, according to our cause classification.

Physical Control of Accident Hazards

A PANEL DISCUSSION

Discussion Leader—J. B. Lewis, Assistant Superintendent, Buffington Plant, Universal Atlas Cement Company, Buffington, Ind.

Chairman Lewis outlined the scope of the discussion and introduced the members of the panel, as follows:

Fred B. Hunt, Plant Manager, Dewey Portland Cement Company, Danversport, Iowa.

A. A. Oustaric, General Superintendent, Federal Portland Cement Company, Inc., Buffalo, N. Y.

T. W. Jones, Safety Engineer, New Haven Trap Rock Company, New Haven, Conn.

H. R. Patterson, Superintendent, Lehigh Portland Cement Company, Madison City, Iowa.

(The following résumé of the discussions has been prepared for this record by I. F. LeGore, Safety Engineer, Portland Cement Association, Chicago.)

FRED B. HUNT pointed out that safety starts with the proper design of plants and equipment. This includes such items as light-

ing and ventilation, stairways and guard rails, and should cover the entire plant and equipment down to the locker rooms. In order that accident prevention will receive adequate attention, construction and repair, suggestion was made from the floor that plans and specifications be routed for comment from engineer to superintendent to safety officer to the foreman in the department in which the work is to be done. Safeguards should be specified in the purchase orders for equipment. The set of safety inspection check lists developed by the Accident Prevention Bureau of the PCA was cited as good reference material.

Considerable discussion from the floor was given the subject of safe electrical equipment, switches and protective devices as a result of several severe accidents recently reported in the portland cement industry. Audible signals for machinery starting controls were mentioned and the relative merits of locking or tagging controls during repairs were argued. Consensus was that locking controls gives more positive protection, although a half dozen men signified that practice in their plants is to tag rather than lock. The location of switch-box handles and the use of the left hand in operating standard switches to make less likely the possibility of injury should a flash occur was argued.

A. A. OESTERLE led the discussion of inspection methods, the theme of which was that safety depends a great deal upon the efficiency with which houses are kept in order and that inspections should be made periodically by qualified employees. Some of those present said that daily safety inspections should be made; the majority felt that comprehensive inspections should be made at least monthly. Use of the PCA inspection check lists is made by some. Others use these lists as a basis for more detailed lists of their own so as to help make sure

nothing is overlooked. The objection that the use of check lists makes inspection too stereotyped was countered with the idea that inspectors are to understand that their investigations are to include, but not be limited by, check list questions. It was concluded that, whatever the method, it was best to get inspectors on record about safety conditions throughout mill and quarry.

T. W. JONES' interesting exposition of the guarding problem left little for discussion. Those present were fully in agreement on the great value of physical safeguards for all equipment requiring them.

R. A. DITTMAR, new General Chairman of the Section, made an interesting report on his new plant, which is equipped with individual drives throughout and which has all moving parts of machinery enclosed. Equipment is controlled by push-buttons interlocked to provide positive operation.

H. R. PATTERSON started the consideration of personal protective equipment and stressed the importance of providing goggles, safety shoes and other clothing which fit well, are comfortable and which do not interfere with the work in any way.

One company furnishes goggles and respirators to all employees whether the work for which they are hired makes their use immediately necessary or not. All safety equipment must be turned in when the plant is shut down and it is carefully inspected, repaired and cleaned before it is reissued. A 1-to-10 hydrochloric acid solution is used to clean the glass of goggles of cement incrustations.

Some plants make compulsory the wearing of hard hats by workmen lining kilns. A steel industry representative reported that his company gives each employee a pair of safety shoes at Christmas in the belief that serious toe injuries prevented more than repay the cost.

ceding the concluding session of the Section. He complimented the Cement and Quarry Section for the excellent safety record of

THURSDAY LUNCHEON SESSION

October 10, 1940

Dr. R. R. Sayers, Director of the United States Bureau of Mines, Washington, D. C., was the honored guest at the luncheon pre-

their industries and described the activities of his Bureau in the defense program to fortify the needs of this country for strategic minerals.

Jack Dempster, Director of Safety of the

Canada Cement Company Limited, Montreal, delivered an inspiring message of encouragement on the present world situation and the part safety men play in it.

THURSDAY AFTERNOON SESSION

October 10, 1940

The new General Chairman, R. A. Dittmar, presiding at the closing session, briefly outlined activities contemplated for the Section during the new year and made an appeal for assistance in building a strong membership.

He then turned the meeting over to Panel Discussion Leader R. A. BECHTOLD, Superintendent of the Pennsylvania-Dixie Cement Corporation's plant at West Des Moines, Iowa.

CHAIRMAN BECHTOLD started the discussion, "Creating a Safe Working Force," and assigned the phases into which it was divided to the following members of his panel:

J. J. Kelly, Manager of Industrial Relations, Marquette Cement Manufacturing Company, LaSalle, Illinois.

C. P. Harris, Superintendent, Huron Portland Cement Company, Alpena, Michigan.

L. P. Warner, Jr., Industrial Relations Manager, Warner Company, Philadelphia.

A. S. Hetherington, Supervisor of Safety and Labor, Universal Atlas Cement Company's plant at Duluth, Minnesota.

(The following is a summary of the discussions, prepared for this record by I. F. LeGore, Safety Engineer, Portland Cement Association, Chicago.)

J. J. KELLY told of his company's methods of selecting and placing employees to best advantage. Men are employed through a central employment office, and after thorough medical examination are interviewed by the safety engineer who acquaints them with the safety record of the company and the aims and desires of management and employees in accident prevention. The new employee is then taken to the department foreman who is responsible for in-

spection and training. The newly hired man is permanently attached to a department only with the consent of the department head.

An important discussion developed over the question of physical standards for employment, and the methods employed in the case of old employees becoming disabled so they are unable safely to continue in hazardous work. Many plants are able to find easy, non-hazardous work for these employees but recognize that it may become increasingly difficult to fit these men into jobs of this kind. Pension plans were mentioned in this connection.

C. P. HARRIS said his company's program of instruction and training and development of employee cooperation through training centers in foremen's meetings. His and a number of other companies have been following the PCA safety conference procedure in organizing and stimulating the thinking of supervisors about safety problems. It was brought out that employees should be instructed and trained in safety principles at the same time they are instructed and trained in other duties. Voluntary meetings among employees to discuss safe practices and suggestions are encouraged.

M. P. GREER, Safety Engineer of Marquette Cement Manufacturing Company's plant at Cape Girardeau, Missouri, reported an interesting transfer card in use in his mill. The foreman shows the new or transferred employee in his department how to do the job and at the end of the period of training fills out and turns in a card indicating that the employee has been properly instructed.

L. P. WARNER, JR., led in the discussion of the analysis of work methods and operating practices. Several of those pres-

ent pointed out that comprehensive job analyses have often been made as a method of establishing equitable wage rates; but an even more important development of these studies is the study of job hazards. Job analysis had been found by many to be valuable in determining whether new methods or equipment would make jobs safer. Experienced employees should be freely consulted in preparing the job descriptions on which studies are based.

A. S. HETHERINGTON spoke highly of the PCA Foremen Conference training course in instructing foremen to be competent teachers and stated that it has been demonstrated that foremen who are experts

in the work performed in their departments may not have adequate teaching ability. It was felt that current emphasis on the responsibility of foremen seeks to develop greater competence in discharging duties and influencing employees rather than to overload supervisors.

Opinion was divided as to whether foremen's meetings should be held on company time. Those who hold them on company time reported no difficulties arising from this practice. Those companies holding safety meetings outside of working hours usually provide dinners and sponsor a brief social program in the course of the evening.

ADJOURNMENT

Chemical Section

Officers 1939-1940

- General Chairman*—RALPH O. KEEFER, Aluminum Co. of America, Pittsburgh, Pa.
Vice-Chairman in Charge of Program—STANLEY WARZALA, The Calco Chemical Co., Inc., Bound Brook, N. J.
Secretary—F. W. DENNIS, Hooker Electrochemical Co., Niagara Falls, N. Y.
News Letter Committee—S. W. GURNEY (*Chairman*), Liberty Mutual Insurance Co., Boston, Mass.
 *A. L. ARMSTRONG, Rochester, N. Y.
 R. S. MACKIE, General Electric Co., Nela Park, Cleveland, Ohio.
 P. V. TILDEN, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
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 *S. E. WHITING, Liberty Mutual Insurance Co., Boston, Mass.
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 CLARENCE WIGLE, Niagara Alkali Co., Niagara Falls, N. Y.
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 *JOHN ROACH, Deputy Commissioner of Labor, Jersey City, N. J.
 K. E. ROOF, Willard Storage Battery Co., Cleveland, Ohio.
Statistics and Contest Committee—R. C. STRATTON (*Chairman*), The Travelers Insurance Co., Hartford, Conn.
 *H. L. MINER, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
 *Past General Chairman

Officers 1940-1941

- General Chairman*—STANLEY WARZALA, Calco Chemical Div., American Cyanamid Co., Bound Brook, N. J.
Vice-Chairman in Charge of Program—F. W. DENNIS, Hooker Electrochemical Co., Niagara Falls, N. Y.
Secretary—S. W. GURNEY, Liberty Mutual Insurance Co., Boston, Mass.

- News Letter Committee*—JAMES J. DUGGAN (Chairman), Carbide & Carbon Chemicals Corp., South Charleston, W. Va.
 R. S. MACKIE, Incandescent Lamp Dept., General Electric Co., Cleveland, Ohio.
 J. H. TAYLOR, Procter & Gamble Co., Cincinnati, Ohio.
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TUESDAY LUNCHEON SESSION

October 8, 1940

The opening session was a special luncheon meeting, attended by a large number of delegates. General Chairman Ralph O. Keefer, Purchasing Agent, Aluminum Company of America, Pittsburgh, Pa., presided.

Following the luncheon, the Chairman welcomed the delegates and guests, spoke briefly of the Section's activities during the past year, and then introduced the speaker of the occasion, Mr. O. S. True, whose address is given below.

The Use of Rubber and Rubber Compounds in the Chemical Industry

By O. S. TRUE

United States Rubber Company, New York, N. Y.

Strictly speaking, rubber as such would be of little value to the chemical industry. It owes its valuable properties to an ability

to combine chemically with certain substances such as sulphur, and to its ability to incorporate with and to hold in uniform

dispersion certain reinforcing materials such as carbon black. Also the quality and durability of modern compounds has been much improved by the addition of small quantities of accelerators and anti-oxidants, for the most part complex organic materials which improve the uniformity of the cure and increase the resistance to natural aging.

Rubber can be compounded so as to provide substantial resistance to corrosion and abrasion, as well as high dielectric, low co-efficient of heat transfer, and marked ability to absorb vibration and shock. These properties make rubber of value to the chemical industry.

With regard to corrosion, an ever-present problem in the chemical industry, rubber can be compounded to satisfactorily resist the following:

1. Most inorganic acids—including hydrochloric, phosphoric, dilute sulphuric, etc.
2. Most organic acids—such as acetic, formic, tartaric, etc.
3. Inorganic bases—caustic soda, etc.
4. Inorganic salts—chlorides, sulfates, etc.
5. Organic salts—acetates, tartrates, etc.
6. Bleach solutions—hypochlorites, chlorine solutions.

No one compound is satisfactory for use in connection with all of the above classifications but a suitable compound can be obtained for each individual requirement.

Rubber is not suitable for use with the following:

1. Strong oxidizing agents—such as nitric and chromic acids.
2. Aromatic hydrocarbons—such as benzol and toluol.
3. Aliphatic hydrocarbons—petroleum and its derivatives.

Rubber has one further limitation which should be borne in mind; namely, temperature. While compounders have improved the temperature resistance of rubber, 180 to 200 degrees F. must still be considered the practical maximum for industrial rubber goods, if long life is to be obtained.

For present purposes, some generalization may be made. There is the type abrasion caused by a material sliding over a surface, a shearing action, and there is the type caused by impinging of a material against a surface, abrasion due to impact. Between

the two extreme types is an infinite number of combinations. Different rubber compounds are necessary for different types of abrasion, but unless the impact is so severe as to cut the rubber to pieces, the proper compound has a very high degree of resistance to abrasion. Without qualitative tests it is not possible to say just how much more resistant rubber is than some other material, but such tests can be made if necessary. When corrosion and abrasion are both present, rubber is an ideal material although if the corrosive action is so severe as to make necessary a compound designed primarily to resist corrosion, it might be necessary to sacrifice some abrasion resistance.

With regard to dielectric for potentials up to 10,000 volts, rubber is generally considered the best available commercial insulation. Furthermore, rubber can be compounded to provide low water absorption, thus maintaining its high insulating factor, a characteristic not enjoyed by most other insulating materials. Rubber insulation finds its most common use with electric wires and cables, although it has also wide application in connection with electro chemical processes where resistance to corrosion and to stray current losses are both important.

The ability of rubber to absorb vibration and shock is due to a high degree of resilience. If displaced under load it immediately returns to its original position when the load is removed. The movement is accomplished with a minimum of internal friction. This characteristic enables engineers to design rubber springs and vibration dampeners, a recent application of rubber that is proving very beneficial in many of the process industries.

Rubber may be considered a good thermal insulator with coefficient of heat transfer corresponding approximately to that of asbestos. This permits transfer of solutions through rubber lined pipe with small loss of heat content, and evaporation in rubber lined vacuum crystallizers without excessive radiation. On the other hand, low heat transfer precludes the possibility of temperature control by indirect heating in rubber lined jacketed kettles or similar equipment, it being necessary to maintain temperature by heating coils or direct injection of steam.

Rubber compounds vary in tensile strength from 2,000 to 10,000 lbs. per sq. inch, in elongation or stretch from 800 per cent to

2 per cent, and in specific gravity from .97 to 1.70 (processes). Rubber can be molded, extruded, or made up in sheet form, can be incorporated with duck or other fabric, or can be permanently adhered to metal.

A great deal of research and experimental work has been necessary to develop compounds of present day standards, and hand in hand with the improvement in the material has gone the development of the mechanical equipment necessary for the production of modern rubber goods. The items most generally used in the chemical industry are: conveyor and transmission belts, packings, hose of all kinds, rubber lined equipment, various molded articles, electric wire and cable, tape, gloves, boots and aprons.

The chemical industry uses in quantity conveyor and transmission belts. The foundation of most rubber belts is a woven cotton duck, especially designed for the purpose. The weight of duck varies from 28 oz. to 48 oz. per rubber man's yard of 42 x 36 inches. The permissible tension varies between 24 and 60 lbs. per inch of width per ply, the number of plies being determined by the maximum applied load. The plies of duck are held together with a soft rubber compound known as the friction. This friction serves to unite the plies of duck into the finished belt, at the same time permitting sufficient freedom between the plies to assure a homogeneous structure capable of conforming to the distortion over pulleys without mechanical break down. It is essential that the friction not only penetrate throughout the duck, but that it be of such character and thickness that the belt will stand up serviceably under repeated flexing. A rubber cover is provided to protect the carcass against abrasion and deterioration. This cover will vary in thickness between $\frac{1}{8}$ and $\frac{1}{4}$ inch, depending upon severity of service, and can be especially compounded to resist heat, abrasion, acid or oil.

The use of conveyor belting is based on the mechanical theory that it is less expensive to move materials in a constant stream of small quantities than to move the same volume of material intermittently in larger quantities. Also in many processes, it is desirable to have the raw materials delivered at a constant and uniform rate. Conveyors can be made in widths up to 72 inches and in continuous lengths up to any practical requirement. Conveyor belts can be made

endless either in the factory or in the field, or can be fastened in the field with one of several standard types of fasteners.

Transmission belts have a usual maximum size of 24 inches width with 8 or 10 plies of duck. Such a belt will transmit approximately 350 H.P. at 5,000 lineal feet per minute. Rubber transmission belts are adaptable to practically every type of belt drive. Transmission belts may be made endless either at the factory or in the field, or may be fastened with one of the standard fasteners. It is, of course, standard practice to protect belt drives with metal screens. However, there is considerable potential power in a high-speed transmission belt, and there should be frequent inspection to make sure that the belt is in good condition. In particular, the fasteners should be kept tight and properly fitted, and checked for weakness or breaks caused by metal fatigue. There have been serious accidents due to breaking of belt fasteners, most of which could have been avoided by proper inspection.

The chemical industry uses a large variety of packings including flax, jute, rubber, duck and rubber, asbestos and rubber, a variety of synthetic materials, and metallic packings, all of which have definite places in this industry.

Rubber packings can be furnished in sheet form or can be extruded or molded to desired shape.

Duck and rubber or asbestos and rubber can be furnished as sheet, or can be braided to square or circular cross section or molded to required shape. All rubber packings are ordinarily used up to 180 degrees F. maximum temperature, duck and rubber up to 250 degrees F. with asbestos and rubber varying from 400 to 800 degrees F. dependent on the grade of asbestos.

All these types are lubricated with oils or waxes and finished with a treatment of graphite or mica. The type of lubricant used depends on the material handled, the temperature, pressure and the kind of motion involved, i.e., centrifugal, reciprocating, etc. Pressure limit is dependent on stuffing box design.

As a successful packing must meet all of the conditions for which it is recommended, and as there is great variation in service conditions, most packing manufacturers carry a wide variety of packings.

This makes it imperative that the proper packing be selected for each individual service if the best results are to be obtained. Better packings improve the margin of safety. The reputable manufacturers are more than willing that the safety committee pass on the quality of packing for severe service conditions and glad to cooperate with such committees in the development of the best specification. The temptation to permit the use of inferior packings to save a few pennies on initial cost should be carefully avoided.

Very few persons realize the extreme importance of hose to industry. Hose represents the largest single item of mechanical rubber goods and there are several manufacturers who concentrate their activities almost exclusively on hose. Early hoses were made of fabrics or leather but the introduction of rubber enormously enlarged the adaptability and use of hose items.

A rubber hose consists of a tube, a carcass and a cover. The material being conducted comes in active contact with the tube, hence the rubber must be compounded to resist the action of heat, acid or oil as the case may be. The carcass provides the necessary strength and from the nature of its construction the hose derives its flexibility. The carcass usually consists of a number of layers of cord or fabric, the number dependent on the service pressure, each ply being separated by a thin layer of rubber. With cord or braided construction hose can be made in continuous lengths; with wrapped duck construction length is limited to 50 feet. The cover provides protection from outside wear and must be compounded to resist abrasion, acids, or oil as required.

The chemical industry uses hose for a variety of purposes; air hose, steam and water hose, acid hose, sand blast hose, fire hose, etc. Many of these are standard items as supplied to other industries. Many are special hoses designed for particular services. For instance, in handling food grade phosphoric acid it is important to prevent contamination of the product. Most rubber compounds will satisfactorily resist the corrosive nature of the acid but many will discolor the acid; in fact, special compounding is necessary to prevent discoloration. Hence a special tube must be provided for acid hose handling this material.

Steam hose is commonly used in most plants and with the general increase in

steam pressures and temperatures the service has become more and more exacting. Until recently use of steam hose has been accompanied by considerable hazard. It is difficult to determine the condition of the carcass of the hose from the appearance of the cover. Cotton starts to deteriorate and to char at temperatures around 250 degrees F. Progressive deterioration sets in and after a period of service, there is a possibility that the hose may burst with attendant risk to personnel. Two recent developments contribute substantially to safer use of steam hose. One is the development of an asbestos cord of requisite strength which provides a non-char, non-deteriorating carcass. The other is the use of wire braid in place of cotton braid. The wire braid is, of course, unaffected by high temperature and has ample strength to resist the pressure. Danger of blow-out is eliminated, and as it is not possible to compound a rubber tube that will outlast the braided steel carcass, failure occurs when the rubber becomes porous and allows the steam to leak through the wall structure, not a particularly dangerous type of failure.

For larger sizes of hose, it is possible to provide resistance to pressure or to vacuum by building into the hose a flat or round wire spiral. With hose of this type, it is also possible to provide an integral duck and rubber flange, ordinarily designed to conform to A.S.M.E. standards. The result is a flexible pipe with a high degree of resistance to abrasion, corrosion, pressure, vacuum or vibration. There are many places in the chemical industry where this type of hose can be used to advantage in the handling of abrasive materials in suspension, or slurries. In many cases, a flexible pipe can be run in a more direct line than a rigid pipe, and in other cases it is possible to eliminate elbows and short connections. Furthermore, a flexible pipe will compensate for misalignment of pipe line and pump connections and can be used to compensate expansion and contraction.

Proper and adequate fire hose is as essential to the chemical as to other industry. Fire protection is a highly specialized subject and need not be discussed here. In the chemical industry it is complicated by the necessity of protecting the hose against the destructive action of acid fumes. Special treatment of cotton jacket can be provided but for severe conditions, rubber cov-

ered hose is recommended. The hose manufacturer is always glad to consult with you regarding your particular requirements.

The extreme flexibility and excellent electrical properties of rubber make it a logical basic material for insulation of electric wire and cable. In addition, the resistance of rubber to chemical corrosion makes rubber insulation particularly desirable in the chemical industry. In compounding rubber for electrical purposes, it is essential that the ingredients have good electrical properties and low water solubility. It has been found possible to produce flexible insulation varying in rubber content from 10 to 70 per cent rubber, hence a wide range of electrical and chemical properties is available. Also, it is possible to provide an insulation with sufficient resistance to mechanical damage to permit use without other protective covering such as lead. This is not possible with certain other types of insulation, such as varnished cambric or paper. Lead coverings are subject to mechanical damage and if the lead covering is provided as a protection for an inferior insulation electrical difficulties are quite certain to occur subsequent to any damage to the lead covering. On the other hand rubber insulation properly compounded to provide the best obtainable electrical and mechanical properties plus resistance to chemical corrosion have given satisfactory and safe service under severe conditions in many plants for a number of years.

Wires and cables are commonly spliced with a combination of rubber and friction tapes. The splicing compound is a tacky, unvulcanized or semi-vulcanized rubber, and the friction tape is a cotton fabric thoroughly impregnated with rubber. The splice is ordinarily made with the rubber tape applied directly to the wire, held in place with an outer layer of friction tape. The rubber tape provides the dielectric and the friction tape the protective cover. Friction tape alone is sometimes used but this is not considered safe practice. Recently so-called twin-tapes have been introduced, a combination of rubber one side and friction the other; important from a safety angle in that it eliminates the possibility of a splice made from friction tape only.

Of interest to the chemical industry is a special frictioned fabric of 4 inch width, similar to a tape, used with hair felt or cork for insulation of pipe lines. The tape is applied continuously holding the insula-

tion in place and providing a permanent airtight cover.

The most recent and probably the most direct contribution of the rubber to the chemical industry has been the application of rubber linings and rubber coverings for tanks, pipe and fittings and equipment such as fans, pumps, continuous filters, centrifugals, etc. With the expansion of the chemical industry, there came a demand for corrosion resisting equipment of size and structural strength to meet the increasingly more severe requirements of the service. Most of the older materials had limitations such as insufficient maximum size, inability to withstand vacuum or pressure, susceptibility to thermal shock, necessity for frequent repair, etc. Ordinary steel construction is, of course, impossible, but steel protected by rubber has a wide range of application. For such equipment, the structural strength of steel and the corrosion resistance of rubber are available, size limitation is removed, pressure and vacuum can be provided for, and cost and life expectancy usually indicate excellent economy. Most engineers are familiar with the principles of design of steel equipment and as relatively few modifications are necessary to permit installation of rubber a specialized design knowledge is not required. The discovery of an adhesive capable of permanently and adequately bonding vulcanized rubber to steel is responsible for the development of rubber linings.

The process consists essentially in the preparation of the metal surface by cleaning with sand or steel girt blast, application of several coats of adhesive, placing of the unvulcanized rubber over the cemented area, and the subsequent vulcanization of the rubber. The cements are brushed on, necessary allowance being made between coats for evaporation of solvents. The rubber is applied in calendared sheets, cut to proper size usually $\frac{1}{4}$ inch thick. For severe operating conditions, $\frac{1}{2}$ inch thickness is frequently used. The cure is effected by means of pressure steam, exhaust steam, hot water, or hot air, dependent on conditions and the size of the vessel. Subsequent to cure, an electric spark test is applied to insure against concealed defect. The work is preferably done at the rubber factory but may be done in the field if necessary.

There are certain rigid safety regulations which we insist be followed by our men in

this work. The cement solvents are highly volatile, somewhat toxic, and form explosive mixtures, hence care is necessary to prevent accident. Also activated cure necessitates the use of carbon bisulphide, another hazardous volatile material. Hence with all closed vessels we require an 18 inch minimum manhole, that our operators wear gas masks when cementing in confined areas, that proper ventilation be provided for removal of fumes. In addition, in closed vessels the operator wears a life belt and a watchman stands at the manhole to be ready in case of emergency. Care should also be taken that no smoking, no open flame, or no welding occurs in the area. Finally, all motors driving exhaust fumes must be non-sparking and it is best that the tanks be grounded and that all tools have wire wound handles and be properly grounded. Only vapor-proof lights should be used. Tools should be of non-sparking materials and shoes should not contain steel nails in soles or heels. It is advisable to have fire extinguisher readily available while work is in progress.

It should be borne in mind that it is possible to machine certain grades of rubber to close tolerances, hence when necessary rubber lined and covered equipment can be machined to size subsequent to application of the rubber. Also for severe conditions involving mechanical abuse or high temperature, it is possible to protect the rubber with

brick inner linings set in acid proof cement. The use of this type of construction is rapidly increasing for pickling tanks, flues, absorption towers, sulphuric acid mixture tanks, etc.

Rubber gloves, boots, aprons and clothing should be mentioned briefly in any discussion of rubber for the chemical industry. These are standard items usually drawn from stock and most companies have safety regulations which compel the wearing of these protective items during certain operations.

Today no consideration of rubber is complete without some mention of the synthetics. Strictly speaking, these are not synthetic rubbers, but are compounds of similar molecular structure having rubber-like properties.

In normal times it is not to be expected that synthetics will replace natural rubber. Rather it is expected that they will supplement rubber for service conditions for which they are better adapted. Their resistance to oil, strong oxidizing agents and heat being superior to rubber makes them especially valuable in many instances. Rubber has the tremendous economic advantage of low cost and at the present time, it does not appear that synthetics will be able to meet this competition. However, with world conditions as they are almost anything can happen and it may be extremely fortunate that we have synthetic materials available and a knowledge of their processing.

TUESDAY AFTERNOON SESSION

October 8, 1940

Accident Prevention Through Periodic Test and Inspection of Machinery and Equipment

By JAMES J. DUGGAN

Carbide and Carbon Chemicals Corporation, South Charleston, W. Va.

To clarify my remarks, by *machinery* I refer to apparatus that involves moving parts such as compressors, pumps, motors, etc.

By *equipment* I refer to apparatus which has no moving parts such as tanks, condensers, kettles, piping systems, etc.

By *test* is meant the subjection of a pressure or load in excess of the normal operating or design requirements within, however, the factor of safety limits, and in no case destructive.

By *inspection* is meant, the visual observation of such apparatus as cannot be sub-

jected to any form of strength of performance test such as shop equipment, hand tools, open top kettles, etc. Where operating conditions or the past service record of any apparatus justifies the waiver of a strength or performance test, a visual inspection should be mandatory.

In 1934 the management of the Carbide and Carbon Chemicals Corporation decided to extend the scope of their safety work to reduce not only accident severity and frequency rates but to reduce mechanical failures, reduce fire hazards, and increase the overall plant efficiency through the elimination of mechanical hazards thus assuring continuity of production.

The theory was sound, and a separate department was established to originate and supervise test and inspection routines. This organization was to be known as the "Process Safety Department," the direction of which was to be independent of those primarily in charge of production or equipment, thus allowing a free expression of opinion concerning the condition of the equipment and the character of the maintenance without being influenced by someone whose primary interests centered on maximum production or maintenance at the lowest cost. Freedom to state conditions exactly as found and to criticize constructively were considered the prime requisites for a successful test and inspection organization.

The Process Safety Department originated procedures based on sound engineering principles. The various code requirements, for example, were considered standard. Every source of information was utilized and where standard practice procedures were applicable to plant conditions they were included. The services rendered, however, were in no way intended to relieve a department supervisor of the responsibility for the safe operation or maintenance of his equipment. The procedures were intended:—

1. To establish a system for periodically testing and inspecting all machinery, equipment, and safety devices.
2. To eliminate a possible cause of fire, explosion, or accident through decreasing the likelihood of any mechanical failure of equipment in service.
3. To record all tests, inspections, and repairs by providing suitable report forms and record systems for future reference.
4. To circulate all reports and information

compiled to the department heads and all other interested persons that they may know as nearly as possible the condition of equipment.

5. To establish safe operating pressures by standardized retest pressures and procedures, making each successive test or inspection identical, thus giving means for determining the exact conditions of equipment based on past tests.

6. To provide proper tools, instruments, and such other equipment as may be found necessary to carry on the test and inspection work as thoroughly and efficiently as possible.

7. To correlate corrosion rates and estimate the life of all equipment and to recommend the replacement of old or defective equipment before it fails in service.

8. Through the data thus compiled, to be of assistance in the establishment of design, construction, and maintenance standards for future equipment.

9. To study the design of new equipment and plant layout in an effort to eliminate the repetition of hazardous conditions.

10. To effect co-operation between production, maintenance, engineering, and inspection forces that each may benefit by the experience of the others.

11. To keep the plants perpetually new through the replacement of defective equipment or machinery.

The application was not found as difficult as originally anticipated. Investigation revealed the fact that a large portion of the necessary work was being done. Efficient repair work was effected through the existing maintenance departments, tests of some nature were being made following each repair to determine that satisfactory repairs had been made. Various inspection schedules had been established for the convenience of department heads. The record of such work however was very incomplete and lacking in detail and thoroughness. To make a long story short, much effort was being exerted with little benefit. Therefore, when definite procedures were put into effect the actual work performed was not materially increased and the small increase necessary was soon justified. To be more specific, the total time chargeable to process safety work, which includes all fire protection work, is less than one-half of one per cent of the total plant manhours.

Such a system, applicable to any type of industry, may be summarized as follows:

1. It must have the approval of the management.

2. The system for gathering data must be routine, specific in requirements, and efficient in operation.

3. Complete co-operation between all plant departments is essential to insure compilation of all facts and data.

4. A report must be made of each repair as well as each test and inspection. Information concerning operating irregularities are valuable also in compiling an accurate service record. These reports must become a part of the record system.

5. A means of identification of all machinery and equipment must be provided. For example, equipment can be grouped such as motors, compressors, boilers, stills, etc., and numbered in rotation either by department or installation.

6. All test and inspection work must be under the supervision of one department to eliminate repetition and to insure complete coverage and the following of approved procedures.

7. All equipment should be prepared for test and inspection by the maintenance department mechanics or operating department personnel. This arrangement eliminates the necessity for duplication of effort. The actual test, however, must be applied, or at least supervised, by an authorized inspector.

8. Inspectors should confine their efforts to a detailed analysis of the present condition of equipment in order to establish the rate of corrosion or deterioration and the safe operating life of the equipment. When this information is passed on to the maintenance and design departments it will assist them materially in deciding the proper repair and/or change in design for future installations.

9. The reports submitted should form a "service record" of each individual piece of equipment and be kept in a convenient place accessible to all interested persons. If necessary, duplicate systems may easily be maintained in two or more advantageous locations.

10. When periodic test and inspection reveals equipment to be unsatisfactory for the operating conditions to which it is subjected, it should be removed to a less severe service or condemned and completely removed

from service. This decision is reached by applying sound engineering principles, and by consultation with the plant engineering and maintenance engineering departments.

All information should be circulated to or made available to all units of a plant within a corporation that they may judge similar equipment in similar service under their supervision. With this information available to maintenance and design engineering groups, future plant extensions or replacements can be made to eliminate the repetition of hazardous conditions and assure more efficient plant operation. Inefficiencies in the design and fabrication of machinery and equipment can many times be rectified if detailed field experience as reflected in the service record is called to the attention of the supplier.

Each of us can recall glaring examples of neglect that have resulted in some cases in disaster. In one plant compressed air is obtained from a battery of seven air compressors centrally located and distributed through the plant in an extensive piping system. Receivers are located at advantageous locations. Each of these seven compressors is equipped with a large receiver connected to a 16-in. or 18-in. header for delivery throughout the plant. Important distribution lines are taken off this header as required and each separate distribution line is equipped with its own receiver. An explosion occurred which destroyed all the receivers on the complete header system, causing failure in parts of the main header and seriously damaging the three compressors which were operating. This indicates that, while the cause may have been in or at the compressors, the effect was transmitted through interconnecting piping by propagation of flame through a flammable atmosphere with explosive force.

This accident had all the earmarks of an oil-vapor explosion in the system and while little can be learned concerning the compressor practice at this particular plant it is alleged that the compressor equipment was old and overworked. Should this assumption be correct, it is fair to assume that excessive lubrication may have been required which, of course, would be responsible for sufficient oil vapors in the system to form an explosive atmosphere.

Another disaster in recent years was a fire in a large refinery in the state of New York. This fire is alleged to have started from a

leaking pump which liberated flammable material in the presence of an ignition source. Both of these disasters were absolutely preventable.

The results to be obtained from a program of periodic tests and inspection are far reaching. The experience of the Carbide and Carbon Chemicals Corporation has proved this beyond a doubt. The equipment is better maintained and the personnel has been better educated as to mechanical limitations. A brief summary of this program indicates that:

1. Plant machinery and equipment have been operated more efficiently.

2. The plants have been provided with an additional means of fire prevention.

3. A continuing service record has been provided for all equipment and machinery.

4. Data has been compiled for future design and maintenance.

5. A means of education of the plant personnel has been effected through the circulation of detailed reports giving to them information heretofore not available as to the condition and limitations of equipment under their supervision and control.

6. Overall plant efficiency has been increased.

7. Many accidents have been prevented.

Presentation of National Safety Council Awards in the Chemical Section Safety Contest

Outstanding facts about the contest were presented by R. C. Stratton, Supervising Chemical Engineer, The Travelers Insurance Company, Hartford, Conn., and Statistics Committee Chairman, Chemical Section, National Safety Council, as follows:

Participation in the 1939-1940 Contest exceeded all previous competitions. The enrollment was 170 plants, employing 81,331 people who worked 164,669,820 hours during the year.

The average frequency rate for all participants was 3.59. Division I again had the lowest rates, averaging 3.38.

Injury records, on the whole, were worse than in the 1938-1939 competition. Frequency rates averaged 9 per cent higher. Improvement was made only by Group B plants of Division I and Group A plants of Division III.

Small plants, on the whole, had the highest frequency rates and also the worst records in comparison with the previous Contest.

One-third of the participants went through the contest period without a reportable injury.

The awards were presented to winning companies in the name of the National Safety Council, by John Roach, Deputy Commissioner of Labor, Trenton, New Jersey.

The awards consisted of handsome Trophies, each being in the form of a Bronze Plaque displaying an eagle in flight

and the Universal Safety Emblem, these plaques being given to winners of First Place; and Certificates of Merit in the shape of lettered scrolls, which were given to winners of second and third place. In the lists below first place is indicated by the numeral (1), and second and third places by numerals (2) and (3), indicative of their relative standing.

DIVISION I

Group A

1. E. I. du Pont de Nemours & Co., Spruance Rayon Plant, 5,325,045 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Parlin Plant, 2,321,922 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Doyle Works, 1,594,271 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Newburgh Plant, 1,471,398 man-hours, no reportable injuries.

Group B

1. E. I. du Pont de Nemours & Co., East Chicago Plant, 1,163,176 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Buffalo Cellophane Plant, 1,091,696 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Buffalo Rayon Tech. Div., 921,519 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Henry Clay Exp. Station, 903,942 man-hours, no reportable injuries.

1. Canadian National Carbon Co., Toronto, Canada, 830,789 man-hours, no reportable injuries.
1. Canadian Industries Ltd., Shawinigan Falls, Cellophane Div., 643,436 man-hours, no reportable injuries.

Group C

1. E. I. du Pont de Nemours & Co., Fairfield Plant, 528,855 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Deepwater Technical Laboratory, 484,855 man-hours, no reportable injuries.
1. Canadian Industries Ltd., Shand Wks., James Island, B. C., 484,342 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Cel-O-Seal Plant, 446,205 man-hours, no reportable injuries.
1. Niacet Chemicals Corp., Niagara Falls, N. Y., 404,672 man-hours, no reportable injuries.
1. Canadian Industries Ltd., New Toronto, Fabrikoid Div., 338,523 man-hours, no reportable injuries.
1. American Cyanamid & Chemical Corp., General Explosives Div., Latrobe, Pa., 323,327 man-hours, no reportable injuries.
1. American Cyanamid & Chemical Corp., Burton Explosives Div., New Castle, Pa., 297,707 man-hours, no reportable injuries.
1. Canadian Industries Ltd., Alkali Div., Cornwall, Ont., 165,150 man-hours, no reportable injuries.
1. Canadian Safety Fuse Co. Ltd., Brownsburg, Que., 144,799 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., New Castle Plant, 136,942 man-hours, no reportable injuries.
1. Tobacco By-Products & Chemical Corp., Inc., Louisville, Ky., 134,820 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., Lockland Plant, 122,273 man-hours, no reportable injuries.
1. Ansul Chemical Co., Marinette, Wis., 119,321 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., Rubber Laboratory, 108,528 man-hours, no reportable injuries.
1. American Cyanamid & Chemical

Corp., Erie, Pa., 102,739 man-hours, no reportable injuries.

1. E. I. du Pont de Nemours & Co., Inc., Paulsboro Plant, 101,489 man-hours, no reportable injuries.
1. Canadian Industries Ltd., General Chemicals Div., Copper Cliff, Ont., 99,716 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., El Monte Plant, 99,492 man-hours, no reportable injuries.
1. Celastic Corp., Arlington Plant, 90,062 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Burnside Laboratory, 76,708 man-hours, no reportable injuries.

DIVISION II

Group A

1. E. I. du Pont de Nemours & Co., Inc., Parlin Plant & Lacquer Plant, 2,289,124 man-hours, no reportable injuries.
1. Lever Brothers Co., Hammond, Ind., 1,748,178 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., Philadelphia Plant, 1,453,865 man-hours, no reportable injuries.
1. Lever Brothers Co., Edgewater, N. J., 727,606 man-hours, no reportable injuries.
1. Canadian Industries Ltd., Paint & Varnish Div., West Toronto, Ont., 635,258 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., Newport Plant, 632,062 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., Flint Plant, 614,030 man-hours, no reportable injuries.

Group B

1. Lever Brothers Co., Baltimore, Md., 592,625 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., Toledo Plant, 444,659 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., San Francisco Plant, 268,566 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., Everett Plant, 194,799 man-hours, no reportable injuries.

1. Vick Chemical Company VapoRub Laboratory, Greensboro, N. C., 151,584 man-hours, no reportable injuries.
1. Canadian Industries Ltd., Paint & Varnish Div., Montreal, Que., 131,856 man-hours, no reportable injuries.
1. Vick Chemical Company of Pennsylvania, Philadelphia, Pa., 108,997 man-hours, no reportable injuries.
1. Canadian Industries Ltd., Fertilizer Div., New Westminster, B. C., 95,592 man-hours, no reportable injuries.

DIVISION III

Group A

1. Michigan Alkali Co., South Works, Wyandotte, Mich., 1,944,999 man-hours, no reportable injuries.
2. E. I. du Pont de Nemours & Co., Inc., Belle Plant, 4,205,763 man-hours, 7 reportable injuries.

3. North American Cyanamid Ltd., Niagara Falls, Canada, 2,091,924 man-hours, 4 reportable injuries.

Group B

1. National Carbon Co., Inc., Clarksburg, W. Va., 563,567 man-hours, no reportable injuries.
1. National Carbon Co., Inc., Fremont, Ohio, 527,906 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., Ammonia Experimental Station, 218,636 man-hours, no reportable injuries.
1. National Carbon Co., Inc., Republic Div., Niagara Falls, N. Y., 183,974 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., Alcohol Plant, 157,969 man-hours, no reportable injuries.
1. E. I. du Pont de Nemours & Co., Inc., Philadelphia Ammonia Plant, 94,738 man-hours, no reportable injuries.

THURSDAY AFTERNOON SESSION

October 10, 1940

Management and Employee Responsibility in the Prevention of Personal Injuries

By H. L. MINER

Manager, Safety and Fire Prevention, E. I. duPont de Nemours & Co.,
Wilmington, Del.

The 1939 frequency rate for the chemical industry, according to the 1940 edition of the Council's Accident Facts, is 7.48. This is considered a fairly good record for the chemical industry is in the seventh position in a classification of some thirty industries.

Comparing the 1939 safety record with that of eleven years ago—1928—when the frequency rate was 19.7 it is apparent that splendid progress has been made in reducing the number of personal injuries. Yet when one admits that "all personal injuries can and should be prevented" a frequency rate of 7.48 is obviously enormous and indicates that far more effective work needs to be

done to really control the personal injury hazards in our industry.

The belief that certain personal injuries are unpreventable, or to put it another way, that all personal injuries cannot be prevented, has not and cannot change the indisputable fact that they are all preventable and that they all can be prevented.

Let me offer a few proofs to support this statement. John Andrews, a tinsmith and sheet metal worker, worked over 145,000 hours without experiencing a serious or time-losing injury and his record is still unbroken. The uncovering of this record

resulted in a compilation of the most outstanding individual employee safety records on the plants of a large chemical corporation.

As of May 31, 1940 the records of ten employees are as follows:

one employee worked 168,250 exposure hours
one employee worked 155,170 exposure hours
one employee worked 145,180 exposure hours
one employee worked 144,238 exposure hours
one employee worked 143,970 exposure hours
one employee worked 140,070 exposure hours
one employee worked 138,010 exposure hours
one employee worked 136,000 exposure hours
one employee worked 135,640 exposure hours
one employee worked 133,360 exposure hours

Ten employees established records of 119,890 to 129,820 exposure hours with service records of 37 to 50 years.

Ten employees established records of 114,126 to 117,670 exposure hours with service records of 34 to 47 years.

Five employees established records of 112,838 to 113,670 exposure hours with service records of 39 to 46 years.

This survey uncovered many records of from 40,000 to 100,000 exposure hours—10 to 20 or more years of work without a serious injury. One plant, for example, reported that the maintenance department painters averaging 25 men have worked as of August 2, 1940, 325,000 exposure hours—6½ years without a minor, sub-major or major injury occurring.

Quite recently a medium sized chemical plant manufacturing finishes, with an annual average of over 300 employees, worked more than 11½ years, nearly 8,000,000 man exposure hours without a time-losing injury occurring, and there have been some violent employee fluctuations during this period—employment at times reaching as low as 198 employees and increasing to as high as 451 employees. And during the past three years this plant has not experienced even a sub-major injury and only 20 submajors in the seven years previous to the three year period.

A small technical ballistic laboratory averaging about 50 men has functioned over 6,928 calendar days since its last injury and is continuing its record unbroken. While the exposure hours are only slightly over a million and a half you will agree that an injury-free period of over nineteen years is an outstanding record.

Another small chemical plant, manufacturing finishes, with an employment of about 100 men, has operated 5,252 calendar days since its last injury and accumulated nearly two and three quarter million exposure hours without an injury.

And, of course, you are all familiar with the large rayon plant which holds the world's record—over 4,100 employees having worked 11,362,000 man exposure hours, 525 days, without an injury.

The first major element in the prevention of personal injuries is the providing of adequate mechanical safeguards and suitable personal equipment. This is a management responsibility. At this point a study of your own injury statistics or those of the National Safety Council given in Accident Facts, or a combination of both, will clearly indicate, first, the part of the body most frequently injured; secondly, the hazards most likely to cause injuries; and thirdly, the parts of the body most likely to be injured by certain recognizable injury hazards. And then management must step in, accept and assume its responsibility for providing the necessary safeguards.

The question of adequate guarding, both mechanical and physical, is rather commonplace. Perhaps we have tried to make the problem too hard and difficult. Sometimes I think we cannot see the trees because of the forest. When we put aside theories, speculations and possibly the desire to face a very difficult and trying problem, and think simply, we will find that the major part of the job, the inauguration or provision of those things which will provide the greater portion of the protection, is quite obvious.

We find for example, safety shoes will prevent a large part of the foot injuries, but this is secondary to the study which should be made to so store, pile, handle or move materials that they are not likely to fall or be dropped and cause foot injuries. Recently I visited a large plant under construction where a great many colored people were at work and was told that they "had safety shoes on seven out of every ten colored employees and that in a few months they expected to have all of the black feet protected."

Head injuries are prevented through the use of hard hats; and eye injuries through the use of goggles. Acceptable standards are available from many sources, insurance

companies, state labor departments, etc., for guarding machines, belts and gears. They are so well set-up and depicted at the present time that there is no excuse for lack of complete protection along this line.

It is safe to say that today there is available adequate and effective protective equipment for practically every hazard to which employees may be exposed. The problem of suitability can be divided into two parts, first, the protection of the hazard at its source, such as guards around gears, belts and other moving machinery or equipment; tight equipment to contain dangerous materials to prevent personal contact; mechanical ventilating or collecting systems to entrain and remove dangerous gases, vapors or dust at their point of exit, etc. Secondly, the protection of the employee. Let us briefly review those factors which must be given consideration when selecting the type of protective equipment needed to cope with a given hazard.

1. The character of the materials or operations exposing the employees to possible hazards must be determined.

2. The employees' duties which bring them into contact with them must be established.

3. The parts of the body likely to be injured and nature of injury should be fixed.

Now we have before us those conditions, operations or things likely to cause personal injuries:

- (a) How and where the exposure may take place; and

- (b) Part of body and nature of injury likely to result.

Management's responsibility consists of selecting the proper type of protective clothing or device which will protect the employee; and employee responsibility consists in using such protection.

Management responsibility also includes "executive direction or supervision." It is urgent that supervision and the employees thoroughly understand this important, vital part of the safety program. The term "supervision" includes the entire management staff—managers, superintendents, supervisors, and foremen.

Recently there appeared in a safety article a statement which is quite significant: "Thus it is recognized that safety does not

happen, it is earned." This statement voices something we must acknowledge, the fact that the establishment and maintaining of a good safety record is fundamentally a co-operatively directed accomplishment of the employees, or in other words, it goes beyond the necessary provisions of mechanical or physical safeguards, it recognizes the primary factor of employee cooperation and obedience; the performance of the employee; the democratic direction and control of the human element. This might properly be referred to as "democratic participation," the phrase interpreted to mean an organization where management and supervision directly, and supervision and employees indirectly, accept the responsibility for preventing personal injuries and plan together the program of plant safety. Such is the real intent of plant safety organizations.

The delegation of responsibility might be placed in the following manner: First, that supervision must be sure that the employees know how to work safely—educate and train them to do so. We have found by actual experience what others are also discovering, that a plant fully guarded and protected from a physical standpoint, while unquestionably much safer than one not so guarded, is not immune to serious injuries or even fatalities. It is the human element with which we must reckon.

Secondly, supervision responsibility must embrace a constant, sincere, well-organized effort to gain and maintain the employees' cooperation; that they not only work safely but that they willingly use protective equipment which has been provided, and follow the prescribed operating rules and safety regulations. All of the time and effort to safeguard employees may be entirely cancelled or nullified by a single careless, thoughtless, indifferent, chance-taking or disobedient act. Alertness must be engendered to guard against carelessness and thoughtless action.

Management and supervision must accept the responsibility, a moral obligation, to see that the conditions under which the employees work are safe and are properly maintained, that good housekeeping prevails, that all protective equipment, for example, guards around gears, belts, shaftings, etc., is in good repair and functioning as it should; and that the prescribed personal safety equipment, such as goggles,

aprons, gloves, safety shoes, etc., is available and in good condition, and that the employees know how and when to use these safeguards and do so.

Another essentially important supervision responsibility is to make sure that the employees thoroughly understand, without any mental reservations or excuses or alibis whatsoever, that they are to work safely. Working safely is just as much a part of their job as is following the established operating procedure in order that a satisfactory article or material or compound may be produced. Equally important is it for supervision to see that employees work safely at all times.

There is still another very important requisite which should always be foremost in supervision's contacts with employees, and it also applies to each employee as well; namely, being a leader, of always setting an example in the practice of safety.

A personal injury, a fatality, which came to the speaker's attention several years ago, was largely due to the failure of supervision to set the right example to workmen associated with him. Employees saw supervision not only utterly disregard an important plant safety rule, but apparently ignore the fact that the employees were doing likewise. In due course, after the unsafe practice had been followed for over a year, an experienced, valued employee, while attempting to place a belt on a revolving pulley, caught his hand between the belt and pulley and was wound up on the shaft and killed. Not a so-called "accident" but supervision and employee failure to discharge their responsibility to safeguard themselves and fellow workers.

Does not the real cause of this injury further establish the assumption that even

appalling fatalities are absolutely needless and preventable through the exercise of foresight, because fundamentally all personal injuries result either directly or indirectly from human laxness, lack of constructive thinking, the non-acceptance of management and employee responsibilities?

Management responsibility might be considered as the bringing about and maintenance of safe working conditions, the provision of adequate safeguards, and that supervision effectively assumes its responsibilities with reference to employee direction.

Supervision's responsibilities in safeguarding those in their charge might be summarized as follows:

The establishment and maintenance of friendly cooperation between the employer and the employees; to see that all employees are properly instructed and trained to work safely—that they understand safety regulations as well as safe operating procedures; that the employee is to work safely, and to so supervise and direct him that he does so; that all mechanical safeguards are in place, in good condition, and functioning properly; that personal protective equipment is available, in good condition and used when necessary; to be a leader and always set a good example.

Employees' responsibilities:

To work safely at all times, never take chances, never indulge in unsafe practices, or do those things which may injure himself or a fellow worker; to follow always prescribed operating instructions and safety regulations; always to use protective equipment when required; to discontinue unsafe practices and report any observed to supervision; to report promptly all unsafe conditions which are noted.

The Safe Disposal in Chemical Plants of Empty Containers Including Tanks, Drums, Cans, Bottles, Gas Cylinders, Dismantled Equipment, and Old Pipe Lines

By C. L. JONES

Safety Engineer, Hercules Powder Company, Wilmington, Del.

It is well always to keep in mind that a so-called "empty" container is probably more dangerous than a full one. This is true of containers which have been used for flam-

mable volatile products; the vapors from small amounts of such materials mixed with air may form explosive mixtures. Also, containers which have been used for corrosive

liquids are dangerous, such as unlined drums used for corrosive acids. The acid attacks the metal and hydrogen is formed. All that is then needed is ignition from some source to set off the "bomb." Many persons do not appreciate the potential danger connected with so-called empty containers.

It is our belief that the cleaning and reconditioning of any of the containers or equipment which we are considering should be carried out at a location designed for the purpose. If carried out at other locations, hazardous conditions may be created exposing other persons and employees unnecessarily.

Bottles

A truck transportation company had been instructed to pick up a lot of supposedly empty carboys at a customer plant. Late in the afternoon the driver proceeded to load the empties. However, one of the carboys, all of which had contained nitric acid, had not been completely drained. In placing this carboy on the truck, some of the acid spilled on the driver's clothing. He was not seriously burned but his clothing and shoes were ruined. Only by very good luck did the man escape a serious burn.

It might be argued that the handlers of such containers should wear protective apparel, no one will disagree with the principle. However, all of us will grant that it is too much to expect the drivers and other employees of transportation companies to wear ordinarily such protective apparel.

It is the responsibility of the user to see that the carboy or similar container is thoroughly drained before offering it for transportation or other movement. The draining of carboys is a legal requirement of the Interstate Commerce Commission and the safe handling and disposal of such containers is covered in the Commission's Regulations and amplified in the following Manufacturing Chemists' Association pamphlets:

C-2, "Carboys, Glass-Boxed (I. C. C. 1A) Handling and Storing (When Filled With, or Last Containing, Any Product Authorized For Use Therein)." This pamphlet is intended for the guidance of the consignee.

C-1, "Carboys, Glass-Boxed (I. C. C. 1A) Service Requirements (When Used For Any Product Authorized for Shipment Therein)." This pamphlet is intended for the guidance of shippers.

After draining, carboys should be flushed out with water. The draining is a legal requirement and should be complied with; however, we believe that the time and expense of washing out carboys is justified. It is also important that carboy boxes be kept in good repair for the safety of the men handling them.

The Interstate Commerce Commission requires that the white corrosive label be placed on containers used for acids, such as sulfuric, hydrochloric, and nitric. These labels are obtainable from the Bureau of Explosives, 30 Vesey Street, New York City, and must be removed before the empty container is offered for return movement.

In addition, the Manufacturing Chemists' Association recommends the use of their label No. C-5 on carboys containing the above acids excepting nitric and on carboys containing aqua ammonia. This label reads "Contents Dangerous—Before Moving Carboy Be Sure Stopper is Securely Fastened, Etc." These labels may be obtained from the Manufacturing Chemists' Association, Washington, D. C.

On carboys containing nitric acid, the Manufacturing Chemists' Association recommends the use of a special warning label, their Number C-6.

In addition, several manufacturers place on carboys containing nitric acid, a label reading "Warning—Nitric Acid—Do Not Breathe Fumes, etc."

In carrying out the work just described or any other work involving exposure to potentially harmful chemicals, protective apparel should be supplied to and worn by the men doing the work, such protective apparel to include goggles, gloves, boots, and apron and, if the need indicates, respiratory protection.

Drums

The hazard of empty drums can best be illustrated by an accident that occurred at a plant of a chemical manufacturer several years ago.

An empty drum which had contained sulfuric acid was being heated over a forge fire to loosen the drum plug. Evidently, the drum contained hydrogen and the pressure rose until it caused the rupture of the drum. Parts of the drum struck and killed another man working nearby.

It is well known that certain strengths

of sulfuric acid (60°Be and below), muriatic acids, and others, attack most metals and form hydrogen which has a wide explosive range varying from about 4 per cent to 80 per cent. This gas is ignited by a relatively low temperature spark. However, in the incident just described, it is probable that the rupture of the drum was due to overpressure from heating and not to ignition of the gas.

Another incident was recently reported to the Manufacturing Chemists' Association. A 12-year-old boy was killed by the explosion of a drum which had previously contained a flammable substance. The boy dropped a lighted match into the empty drum.

To prepare a drum or similar container for mechanical work, re-use, or sale calls for its proper cleaning. Of course, there are many commodities packaged in drums and each requires a specific procedure. However, the drums should first be thoroughly drained and then usually washed out. If the nature of the material is such that mere washing will not properly clean it, then steaming and the addition of some neutralizing agent may be necessary. Mechanical cleaning, using some form of abrasive, may be necessary to remove materials which cannot be removed otherwise.

Working with water cannot be used in all cases. The person supervising the work should determine the medium which can be used safely.

If the drums have contained a flammable volatile material, the abrasive used within the drum or container should, of course, be non-sparking.

It is frequently necessary to inspect drums both before and after cleaning. For this purpose a low voltage, vapor-proof extension cord lamp should be used. The frame of the lamp should be grounded. It is a matter of record that electrocutions have occurred due to the use of 110-volt ungrounded extension cord lamps for such work. As many drums formerly contained flammable material, it is unsafe to use a bare lamp for inspection as lamp breakage or arcing at the socket could ignite the flammable vapor-air mixture within the container.

Even after supposedly thorough cleaning, a drum may not be safe for welding or other hot work due to the pockets of some

flammable material in the chime joint. Therefore, before carrying out welding on such containers, the welder should observe these precautions:

(1) Do not stand facing either end of the drum—stand at the center. The reason for this is that the end seams are about one half as strong as the side seam and if the drum does explode, in all probability one or both of the heads will blow out first.

(2) Test the air at both end and side openings for flammability by holding the lighted torch at these openings for a short time. Of course, if there is any sign of firing, the drum should be again cleaned before attempting to carry out the hot work.

(3) In any case, do not reach across a drum in carrying out welding work. In other words, do not expose any part of the body unnecessarily.

While we have a drum cleaning and conditioning problem at some of our own plants, we thought it desirable to discuss the matter with one of the firms which daily reconditions many drums. This firm reconditions drums which have contained almost every conceivable commodity. The average number reconditioned daily is far in excess of 1,000 and they have been in business for more than fifteen years.

To date this firm has had only one serious accident and it was not due to the package. With some containers it is necessary to burn them with torches. Solvent naphtha is the fuel used. Safety cans had been provided for the handling of naphtha about the plant. However, an employee filled a bucket with naphtha and in so doing spilled some on the leg of his trousers. He then carried the bucket of naphtha to the burning location. As he passed near one of the torches his clothing caught on fire, resulting in body burns which laid him up for several weeks.

At this point we call your attention to the liability you may incur in selling or otherwise disposing of empty containers not properly cleaned. Should the buyer or his employees be injured as a result of the condition of the container, your company may be called on to defend itself against a suit. It has been our policy that all such containers be cleaned even when a purchaser has offered to sign a release, freeing us from liability.

The following publications contain much useful information: M. C. A. Manual Sheets

D-30, D-31, D-37, and H-1. These manuals among other things call for the use of warning labels which can be obtained from the M. C. A. office in Washington, D. C.

Also, the National Safety Council Safe Practices Pamphlets, particularly No. 8, "Handling, Filling, and Cleaning Drums and Barrels," contain much helpful information. Certain manuals issued by the American Petroleum Institute also contain helpful information.

Gas Cylinders

The disposal, that is, the conditioning for re-use, sale, etc., of compressed gas cylinders is a matter which the average user faces very seldom. I think for the purpose of our discussion here we can confine our remarks to the procedure that the average user should follow.

There is a long list of the so-called compressed gases all of which are usually packaged in steel cylinders of various sizes. All such containers must comply with the requirements of the Interstate Commerce Commission.

It is not desirable, practical, or necessary for the average user to make any attempt to clean, flush, or do anything else to such containers. If trouble develops, the best thing to do, if the answer is not immediately at hand, is to contact your supplier and ask his advice. Most of the concerns in this field have representation throughout the country with qualified employees, who can give expert advice and assistance.

The following simple fundamental rules are those recommended by the Compressed Gas Manufacturers' Association and are taken from their publication, "Safe Handling of Compressed Gases."

"When returning empty cylinders, remove the lower portion of the shipping tag attached to the cylinder. The bill of lading should specify the number of cylinders, consignee, and the fact that the cylinders are empty. A copy of the bill of lading should be sent to the consignee. *Close the valve before shipment.* See that the cylinder valve protective caps and outlet caps, if used, are replaced before shipment."

"Never use cylinders for rollers, supports, or any other purpose than to carry gas."

"Never attempt to repair or alter cylinders or valves."

"Never under any circumstances attempt

to refill an acetylene cylinder." (This I think should apply to any compressed gas cylinder on account of the possibility of some reaction and the formation of an explosive compound. One possible exception to this is the recharging of CO₂ fire extinguishers using as a source of supply bottles of commercial CO₂. Such recharging is safe if carried out with the proper set-up and control.)

"Before the regulator is removed from a cylinder, close the cylinder valve and release all gas from the regulator."

"As soon as the cylinder is empty and disconnected, the outlet cap, if used, should be immediately replaced on the outlet connection of the valve, in order to prevent damage to the threads on the outlet connection."

"Every precaution should be taken to avoid drawing liquids back into containers as their contents are exhausted. To avoid this, close the valve immediately after the container has been emptied."

Finally, be sure that the cylinder is empty, either by weighing or observation of the gauge.

Our remarks regarding compressed gas cylinders are not very complete and it might be assumed that we do not attach much importance to such packages—just the contrary is the case. However, we believe that the problem having to do with the cleaning, repairing, and reconditioning and "disposal" of such containers is a highly specialized one and not of much practical interest to the average user.

Additional information regarding compressed gas can be obtained from organizations such as the Compressed Gas Manufacturers' Association and the Chlorine Institute, both located in New York City, as well as from the various firms in the field.

Tanks

A tank equipped with stirring equipment and used for the making up of a solution containing solvents was to be cleaned in order to change over to another type of material. The vessel was drained but not steamed out, the drive belt removed, and the cover was opened. An employee then went down into the vessel in order to wipe up the residue. He ran out of wiping cloths and sent his helper to get an additional supply. When the helper returned, he found that the man in the tank had collapsed. Assist-

ance was quickly obtained and the man was removed from the vessel promptly. He was carried to fresh air and artificial resuscitation started. In addition, a physician was called. Despite all efforts, it was impossible to revive the man.

The same procedure should be followed with tanks as with other containers—be sure they are cleaned of gases, vapors, or toxic or harmful material before men are permitted to enter and work in or on such equipment. The necessity of having clean tanks is probably more important than having clean containers of other types. A person should not enter a vessel unless someone is on guard outside. If there is a question about the quality of the air within the container, proper respiratory and protective equipment should be worn.

Tanks are used as containers for many chemicals and other materials and it is impractical to set forth a procedure which will fit all cases. However, we can illustrate by describing the recommended procedure for a tank used for the storage or processing of acids.

(a) Remove all run-off and entering lines through which there is any possibility of leakage of acid into the tank.

(b) Blank off the end of all inlet pipe lines so as to prevent acid under pressure from bridging the gap and entering the tank.

(c) With some acids such as sulfuric it is possible to have a hydrogen concentration within the explosive range. To reduce the hazard from this source, the vessel should be thoroughly blown out with compressed air.

(d) Maintain a circulation of air through the vessel to prevent the concentration of hydrogen from reaching the explosive range.

(e) Do not use electrical extension cord lamps or portable electric tools in or near tanks, vessels, or equipment where hydrogen is present or its presence is suspected.

If a light is necessary and no flammable vapors are present, use only an approved low voltage extension cord lamp (32 volts or less) or a flashlight approved by the Bureau of Mines or the Underwriters' Laboratories.

Also, exercise special care with tools or other equipment being used to avoid striking or drawing sparks.

(f) Drain the tank until no more acid and mud will run out and remove all mud possible by hoe or other mechanical means.

(g) Wash the tank with as strong a stream of water as possible using a 2 or 2½-inch hose with a nozzle until all mud is removed. Agitation and removal with bars or hoes may be necessary to get rid of heavily caked mud.

Weak acid attacks metal very rapidly; therefore, immediately fill the tank to overflowing with water containing enough soda ash to neutralize completely any residual acid and still maintain the solution alkaline. This is necessary not only to prevent acid drip but to avoid the formation of hydrogen or hydrogen sulfide gas because of the action of dilute acid on the tank metal. The solution should be well agitated in order to reach and neutralize all parts of the tank. Remember that small quantities of hydrogen sulfide gas are quite poisonous.

(h) Thoroughly drain off the solution and then proceed with whatever work or use is required.

If hot work is to be carried out and the vessel is of riveted construction, apply heat to the seams from the outside after the tank has been cleaned. This is to remove fumes from the sulfate which collects in the seams. The procedure just described should be carried out if men are to work inside of the vessel.

If the vessel is to be returned to acid service, complete the repair or other work as promptly as possible and then fill the vessel with acid.

Obviously, tanks used for other chemicals call for an appropriate procedure. For example, if the tank had formerly contained chlorine, it would have been evacuated or blown out until all liquid chlorine had been removed; then dry air would have been blown through the tank for a number of hours in order to remove as much of the residual chlorine as possible. Such a vessel would not be washed out ordinarily. However, washing can be safely carried out by following the procedure just described and then adding sufficient neutralizing solution to minimize attack of the metal. Then wash and dump the vessel several times. After washing and neutralizing, the tank should be pumped or blown out and dried. It is then in order to proceed with such other work as may be required.

A final caution regarding any vessel which has been used as a container for volatile flammable material:—Before men are permitted to enter or to carry out any mechanical work, check the vapor concentration by means of a vapor detector or other suitable means. If the concentration found is unsafe for men to enter or to carry out the proposed work, put the vessel through a cleaning procedure which will make it safe.

Dismantled Equipment and Old Pipe Lines

The hazard connected with such equipment is illustrated by a serious accident which occurred several years ago.

A lot of pipe had been removed from a plant manufacturing an explosive material. This material when wet is relatively harmless but when it is dry it is quite flammable and even explosive. This removed pipe was being loaded on a truck. Evidently some of the material in the pipe had dried out and was sensitive to shock. Anyway, the material exploded and four men lost their lives.

Naturally, not all materials are as potentially dangerous as this particular commodity. However, many are explosive when mixed with air and many are poisonous to a varying degree.

The principle already stated holds good again. Be sure the equipment, whether it be an autoclave, digester, pipe fitting, etc., is properly cleaned.

Hazards and Proper Maintenance of Portable Electrical Equipment

By R. B. SHEPARD

Electrical Engineer, Underwriters' Laboratories, New York City

Any program for the safe use of portable equipment must start with the proper selection of the tools. Tools should not be used for jobs for which they were never intended. This should not, of course, rule out the use of multiple purpose tools which are properly designed to serve two or more purposes.

Portable electrical tools fall roughly into three classes. Those designed to be used intermittently or on light work are designated as "light duty." Those to be used for more continuous operation or on somewhat heavy

work are referred to as "standard duty." Those intended for continuous operation or for heavy work are described as "heavy duty."

With autoclaves, digesters, tanks, and similar equipment, it is usually practical to clean by washing, steaming, neutralizing, or mechanical removal, or possibly a combination of all four methods.

With pipe, valves, cocks, fittings, etc., and similar pieces, like methods may be employed, but due to the design and shape, it is not always possible to clean such pieces completely. Our usual practice is to clean them by one or more of the methods mentioned above or a combination of all of them, but we do not stop there. Such pieces are then sent to the burning ground and a fire built around them. This is usually effective. Valves, cocks, and similar pieces should be taken apart before burning. After cooling, the pieces can be safely worked on or offered for sale.

Everyone who has given thought to the problem of the safe disposal of the equipment realizes that the principle that needs to be kept in mind always is to be sure that the piece or article is thoroughly and properly cleaned. If this is done, the probability of accidents occurring will have been very much reduced.

We have not said much about "disposal" as such, and I intentionally avoided doing so because I think it is obvious that you can very nearly do as you please with all of the containers and objects mentioned if you have them clean of flammable, poisonous, or corrosive materials.

Due consideration should be given to these classifications and tools should be selected which will not be overworked by the service to which they are subjected, either by too constant operation or too heavy loads.

Generally speaking, portable tools present all of the hazards incident to the use of

stationary machines performing similar operations and, in addition, various hazards resulting from their portability. Injuries resulting from the use of portable tools include cuts, bruises, concussions, foreign particles in eyes, burns and electric shock. Such injuries may be due to moving parts, jamming of tools, falls, bursting due to centrifugal force, explosions due to ignition of gas or dust by sparks, unexpected starting or electrical failure.

Drills, reamers, circular saws, knives used for cutting fabric and many other tools have sharp working edges, contact with which may result in serious injury. Contact with working parts should be guarded against wherever possible in a manner similar to that used with stationary equipment. The attachment of shields and guards is, however, somewhat more difficult with portable tools and an equal degree of protection cannot always be provided.

The possibility of injury from cutting tools is greater when the cutting edge is not in contact with the work, and shields and guards should be so designed that cutting edges are protected before entering and immediately after leaving the work. With certain types of tools, such as those having milling cutters or woodworking shaper heads, it is practically impossible to provide satisfactory protection, and in any case it is not possible to fully guard against injury resulting from such practices as brushing shavings away from the work with the fingers. It is important, therefore, that workmen be fully instructed relative to safe operating practices.

Rotating tools such as those used for drilling or reaming may present a hazard when the work requires more power than the motor develops, or when a drill or reamer jams in the work. Under such conditions the body of the tool may revolve with such force that the operator is unable to control it. Care should be taken to provide tools sufficiently powerful for the work and drills and other cutting parts should be kept well sharpened.

The body of the tool may be prevented from turning under such conditions by anchoring with chains. Properly adjusted friction clutches which slip when too heavy a load is placed on the motor are useful in preventing tools from turning in the hands. Similar protection may be afforded

by an automatic overload protective device inserted in the electric circuit which operates to cut off the current to the motor when it is overloaded.

Where work is frequently done at one location a carriage or other support may be provided which will hold the tool and prevent the body from turning.

Grinding wheels present a particular hazard, in that if they are cracked or are driven too fast they may burst, throwing pieces with terrific force. As most abrasive wheels are relatively brittle they should be handled and stored with great care, and if cracked or otherwise defective should be discarded. The National Safety Code for the Use, Care and Protection of Abrasive Wheels specifies a maximum peripheral speed of 6,000 feet per minute and a normal speed of 4,500 feet per minute.

Grinding wheels should be protected with substantial guards capable of withstanding the force of a bursting wheel. As pieces are thrown from wheels tangentially operators should be cautioned to keep out of the line of operation.

Circular saws should be kept well sharpened and set, as this results in faster cutting and less load on the motor. Cracked saws should be discarded to avoid bursting. Circular saws may be quite thoroughly guarded so as to protect them both while in contact with, and when removed from the work.

In so far as possible moving parts should be free from projections which may cause injury due to direct bodily contact or which may engage clothing. When it is not possible to streamline such parts they should be protected by adequate guards.

The fact that a portable electrical tool must be provided with a supply cord introduces several hazards not present in connection with the use of stationary or hand-operated tools. Supply cords, if allowed to lie on floors or working platforms, constitute a serious tripping and slipping hazard. Stumbling over a supply cord may also cause the tool to be suddenly jerked, causing the operator to lose control, with resulting injury. When possible supply cords should be suspended so as to permit free passage beneath.

When portable tools are left on stairways or in passageways, and particularly in elevated locations, as on scaffolding or ladders,

there is not only a hazard from the presence of the cord but also from the possibility of falling.

Where a portable tool is used in one place it is often possible and convenient to have it suspended by means of springs or counter weights. The practice of suspending equipment is particularly desirable in the case of heavy tools which cannot readily be handled by one man.

Loose clothing worn while using portable tools presents the same hazards as when worn by operators of stationary tools and should be avoided.

The importance of wearing goggles and respirators in connection with certain types of work is as important in connection with portable tools as when similar operations are carried on with stationary equipment.

Another hazard which is quite important is that of accidental starting. Portable tools are usually controlled by a switch on the tool. The operating member of such a switch should be shielded so that it is not likely to be accidentally closed. Such switches should preferably be spring-actuated in such a manner that the switch remains open unless held in the closed position.

Such a switch also guards against unexpected starting when current supply is resumed following an interruption due to supply failure or disconnection at some remote point.

When adjusting a tool it is wise not to depend upon the switch but to disconnect the tool from the source of supply. This may readily be done by removing the attachment plug on the cord from the receptacle. Where a long cord is used it may be convenient to place a cord connector or a through switch in the supply cord near the tool.

With tools which employ a flexible shaft the operator should be cautioned not to release his hold on the tool end of the shaft while the motor is running; if released the shaft may whip and strike a severe blow.

A motor usually forms the heart of any portable electrical tool. Although a motor should not be expected to operate indefinitely without attention, a reasonably well-made motor which is kept properly lubricated and not subjected to excessive overloads or otherwise misused will seldom present an accident hazard.

The weakest part of portable electrical

equipment and that most vulnerable to damage is the supply cord. The failure of supply cords due to breaking or wearing through may result in short circuits and flashes or the exposure of live conductors, causing fires, burns or electric shock.

The rubber-sheathed types of cord are the most suitable for use on tools used in industry. The so-called "Hard Service Cord," which is the most rugged type, is made in Awg sizes from 18 to 10 wire having corresponding current-carrying capacities of from 5 to 35 amperes. It may be had with two or more conductors as required. Each individual conductor is provided with a covering of 30 per cent rubber insulation which is $\frac{1}{8}$ -inch thick on 18 and 16-gauge conductors, and $\frac{1}{4}$ -inch thick on 14-12 and 10-gauge conductors. The conductors are twisted together and enclosed in an outer jacket or sheath of at least 40 per cent rubber. The rubber in the outer jacket is compounded so as to give superior resistance to abrasion and crushing and has similar characteristics to those of auto tire stock. The outer jacket varies from $\frac{1}{8}$ to $\frac{1}{4}$ -inch in thickness in the several sizes. Filler cords are usually supplied to provide additional mechanical strength and a braid is sometimes provided over the twisted conductors and under the outer jacket.

The so-called "Junior Hard Service Cord" is made in Awg sizes 18 and 16 only and in 2, 3 and 4-conductor only. It is suitable for use only on light tools where it will not be subjected to hard service.

The rubber-jacketed cords are more satisfactory for factory use than are the braided types, not only on account of their greater resistance to abuse, but also due to the fact that they kink less readily, and due to their smooth surface they slide easily and may be wiped clean.

Cords which become worn or bruised should be replaced immediately. Defective cords should under no circumstances be continued in service. Cords should never be patched or spliced. If it is necessary to attach an extension cord it should be done by means of a cord connector. Where a long cord is used to reach the source of supply it may be convenient to place a cord connector in the cord in order to provide convenient means of disconnecting the cord near the device.

Cords are particularly subject to wear at the point where they leave devices, attachment plugs and cord connectors due to concentrated bending at the point of entry. The bending can be distributed somewhat and the life of the cord prolonged if the cord is protected when it enters the device by means of a helical spring or rubber sleeve attached to the device.

Since any tension on the cord may be transmitted to the device the cord should be so attached that any strain will not be transmitted to splices or terminals within. Some form of clamp to grip the cord as a whole and relieve the strain should be provided. Similarly, some form of strain relief should be provided where the cord enters the attachment plug.

Many attachment plugs are made of breakable insulating material, and although suitable for use on some household devices will not stand the abuse to which they would be subjected on factory tools. Plugs ruggedly reinforced with metal or plugs of soft rubber should be used to avoid breakage and the resultant exposure of live parts.

The life of the cord depends to a considerable extent on the manner in which it is used. Cords should not be laid across passageways where they will be subject to crushing by trucks, nor should they be allowed to come into contact with hot surfaces. Oils and acids are deleterious to rubber insulation and contact with them should be avoided. Rubber deteriorates rapidly when continuously exposed to strong sunlight. The cord should not be yanked or pulled to remove kinks or when it is caught or wedged. It should never be used as a means of raising or lowering the device.

Perhaps the most serious hazard involved in the use of portable electrical equipment is the possibility of electric shock. This hazard is properly guarded against so long as tools are constructed and maintained with no live parts subject to contact and supply cords are kept in good condition. There is, however, always the possibility of exposed metal parts of a device becoming alive due to failure of insulation; and injury and death resulting from electric shock have been sufficiently frequent to warrant every precaution being taken.

In most factories there is much metal with which workmen may come in contact, such as pipes, machines, structural building

of such metal is grounded. Most circuits supplying portable tools have one side grounded. If through failure of insulation or other cause the metal case or shell of a tool becomes alive and the operator using it is in contact with grounded metal he will be subjected to the full voltage of the circuit between the points of bodily contact. As the path of contact through his body will usually be from hand to hand or hand to feet, the current will pass through the heart and constitute a real hazard to life.

Many persons have the idea that voltages on the order of 100 cannot cause death. This has been proved false by many fatalities occurring as a result of contact with 110 volts or less. Such fatalities have usually been the result of ventricular fibrillation of the heart, a condition in which the fibers of the heart muscles, contract separately and at different times instead of in a coordinated manner. When this condition is present the heart ceases to function as the circulator of the blood.

Ventricular fibrillation may result from the flow of currents as small as one-tenth of an ampere, or less than that required to light a ten watt incandescent lamp, depending, however, somewhat upon the time of application. The amount of current which will flow through the body as the result of contact with an electric circuit depends upon the voltage of the circuit and the resistance of the individual concerned. The resistance of the human body as measured from hand to hand or from hand to feet with relatively small areas of contact and dry skin may vary from 5,000 to 100,000 ohms for different individuals. The resistance under such conditions is largely in the skin as the internal resistance of the body is low. When the skin is wet due to natural perspiration or surrounding moisture, or when larger areas of contact are involved, skin resistance is greatly reduced and bodily resistance under such conditions may be as low as 500 ohms.

Currents very much less than those necessary to cause fibrillation of the heart may result in involuntary muscular contraction. This may result in closing the hand more tightly on a wire or other live object, or in throwing the person away. If the former takes place the possibility of fatal consequences from the shock is increased; if the latter, injury may result from a fall.

The most common method of protecting against electric shock is to ground all exposed non-current-carrying metal parts. This is most readily accomplished by means of a supply cord having a grounded conductor in addition to the two or three supply conductors. One end of this conductor is connected to the frame or shell of the tool and the other end is connected to an extra contact prong on a polarized attachment-plug cap. As such a cap can be used only in a corresponding receptacle it may in some cases be desirable to provide the cord with a standard plug and to connect the grounding wire directly to a water pipe or to some other grounded object. In such a case the grounding wire should be provided with a clamp. If desired, a separate grounding wire attached to the frame or shell of the tool may be employed.

When a polarized plug is used care must be exercised to insure that the supply and grounding conductors in the cord are attached to the proper terminals in the plug as the connection of the grounding wire in the cord to an ungrounded circuit conductor will result not only in eliminating the grounding protection but in making the frame of the device alive.

In factories where grounding is accomplished by means of a polarized plug, receptacles and plugs of the same design must not be used for any other circuit connection in order to prevent plugging into a wrong receptacle, as would be possible if the same three receptacles were used for both a three-phase circuit without a grounding conductor, and a single-phase circuit with such a conductor.

It should be kept in mind that the tool will operate without the grounding connection being made. This makes it essential that both the permanent grounding connections on the tool and the temporary connection at the receptacle or free end of the grounding conductor be properly maintained.

The National Electrical Code requires that exposed non-current-carrying metal parts of portable equipment in hazardous locations or where used in damp or wet locations, or by persons standing on the ground or on metal floors or working inside of metal tanks or boilers, shall be grounded except where supplied through an insulating transformer with ungrounded secondary of not over 50 volts.

The shock hazard can be practically eliminated by the use of tools operated from a circuit of 50 volts or less or by the provision of a step-down transformer in connection with each tool. A disadvantage of low-voltage tools is the fact that they are necessarily heavier than tools designed to operate on ordinary circuits. Their use is therefore practically confined to tools having small power consumption.

A degree of protection against shock may be provided by having all exposed surfaces of equipment of insulating material. Such a construction is not always practicable, and there is also the possibility of the insulation becoming damaged so as to expose live metal parts. It is, however, good practice to have handles made of or covered with insulating material as tools, at least while in use, are ordinarily grasped by the handles.

Where tools are used in wet locations the shock hazard may be reduced by the use of insulating mats or platforms and rubber boots and gloves, but their use should be considered as supplementary to and not as a substitute for the methods of protection previously described.

Portable electrical tools present an explosion hazard when used in the presence of flammable gases, flammable volatile liquids, or where combustible dust or flyings are present in quantities sufficient to produce an explosive or combustible mixture. Portable equipment should not be used in such locations unless specially designed for the purpose.

Like all other equipment, portable tools no matter how well designed and fabricated or how carefully used, tend to deteriorate. Any program for the safe use of such equipment must therefore include a definite plan of inspection and repair. No such plan will be adequate unless it is well established and conscientiously carried out. All tools should be subject to periodic inspection at definitely stated intervals. The interval will necessarily depend upon the amount which the tool is used. A record should be kept of each tool.

At each inspection the tool should be thoroughly cleaned, particular attention being given to accumulations of dirt and dust in and around motor ventilating openings. The moving parts should be lubricated and worn out grease in the gear case replaced. The supply cord should be carefully examined

and replaced if worn or otherwise damaged. The damaged portion should be cut off or a new cord provided. Cords should never be spliced. Attachment plugs and connectors should be examined and if broken, cracked or otherwise damaged should be replaced.

When cords or attachment plugs are replaced due care should be exercised to see that connections are well made and proper strain relief for the cord provided.

At each regular inspection the tool should be tested not only to determine that it operates properly, but also to determine that the electrical insulation has not been impaired.

Underwriters' Laboratories, Inc. Standard for Motor-Operated Appliances requires that appliances employing a motor rated at $\frac{1}{2}$ horsepower or less and 250 volts or less shall be capable of withstanding without breakdown for a period of one minute the application of an alternating potential of 900 volts between current-carrying parts and non-current-carrying metal parts with

the device at the maximum operating temperature reached in normal use. Similarly, an appliance employing a motor rated at more than $\frac{1}{2}$ horsepower or more than 250 volts is required to withstand the application of twice-rated voltage plus 1,000 volts.

Although properly-designed, well-made equipment will successfully withstand the abuse to which it may be expected to be subjected during normal use, a reasonable amount of care should be exercised to prevent injury. It is important that tools be properly stored when not in use. Cabinets or racks with provision for holding the cord independently of the tool are desirable. It is bad practice to wind the cord about the tool as it may be damaged by being crushed or subjected to oil or grease.

A wise practice is to have all tools returned to a stock or tool room after use. This provides occasion for a cursory examination before the tool is again used. Such examination should not, however, take the place of the regular periodic inspection.

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TUESDAY AFTERNOON SESSION

October 8, 1940

The opening session was called to order by General Chairman R. J. Reigeluth, Vice President, C. W. Blakeslee & Sons, Inc., New Haven, Conn., who presided. Chairman Reigeluth reviewed in some detail activities

of the Section during the past year, and mentioned special work of many Sectional Committees. He spoke encouragingly of accident prevention plans for the future. He then introduced the first speaker.

Organizing a Steel Erection Job for Safety

By W. A. HAZARD

Engineer of Erection, Bethlehem Steel Co., Bethlehem, Pa.

We must concede that safety in any construction operation is very largely a matter of judgment on the part of the superintendent or foreman in charge. No matter how many rules are promulgated, or how carefully the instructions are given, unless the superintendent or foreman is safety conscious, it cannot be expected that the men working under his direction will give much serious thought to safety for themselves, or for others associated with them.

What plan or method then is to be pursued to instill safety mindedness in our employees?

In organizing a job for safety, one of the first things necessary is to provide a set of rules, though I prefer the word "Code," by which certain standards are established, which are to be followed throughout the operation.

Most of us are familiar with the A. G. C. Code, and there are others similar to it, all of them excellent for the purpose intended, but they were not prepared with the primary idea of having them placed in the hands of the individual workman.

Realizing that finally it is the workman who can to a very large degree control

safety conditions on the job, we have developed and printed a Safety Code of convenient size to fit the pocket, and intended for the individual use of the men. As soon as a man is signed up on a job, he is given this booklet and asked (mind you not ordered) to read it over at his leisure. The first printing of this Code was made in March, 1938, and so far, nearly 5,000 copies have been put into the hands of our employees.

It has long been an established rule with the Bethlehem Steel Company that before a man is put to work he must undergo a physical examination, to determine his fitness for the particular job to which he is to be assigned. A few years ago our company decided that this procedure should be extended to include the men in the field. This action, however, presented a problem that has been difficult of solution, especially on small jobs located in comparatively isolated territory. Strenuous opposition has occasionally been encountered from the men themselves, and in some localities certain organizations have refused to allow their members to submit to these examinations. We have been insistent that this rule be observed, and with the able assistance of our medical department, it is now possible to have every

man examined by a competent doctor before he is allowed to go to work.

We are convinced that physical examinations are essential for the protection of the workman, as well as the company. It is unfair to a man with defective vision, poor hearing, or a heart condition, to send him aloft on an erection job, while the same man, once the condition is detected, may be able to render valuable service and be safely employed on ground work. The records of these physical examinations are considered confidential, and are known only to the medical department of our company.

The chief surgeon of the company selects a doctor in the vicinity of the operation, in advance of the starting of work, advises him of the standards which have been established for fitness of the employee, and supplies him with the necessary forms for reporting these examinations. This same doctor is also designated to render service in all accident cases on the job. This procedure relieves the superintendent of the responsibility of seeking the proper medical service, and also establishes a uniform standard for measuring the fitness of our employees.

The steel erector is faced with two problems when organizing his job. He must provide suitable protection for his own employees, and in addition he is compelled to protect the employees of other interests. The latter case often proves the more difficult of solution. The site of the job is frequently found with old lumber full of nails, surplus material and all sorts of litter scattered about, as a result of the operations of others, and there have been a number of instances where we have been obliged to assign men to clear up the site, as a protection to our own employees.

One of the first rules in the code provides that the men employed on our operations must wear hard hats. These hats are furnished by the company, and it is the duty of the foreman to see that every man has his hat before he is allowed to go to work. It required a long struggle to convince the men that this protection was being furnished for their own good; it was only after a few accidents had occurred, when men were struck on the head by falling material and avoided serious injury by wearing these hats, that this opposition began to disappear.

Now comes the second problem—protection for the "other fellow." The steel erector,

almost from the start of his job, is obliged to work over other men; I regret to say that we have yet to find many contractors in the building line who seem inclined to furnish similar protection to their employees. Is it because accidents caused by falling material as a result of the erector's operation are not their responsibility? I do not attempt to answer, but no matter how carefully we police our jobs to endeavor to prevent the possibility of such accidents, they do happen all too frequently; and many serious injuries result, most of which would not have occurred if the victims had been provided with proper head protection.

As soon as the job is organized, usually during the first week of operation, a job safety committee is formed. The foreman is always chairman, and the timekeeper the clerk or secretary. The committee members consist of the pushers and two or more of the workmen, the number being dependent upon the size of the operation and the total number of men on the job. On the smaller jobs, where only a few men are involved, the entire crew constitutes the committee.

Meetings of the committee are required to be held weekly, or bi-weekly in some instances, for the sole purpose of considering safety on the job. Accidents which have occurred since the last meeting of the committee, whether major or minor in character, are analyzed, and the opinions of the members as to the possibility of avoiding such occurrences in the future, are obtained. We firmly believe that free discussion of accidents on the job, while the incidents are fresh, helps materially to fix ideas of safe practice and safe working conditions in the minds of the men, and affords opportunity to point out what results from carelessness of the men themselves in the conduct of the operation.

The secretary keeps the minutes, which he later transcribes; and copies are sent to headquarters. These meetings are held at any convenient time of the day or week, it being left to the discretion of the foreman as to the time, and a record is kept in the general office of the number held each month on each job. During the first six months of this year 453 such meetings were held.

When this committee idea was inaugurated, it was thought that the foreman, as chairman, would be able to initiate and carry through the discussions, since it was sup-

posed that working conditions on the job would furnish an abundance of material for consideration. However, to aid him, a point was made to pick out some suggestion or criticism from reports of the previous meeting, and to write the foreman commenting on that point, thus giving him ammunition for a succeeding meeting. This plan proved impracticable, however, first because study and analysis of the reports was often delayed, and consequently such comments had lost their effect by the time they reached the job, secondly, in most cases the foreman would read the comments to the committee, without any remarks of his own, and unless some member cared to enter the discussion, the subject was dropped. It must not be assumed that these reports were not given attention, for whenever they contained any information to indicate that the code was being violated, this fact was immediately brought to the foreman's attention, coupled with very definite instructions as to his future conduct.

Someone has said that "any pool of water will become stagnant if it does not have an inlet and an outlet," and this is true in the case of safety committee work. Material of a helpful nature must be furnished to the leader; this material must be such that the interest of the members will be aroused to the extent that they will freely enter the discussions and offer their own ideas. The result will be that they will then go about their work with new energy to carry on the operation with the primary idea of safety in their minds.

The type and character of such material merits the most careful consideration, always bearing in mind the class and condition of the men to whom you are to appeal. There are numerous ways of presenting such material, and I feel that only by experimenting with several different methods can it be determined which best fits the particular condition. It is well to take plenty of time and spend plenty of energy to decide this question, but I am thoroughly satisfied that the greatest good and the most satisfactory results are achieved when provision is made for the men themselves to have a voice in the proceedings.

Lectures, pictures, rules, and even individual instruction and training along the lines of accident prevention, are admirable, and not by any means to be overlooked, but

I am firmly of the opinion that to obtain and hold the men's interest in promoting safety in their work, they must be given the opportunity of expressing their views. Thus the feeling is created that they, themselves, control the safety conditions on the job, which, in the last analysis, is a fact.

Our experiment in furnishing topics for consideration at committee meetings has now taken the form of safety bulletins. Each month, four of the bulletins are prepared, one for each weekly meeting. Each deals with a topic common to our work, such as falling material, car loading, slipping, goggles, defective tools, cooperation, eye injuries, etc. All deal with accident causes which at some time or other will involve all of the men. We must have the help and the cooperation of the foremen, and in turn we feel that we are helping him by furnishing material to make these meetings interesting and effective.

The reactions of the men to the subjects discussed are reported through the minutes, which are carefully read by the management, and as occasion requires, are commented upon by letter to the job. It has been most encouraging in reading the reports of these meetings, to note the active interest taken by the workmen in commenting and offering suggestions, some of them proving extremely valuable, and many have been promptly adopted.

After all, one of the most effective methods of guiding the men in charge of operations into safe practices on their work, is through personal contact on the job. We are fortunate in having a civil engineer in our organization, who has had a number of years' experience with erection work. He is familiar with erection tools, equipment and methods, and therefore, can discuss such matters from first hand knowledge. He has been assigned as full time safety engineer. It is his duty to visit every job periodically, to go over the work carefully with the foreman, point out to him the unsafe conditions he discovers, and offer advice for correction. Since he was known to most of the foremen and many of the individual workmen, this fact has been of great assistance in putting over his suggestions for better and safer working conditions.

A report of each inspection visit is made, in which is mentioned in detail any unsafe conditions, or methods, that are observed,

with recommendations for correction. The equipment and tools are carefully examined, and any which he considers unsafe are pointed out. Any practices which are contrary to the safety code are particularly stressed. This report is made to the management, and a copy is sent to the foreman on the job. At the next visit, the safety engineer checks conditions with his previous report to see that all items have been corrected.

Accident statistics have their place when in proper hands, but "Frequency" and "Severity" rates mean little or nothing to the average workman; and yet it is only through some sort of compilation of figures that comparisons of accident records can be obtained. How to convey such comparisons to the men who are responsible for these records, and in a manner that can be readily understood, is worth consideration. I will offer some suggestions which we are using, and which we believe assist greatly in our accident prevention work.

A tabulation has been developed of 31 causes of accidents, and each month the number of accidents, lost-time and non-lost-time, which have been reported, are listed. Thus can be shown, from month to month, what causes are producing the larger numbers of accidents, and the report being in simple form can be readily understood by anybody. This tabulation is sent to every foreman, accompanied by a letter, which stresses the significance of the figures.

As an example, for some months we have been stressing the necessity for the more general use of goggles on our work. For certain operations, such as burning, grinding, chipping, caulking, heating rivets, etc., it is self evident that protection for the eyes is required. Our code demands the use of proper goggles, but an analysis of the eye cases reported indicated that an appreciable number of them were not in any way attributed to these occupations. We started this tabulation in January of this year, and from the first report it was discovered that eye injuries comprised about 30 per cent of the total accidents reported. This same condition occurred each month, and when the report was sent to the jobs, this fact was pointed out and definitely stressed. The effect is beginning to be seen, for the men are talking about this fact in the committee meetings, and there is an increasing demand for goggles.

Such a report serves two important purposes: it points out to the foremen the causes which are producing the greater number of accidents, serving as a warning to guard against such accidents on their work; but perhaps more important, it serves as a guide to the management in providing proper means for carrying on work under safer methods and better supervision, and it points out the possibility that the tools and equipment in use may not be in proper condition or best fitted for the particular operation.

At the close of each quarter of the year, a similar report is compiled, although in a slightly different form. The names of the foremen are listed, the same tabulation of accident causes is used, and opposite the foreman's name is recorded the number of accidents, both lost-time and non-lost-time, which have occurred on his work during the period covered by the report. A notation is made of fatal accidents, and a statement is given of the number of man hours worked. This report is sent to each foreman, so that each one is able to judge for himself his accident record, as compared with the experience of others. We do not show "Frequency" or "Severity" rates, as we believe that a simple statement of the number of accidents charged against the individual is more effective than to provide data which few of the men understand.

At the close of each year, a report is prepared which includes all of the data previously covered, but with the addition of information which is of particular value to the management. Here is shown the record of every foreman, by listing each job of which he was in charge, its location, the amount of payroll, the compensation insurance provision, the compensation liability provision, the percentage of saving or loss on the insurance provision, total hours worked, number of accidents, and the "Frequency" rate. This report is then summarized and is combined with the reports of previous years, so that we now have the accident experience record of each of our foremen since 1935. These two tabulations are placed in the hands of each of the foremen, thus keeping them fully conscious of their individual record as it stands in the home office.

These reports are extremely valuable to the management, for the records are being consulted when assignment of foremen for

jobs is being considered. We also feel that the knowledge that an accurate account of a foreman's accident record is being preserved, and that this record is capable of comparison with any or all other foremen's experience, must result in his using greater effort and care to carry on his work, with the steadfast determination to prevent accidents to his men.

I should not leave this subject without pointing out that the first, and possibly the most important, action to be taken in organizing any job for safety in operation, rests with those who are charged with the general management. On them is laid the responsibility of seeing that the procedure is properly planned, of selecting or designing the proper types of equipment, and finally, to know that the miscellaneous tools suitable for the work are provided. If they go about this duty

with the fixed determination that safety to the workmen must receive first consideration, I am confident that the employees will, perhaps unconsciously, appreciate that serious thought has been given for their safety.

I am convinced that the workman who finds the tools and equipment which he uses in perfect condition, who sees that those in charge of the operation are constantly alert to prevent carelessness on his part, or on the part of his fellow workers, who knows that careful planning and study have been given to the job in advance, and that the procedure has been mapped out beforehand, cannot help but be impressed. Instinctively he is more careful of himself, and more thoughtful of the way he goes about his tasks, as they affect the safety of himself and his fellow workers.

Ups and Downs; Some Facts About Ladders

By F. L. HURLBUTT

Vice-President, The Patent Scaffolding Co., Chicago

In discussing ladder accidents, let us divide our subject under three headings: (a) selection, (b) care or maintenance, and (c) proper use.

By selection I mean the choice of equipment. Some companies from a mistaken idea of economy make their own ladders. I can think of no piece of plant equipment in which there is more opportunity to buy either safety or accidents than there is in ladders. Good ladders cost more initially, but they certainly justify their price, because they are safer and last longer.

Basically, no ladder is better than the poorest piece of stock used in its construction. This implies that only well-seasoned straight-grained woods should be used. For extension and straight ladders, the rails should be of spruce, Douglas fir, Norway pine or long leaf yellow pine. The last named is somewhat heavier, and for that reason is not as desirable as the others. Rungs of oak, ash or hickory are by far the best, and here the grain is all important. To assure straight grain, the best rungs are hand-split in distinction to the ordinary machine-turned rung. By hand-splitting it is impossible to get anything but a straight grain.

The proper 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 one and one-eighth inches nor the tenon less than seven-eighths inch. A genuine safety measure on extension ladders is the use of automatic locks instead of the old-fashioned gravity locks. In the automatic lock the keeper is forced by a spring to grip properly and seat under the rung. All hardware should be of malleable iron or mild steel. No cast iron fittings should be permitted.

Much discussion has been indulged in whether rung tenons should extend fully through the side rails or only to within a quarter of an inch. It has been my experience 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. There is also much less opportunity for moisture 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, and yet thousands are sold. Buy

only the best or you will certainly have accidents.

Any step ladder for industrial use should have side rails of a thickness of at least seven-eighths of an inch and preferably an inch, by three and a quarter inches. The steps or treads to give a good footing should be not less than three and three-quarter inches wide. Steps should be truss-rodged and 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 back and will not become wobbly. Personally, I would not have a flat-back type ladder in a plant. The spreader is a fertile source of hand injuries. This 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 of the platform step 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 to the worker when using a platform step ladder in contrast to an ordinary step ladder is so great, that it seems only a matter of time before it will completely replace the ordinary type for plant use.

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. These are generally used in pairs with a stage between them, or in sets of four with two stages, and with planks from stage to stage. 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.

How can the average buyer hope to check all these points when he buys ladders? The surest way to get safe ladders is to insist that your vendor guarantees his ladders to conform to the National Ladder Code which has been drawn up for your protection by the American Engineering Standards Committee. This code lays down the minimum specifications which tests and experience

have proven must be built into ladders for them to be safe.

We now come to the part that care and maintenance of ladders play in your accident campaign. I can say without fear of contradiction that most structural failures in ladders 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 piles or trucks, often resulting in cracks in the front or back legs. Frequently ladders are stored horizontally with supporting points near the ends, 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 hung 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. This 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 to be 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 increases 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 deflection, 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 in a

ladder which can be eliminated by tightening up the tie rods.

In short, if the maintenance department would give the same inspection and care to ladder equipment that they do other plant equipment, many unnecessary ladder accidents would be avoided.

The third part of this subject relates to "proper use" of ladders. Frankly, I believe it should be entitled "mis-use" or "abuse," for mis-use is the cause of a great proportion of the serious ladder accidents. Regardless of having good ladders, in spite of faithful inspection, if a ladder is not suited to a job, an accident may occur. Frequently, an extension ladder is a little too short, so someone forgets that there must be a proper lap of the sections and does the job or tries to. 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 three feet; ladders 40 to 44 feet require a lap of four feet; 46 to 50 feet take five feet, and over 50 feet, six feet must be had.

Take the case of the steamfitter, standing on a step ladder and using a large stilson wrench. His ladder may be a good one, but was it ever intended to take the load he is subjecting it to? Probably he should be working from a scaffold, not a step ladder. The pressure he is exerting upward on the wrench plus his own weight is enormous.

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 the danger of overbalancing when the user ascends; while if it is too far from the wall at the bottom, there is altogether too much bend-

ing strain in 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.

When ladders are being used where people or moving objects are passing by, a helper should always be stationed at the bottom of the ladder. Non-slip treads will not take care of this situation.

Slippery surfaces present a problem when ladders are to be used. Under such conditions, the proper type of safety ladder feet must be used. 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. The various conditions that must be met, requiring some form of safety feet, are so numerous, that it is impossible to lay down any hard and fast rule as to what type 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 condition is not too 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.

Confessions of a Consulting Safety Engineer

By EDGAR N. GOLDSTINE

Consulting Safety Engineer, San Francisco, California

Let us listen to the average typical ardent safety advocate. What is he saying, over and over, almost continuously? "Practically all accidents can and should be prevented!"

Now go over to a mill-run group of factory managers,—not the kind you read about in safety magazines, but the ones you find in the majority of manufacturing establishments. An expression of opinion from al-

most any of them on industrial injuries in his plant will be substantially as follows: "We don't have many accidents and don't know any reason why we should be doing any more safety work than we are doing right now!"

Keeping these two expressions of opinion in mind, let us garner some facts. If we take the record of accidental injuries for the

United States, or in any average construction company or industrial plant, or any typical community and interpret it correctly, we will be forced to accept this conclusion: There are a lot of accidents, and they are not being prevented,—at least not nearly approaching the extent to which we all say they can be.

Just what do we mean by "a lot of accidents?" By any standard of comparison, 93,000 persons killed and 8,000,000 disabled for at least one day in this country every year would seem to qualify. Should we care to restrict our figures to the annual toll in the Construction Industry we will find:

2,600 men killed.

14,600 permanently partially disabled.

275,000 temporarily disabled for more than one day.

500,000 requiring treatment by a physician.

\$240,000,000 loss to employees, employers and insurance companies.

Let us go from grand totals to sub-totals, and look over one individual employer. While this employer could be selected from almost any industry, we will pick a building contractor, one who is doing about twice as much business as the average successful builder. His year round employment will average about 100 employees. In ten years his organization will have 87 lost time injuries. Of these, 83 will be temporary lost time cases, averaging 19 days of lost time each. Three will be permanent partial disabilities, averaging 1,227 days lost time each. One may be a fatality or permanent total disability.

Anyone is going to have a pretty hard time convincing an employer doing an annual business of a million dollars a year that his face should be pretty red because he has nine lost time injuries a year. It would be just as hard if he had 20 or even 30. I've tried it on dozens of them. Yet this is the average employer who is responsible for the terrible industrial accident record of this country,—of course along with several hundred thousand other employers just about like him.

Let's try an appeal to his pocketbook,—the nerve center of all business. We'll say: "Your workman's compensation insurance is costing you about \$10,000 a year at the manual rate, but \$13,000 a year at your experience rate. If you had good accident experience for five years, it would then cost

you less than \$6,500 a year,—a clear saving of \$6,500."

It is his turn to speak now, and with brutal frankness he begins. "Listen—if I can buy my millwork tomorrow at the price I hope to pay for it for the big job I signed up last month, I'll save \$7,000, and I won't have to wait five years to make it. Besides, I know a lot more about how to run my business than any safety engineer. And I haven't time to bother with you. I think I can pick up a couple thousand dollars on the lumber for that job, too, and I want to close the deal on that. I'm really very busy."

There are some outside forces that bear on our contractor that deserve to be examined. The State draws up a nice set of safety regulations compiled by a couple of State safety engineers, a dozen labor officials, as many more insurance safety engineers, and two or three contractors usually engaged in building bungalows. The regulations are then printed and filed, with copies available at 25c each in some states, although the printing cost ought to be about 5c a copy. Everybody on the committee gets a free copy; that is about the extent of their distribution. Once or twice a year a State safety engineer may get to the operations of the contractor, making some recommendations which are usually disposed of by the completion of the work.

The typical insurance safety engineer in the smaller communities, in between measuring up plate glass, examining prospective risks for burglary insurance, talking to the owner of a fleet of trucks, and inspecting an elevator comes out to the job, passes the time of day after making a suggestion or two, and goes on his way. (At least that was the extent of the service I received when I was superintending building construction.) There has been considerable improvement in many insurance organizations, but even they must admit, if they look at their loss ratios and the experience modifications of their contracting risks, that the work needs to be done much better than it is at present.

Where is the Federal Government in this picture?

It was only about two years ago that some of the employees of the U. S. Government were exposed to a serious silicosis hazard in some exploratory tunnel work. When State safety officials at the job requested the

protection of these men by approved working methods and safety equipment, they were told that it was a Federal job, and not under State jurisdiction, and what were they going to do about it?

The Labor Unions—where are they? Some of us heard a former Secretary of Labor boast at one of our Construction Section sessions of the tremendous contributions made by Labor to safety in industry. Some safety laws were passed. If we want to bring the matter up to date, a certain governmental safety bureau has no personnel to make the inspections required by law and does not even attempt to interpret an 88-page booklet of involved technical regulations for those employers who are trying to find out what they mean.

Those of us who have sat on Safety Code Committees with Labor representatives have heard vigorous denunciations of reckless employers. But I have yet to hear any appreciable portion of them accept any part of the responsibility of instructing or disciplining the reckless employee, or even admit that there was any particular responsibility on the part of labor to be careful so as to prevent accidents.

Let us leave the construction business, for a few minutes, and take a look at my neighborhood. The delivery car of the drugstore is going around the corner on two wheels at about ten or fifteen miles past the legal speed limit. Have I notified the drugstore that I am going to buy my supplies at some other place if they do not persuade their driver to be reasonably careful? Have I requested the police to take the situation in hand? Has the community made an effective effort to have drivers properly trained? Are the schools doing as good a job of teaching safety as they should?

The answer, I regret to report, is no to all of these.

What can a consulting safety engineer do that is worth while?

A consulting safety engineer can sometimes work with an organization and get favorable action and results not hitherto achieved. This is not because he is listened to by management, or because he has a reputation. The reason is that he assembles facts, decides upon a solution, presents ideas in clear form, and follows through until they are definitely accepted or rejected.

The vital ingredients of a safety program

should be selected to fit particular conditions, if they are to be most effective. Certain objectives must, in considerable measure at least, be attained if genuine progress is to be made. Among them might be listed:

Improve the working conditions that need to be improved.

Improve the working habits that need to be modified.

Develop the understanding of the organization and all the individuals in it concerning the prevention of accidents.

Get the organization and all the individuals in it to do the things that need to be done to prevent accidents.

What road must we take to reach these objectives? The entire organization, including management, foremen and workmen, must be regularly instructed through interesting, pertinent and helpful facts concerning safety in their work. The material must be comprehensive, including situations that occur once in a lifetime as well as those of every day and every hour.

Inspections need to be made regularly and frequently, by foremen, inspectors, or safety engineers well acquainted with hazards and the means to minimize or eliminate them. Wherever corrective action should be taken, such action should follow immediately whenever possible.

There must be a personal, inspired leadership, preferably by someone with a broad engineering background who knows what needs to be done, and who can get others to do it.

Some of the elements that can be incorporated in the safety program are:

Regular *Instruction* of adequate depth, width and interest.

Safety Rules, *safety Posters*, *safety Bulletins*, *safety Publications*, etc.

First Aid Training for some or all employees.

Safety Equipment that is adequate, suitable, with a minimum of discomfort through its use.

Schedules for inspection, instruction, etc. *Accident and inspection Records*.

Accident Investigations.

Safety Contests, *safety Awards*, etc.

Safety Committee Activities to enlist employee participation in safety work.

Development of acceptable *Standards* for

working conditions, working methods, etc.

Use of *Photographs* in safety work.

Research to find the right answer to particular problems, so that proposals will be practical and acceptable. This may require a reference *Library*, *Contacts* with others, membership in the *National Safety Council* and local *Safety Engineering Organizations*, special *Investigations*, etc. It also means determining the most suitable *Safety Supplies and Equipment*, etc.

Accident Analysis of past and present experience to be used as the basis for accident prevention measures based on the accident experience of the organization.

Hazard Analysis so that there may be control for the prevention of accidents based on safety experience elsewhere.

Organization Responsibility to be accepted by some company official or a competent des-

ignated person to take hold of the safety program and make it move in the proper direction and keep it moving.

It might as well be admitted that there are many obstacles to be overcome in the practical application of safety measures, and that at least as much art as science is needed. Most of the difficulties are real, but they will yield to well directed effort supported by enough energy, suitable facilities, and cooperative attitudes. Some are imaginary and will disappear as the safety work proceeds. Among the latter is the idea too generally held that the average worker is not sufficiently intelligent to work safely. The level of native intelligence for most workmen is usually about as high as for the rest of us. With proper guidance and encouragement, the worker will go along with management for the prevention of accidents in industry.

WEDNESDAY AFTERNOON SESSION

October 9, 1940

Safety Pays Dividends

By JOHN W. COWPER, M. Am. Soc. C.E.
President, The John W. Cowper Co., Inc., Buffalo, N. Y.

and HARRY O. LOCHER, M. Am. Soc. C.E.
Secretary-Treasurer, The National Assoc. of River and Harbor Contractors, New York, N. Y.

From ancient times to the present, an amazing evolution in construction, design, materials, and methods, has taken place. Skyscrapers, tunnels, caissons, dams, bridges of long span and great height—all these have made it necessary to introduce highly mechanized equipment for rapid and economical erection. All changes have brought about greater hazards to workmen, as well as to property.

Has safety in construction kept pace with this progress? Apparently not. And in failing to do so, construction men may be charged with negligence, lack of humaneness, and with economic waste.

After many years of experience and after witnessing hundreds of accidents, from mashed hands and feet to severe maimings and fatalities, it is our belief that at least

95 per cent of all accidents are due to carelessness—carelessness in safety measures, or carelessness of men in looking out for themselves. Both of these factors require thought and study.

Besides the social tragedy that follows in the wake of most serious or fatal accidents, there are always economic losses, sometimes running into thousands of dollars. The cost of construction accidents is a tremendous burden. Even in 1938, a year considerably below normal in construction activity, the cost was close to \$100,000,000 in losses for injuries—and this figure takes no account of the losses to the injured in time not covered by compensation.

Though the accident situation is largely in the hands of superintendents, foremen, and other men in authority, the real incen-

tive to safety measures must originate with, and be the rule of, the head officer. The head must first become safety-minded himself and pass this attitude down through his staff, all the way down, keeping it alive with unfailing vigilance. He must press it home to everyone by criticizing bad planning, and by complimenting and encouraging those under him for methods that have proved safe. The directing head should watch accident records as he watches construction costs and finance, because safety plays an important part in costs and finance. The accident record can weigh heavily in the profit and loss account—particularly in these times when competition is probably the closest ever known, and the margin of profit is extremely slim.

Any superintendent or foreman who is making a bad accident record should be investigated. The safety of his men is as much a part of his work as how many cars they put in the dump, how many tons of steel they set, or how many yards of concrete they get in. Every foreman should be made to realize that accidents are costs—costs that sometimes make a job show a loss. Insurance is rarely complete protection, either when carried by a company or by the contractor himself. And there are lots of shocks that no amount of insurance money can heal.

Making construction work as safe as possible is, of course, the best method of preventing accidents. Again, superintendents, foremen, and mechanical men are the ones most responsible for safety measures; they should do the thinking and looking ahead.

One of the best accident preventives is "good housekeeping," or keeping the job or project in a clean, orderly condition. Particular care should be taken not to have boards scattered about with protruding nails. These cause many accidents and, if not given immediate attention, result in serious infections. Another matter that gives much trouble is injury to the eyes. Hard, abrasive, and sharp particles getting into the eyes result in many serious and costly after-effects. In working where this danger is at all probable, protective goggles should be worn. Another hazard which has come much to the front in recent years is exposure to rock dust, which may result in silicosis. In many states the laws covering silicosis are so rigid and the penalties so great in case

of its development that few insurance companies will cover the risk. Where this danger exists, all preventive measures should be taken.

Careful and safe planning of all temporary work is highly important. A few years ago, a steel viaduct constructed in 1891, 750 ft. long, 135 ft. high, with a dead weight of about 1,600 tons, was moved in a parallel position a distance of 80 ft. to serve as a detour while constructing a new reinforced concrete arch structure. Several weeks were consumed in planning and constructing a temporary structure on which to move this bridge, all done with the greatest care and testing. When the moving of the structure was started, about two hours were taken to move the first 5 ft., for the purpose of thoroughly organizing and drilling the moving crew in its duties. The structure was moved the other 75 ft. in less than five hours, with the result that there was not even a scratched finger and, to the amazement of thousands of spectators, the structure did not fall over in moving. Six and eight-story buildings have been moved without accident or injury, because of the same meticulous care in planning and organizing.

Some think that, on account of the temporary nature of a construction job, just any old safety measures may be all right. They are all wrong! When a contractor is doing work continuously, his business can be considered as permanent as any permanently located industrial business, and his safety measures and policies should be no different. A man killed on a contract job is just as dead as one killed in a steel mill—and his wife and youngsters will miss him just as much. Because an individual contract job is temporary is no reason whatever for not properly protecting workers. Not to do so adds to social misfortune and runs costs up to sometimes ruinous amounts.

Simply talking about accident prevention does not impress most of us. But when one sees a man maimed or killed, a vivid and lasting impression is made upon one's mind.

On one occasion a stiff-leg derrick, with 12 by 1-in. wood back legs and sills, built on top of a 10-story building for use in erecting a building on adjoining property, fell because one of the wooden back legs broke. Fortunately, no one was killed, but several were hurt and considerable property damage

was done. This derrick and all its parts had been inspected before erection, but because of its having been painted with a heavy coat of red lead, no defects were visible, nor did the usual sounding methods of timber show any. After the timber broke, it was discovered that there was quite a serious interior rot. Although the defective area on the surface was very small, it would have been sufficient to condemn the member had it not been hidden by the coating of red paint. Lumber, particularly timbers used in temporary construction, should never be painted.

Dangerous places must be made as safe as possible—both to protect thoughtless men and to protect thoughtful men who know they are in a dangerous place and cannot give full thought to what they are doing on that account. On a certain hydraulic-fill dam, the material was sluiced to the site through wood flumes on high trestles. The trestle and flume timber was sawed locally; it was not first-class material. In spite of careful inspection, a bad stringer would sometimes be used. Sometimes when the flume became clogged and overloaded, one or more 12-ft. sections of trestle and flume would go down. Several men were severely injured by these accidents. In topping out the dam, it became necessary to build a double-deck trestle over 80 ft. high, with the 3 by 3-ft. flume on top of it. It was a spindling-looking structure.

The flume tenders did not relish working up there, and they could not be blamed. If they happened to be on a section that went down, there was little chance of their escaping fatal injury. They were inclined to play safe and hang back toward the ends of the trestle. This increased the possibility of the flume's clogging, as the men were not strung along as they should be to keep things in order. One day the superintendent heard one flume tender say to another, "If I knew this old running board would stay up, even if the trestle did go down, I wouldn't feel so skittish up here." This remark gave birth to an idea which resulted in resting the top cross-braces of the flume, and the running board and hand rail which they supported, on two 3/4-in. cables suspended from high bents to each end of the trestle. This device gave the men a feeling of complete safety; they attended to their work properly and there were no further clogs or breaks.

On another job, timber lining was being removed from a tunnel that was to be relined with concrete. The wall plates were sawed at certain places and several sections of segments and lagging pulled down with a cable from a hoisting engine set several hundred feet back. One day a bad cave-in followed the falling timber, killing two men and almost blocking the tunnel to the normal roof. As the work was supposed not to interfere with traffic, the track had to be cleared as quickly as possible. However, a desultory falling of rock kept up, and the men were afraid to work under it. Finally two bulkheads of 12 by 12-in. timbers were built across each of two flat cars, one about 8 ft. from the front end of the cars and the other about 16 ft. back of the first. On top of these were laid 12 by 12-in. timbers about 30 ft. long, projecting over the front end of the cars 6 or 7 ft. The men worked under this projection without fear, loading the stone on to the end of the car. The fall was speedily cleaned up, no one being hurt.

A contractor's loaded truck once stalled on a railroad crossing, derailing a locomotive and part of a train. Two men were killed and large property damage resulted. The contractor was ruined. Why did this happen? Through carelessness and thoughtlessness. Where? Everywhere. The truck was overloaded. It had been sent out that morning with a motor not running smoothly. The driver knew the crossing was a dangerous one and that trains passed frequently; yet he limped up to the crossing with a sputtering motor and a big overload. No prudence had been shown anywhere from the time the truck had left the yard until it was demolished.

Superintendents and foremen must constantly keep after men to keep in the clear; to use their heads. And they must constantly seek ways to throw about them as many protective measures as possible.

Taking foolish chances causes many entirely unnecessary accidents. A locomotive crane was being moved across a partly filled canal on a temporary fill. There was about 8 ft. of water on each side of it. Three 20-in. dredge pipes, buried about 3 ft. passed through the fill. For moving, 12-ft. lengths of rails were spiked to 8 by 12-in. timbers, and overlapped them a foot or so at the forward end, to make the

joint. Before moving up, the joints were made secure with fish plates with a bolt in each rail. When the crane was near the center of the fill and ready to make a move, a fish-plate bolt rolled down the bank into the water. It happened that there were no extra ones on the machine. "We'll take a chance," said the foreman to the runner, "Try her." He did. When the front truck hit the joint with a bolt on only one side of it, instead of going over the joint, it shoved this rail and timber ahead out of place. The truck dropped down into the soft fill and on down through the dredge pipes. In about 30 seconds the crane was lying on its side in the mud and water, half out of sight—all on account of not having one 3/4 by 3/4-in. bolt. Too much hurry costs money almost every time. Usually, too, tragedy follows in its wake.

On another occasion a 2 1/2-yd. railroad-type shovel had been rigged as a dragline with a 60-ft. boom, to do bank sloping on a canal job. It worked from a track laid along the canal. On windy days, it was difficult to keep the boom from whipping around—the swinging mechanism was not designed for 60-ft. booms. Provided the jacks were set, there was no particular danger if the boom did get away. As a safety measure, when moving, the bucket was ordinarily left on the ground with the hoist line kept taut until the move was completed and jacks reset. One morning the shovel had to be moved across a 60-ft. trestle about 12 ft. high, which crossed a stream flowing into the canal. A stiff wind was blowing against the front of the machine. A move placed the shovel fully on the trestle. When ready to move back, instead of leaving the bucket on the ground straight out in front and playing out the drag and hoist lines, the operator picked up the bucket and started to move. With the jacks up and the bucket in the air, a gust of wind hit the boom; the operator could not hold it; he lost his head and forgot to drop the bucket. In a few seconds, the boom had swung around far enough to upset the shovel into the creek below, badly damaging it and seriously injuring and scalding the operator.

There is a strange quirk in some men—they have a sort of urge to "take a chance." The trait is sometimes found in the most capable men. But too often it causes serious or fatal accidents and costs a lot of money. Men who take chances on losing weeks and

thousands of dollars, in trying to save a few hours and a few dollars, should be stepped on. The odds are stacked high against them. If they win, it isn't much; if they lose, it may be calamitous. Such procedure is almost always bad judgment, paid for with social tragedy and money that could have been saved.

Timber was being unloaded from a work train along the main line. Everybody was in a hurry; the timber was shoved off, "any old way," to get rid of it quickly, and as long as it cleared the work train it was left where it fell. One morning, after several cars had been unloaded and the work train moved out, the foreman stood on the pile trying to make a record of it. A through train passed and the end of a wide car struck a projecting 12 by 12. In a flash, the foreman was in the midst of a moving, twisting pile of heavy timbers. He was maimed for life. Orderliness and care in piling the timber, or care by the foreman in keeping back out of such possible danger, would have prevented this accident.

Six-yard skips, loaded with stone, were being unloaded from railroad cars by a cableway which passed over the track. A foreman stood between the skip to be hoisted and the one next to it. He failed to notice that the hooked-up skip was not plumb with the cableway carriage overhead. He gave the signal to hoist. As the heavy skip cleared the floor of the car, it swung plumb and crushed him to death against the adjoining skip.

As thoughtlessness causes most accidents, men should be taught to think. Then too, alert, clear-headed men should think for those under them. The way should be made as safe as possible for them in both directions—that is, make dangerous places as safe as possible, and make it easy to get away if something starts to go. It should be remembered that men react differently and that certain men are not fit for certain places. "Put him somewhere else," a tunnel foreman told a superintendent, about an apparently ill-fated man. "I can't spend all my time keeping that fellow from killing himself." The man was put on outside work and got along all right.

"I consider it a black mark against me when one of my men gets hurt," this same foreman said. Here really is the crux of the accident situation. When the men in charge

of other men and responsible for their welfare consider an accident a reflection upon them, one is as near to an accident-proof job as it is possible to be. Thoughtful men must provide safety measures for, and look out for men who are less thoughtful, or who cannot be thinking about their safety all the time.

On large work, it is desirable to have a well-equipped clinic for first-aid treatment, with a qualified nurse, or a doctor, in charge; and every accident, no matter how minor, should be treated and observed until entirely cured. On a project with a payroll of about \$400,000 the medical cost per case was reduced in this manner from \$13.87 to \$7.66; and the total cost of 596 cases treated (including compensation, medical attention, and legal costs) was reduced to an average of \$24.55 per accident from a previous cost, without clinic, of \$63.00.

In addition to the saving in cost, there is a saving to the employee in the matter of lost time and consequent loss of wages, due to accidents. Out of 596 cases, there were only 50 cases of lost time, the average cost being only \$148. After all, the employee is probably the greatest loser because, under even the most liberal laws, he loses a week with no pay and, after the pay starts, the maximum he can receive is two-thirds of his average wage.

The cost of compensation, in accident insurance, is high. On construction it averages

fully 10 per cent on the payrolls, and in some cases (such as steel erection) it is 53 per cent. Good records are rewarded by a reduction in this rate, whereas bad records result in a penalty. One large construction company, over a period of five years, reduced its insurance cost from an 11 per cent penalty on the base rate to a 35 per cent credit; and in the year 1939, on the amount of work done, this resulted in a saving in the insurance premium of over \$40,000, or about 1 per cent on the gross amount of work done in that year. Probably a like amount was saved to the employees in the difference between their full-time wages and what they might have received in compensation if they had had an accident—to say nothing of the saving in the suffering of the injured.

One of the authors, the head of his organization, makes it his duty to see personally that accident prevention is watched carefully. He insists that every accident report shall cross his desk, and whenever a report reveals carelessness or unsafe practices he personally corrects those at fault. The psychological effect of this is great; every employee knows that the "old man" is watching this particular phase of the work as carefully as he watches other things that might seem to be more important. He has found that this method is one of the best accident prevention measures, and has proved that it is highly profitable.

The Maintenance of First Aid Units for Compressed

Air Workers

By WILLIAM REQUARTH, M.D.

Chicago, Ill.

Until recent years, reforms in industrial health were confined to factories and large plants and employees in smaller groups were content with "corner drug store" medical care. This was especially true in construction work where, although the groups were often large, the location was inconvenient and usually transient. It soon being observed that adequate medical attention was not provided in the usual manner, first aid stations were established. The advantages of such industrial medical arrangements were recognized immediately and now specifications for

large jobs require the contractor to maintain medical assistance on the job site. The first aid station, which at first was an accepted part of the health program in every large factory, has become a valuable asset in heavy construction.

1. *The Pre-employment Physical Examination.* This is a safeguard for the employer and employee. For the employee it is an effective inventory of his general physical condition, being a certification of approval of fitness for his particular occupation, or a matter of fact statement of his

existing defects. The man, on the other hand, represents an investment for the employer which must be protected by the careful scrutiny of a physical examination. Although, in general, men who present themselves for tunnel labor are good physical specimens, tunnel workers should be questioned carefully about previous dusty jobs, respiratory infections, sinus infections, and, especially, ear infections or impairment of hearing. The ears and upper respiratory tract must be the subject of a thorough examination. The examining physician should familiarize himself with the occupational hazards in each type of construction work involved. He takes a great responsibility when he refuses to employ some man with a wife and dependents. His decision regarding the fitness of the individual for employment should be fair. Table I lists the commonest physical defects in order of frequency by age groups.

In younger men physical defects are less

common and of no grave importance. As age increases, the more significant cardiovascular changes appear. Of applicants over 50 years, 15 per cent were refused employment because of cardio-vascular findings alone. Hernia, most frequent in the fourth decade, is not always a cause for rejection. We have passed many men whose rupture was small and well retained by a truss. The high frequency of dental caries is to be expected and its decrease in the last age group is due to the use of artificial dentures.

2. *The Immediate Care of the Injured.* In the past, the responsibility for first aid had been relegated to office clerks or timekeepers, individuals whose precarious foundation of first aid principles limited them to the care of minor cuts and abrasions. The services of an expert first aid attendant abolishes the chance of poor treatment and provides trained leadership in bad accidents where the trauma incurred in transportation to a first aid unit so profoundly can influ-

Table I—Analysis of Physical Defects in 1,000 Tunnel Workers

Age Group	No. of Cases	Per Cent.
Age Group 20 to 29 years: 339		
Carious Teeth.....	182	53.7
Elevated body temperature.....	22	6.8
Skin eruption.....	16	4.7
Hernia.....	4	1.1
Varicose veins.....	3	0.8
Age Group 30 to 39 years: 288		
Carious teeth.....	191	65.9
Varicose veins.....	12	4.1
Elevated temperature.....	7	2.4
Skin eruptions.....	4	1.3
Cardiac disease.....	4	1.3
Pulmonary disease.....	4	1.3
Hernia.....	4	1.3
Age Group 40 to 49 years: 273		
Carious teeth.....	203	74.3
Varicose veins.....	17	6.5
Hernia.....	14	5.1
Hypertension.....	10	3.6
Pulmonary disease.....	9	3.2
Elevated temperature.....	7	2.5
Age Group 50 to 59 years: 100		
Carious teeth.....	64	64.0
Hypertension.....	8	8.0
Varicose veins.....	8	8.0
Cardiac disease.....	7	7.0
Hernia.....	4	4.0

Table II—Analysis of Injuries as to Severity and Location

Type of Injury	No. of Cases	% Lost Time	Order of Frequency of Part Involved
Lacerations	688	3.2%	67% hand; 14% head and face. In lost time, injuries, the head equalled the hand.
Contusions	443	17.5%	18% hand; 15% leg and knee; ankle, elbow, and head each 6%.
Abrasions	428	1.1%	49% hand; 12% forearm and wrist; 9% leg and knee.
Sprains	78	16.6%	22% wrist; 19% ankle; 16% knee.
Strains	100	26.0%	63% back; 11% wrist; 30% of the back strains involved lost time.
Infections	106	18.7%	35% hand.
Puncture Wounds	57	8.7%	52% foot, of which only 3 cases were lost time.
Cement Burns	68	1.4%	29% forearm; 17% leg.
Foreign Bodies	256	27.3%	70% eye; 21% hand.
Fractures	16	93.0%	
Ear	528	47.0%	4% progressed to suppuration.

The upper extremity is most vulnerable to injury, particularly the hands and fingers. The back is strained most frequently, one-third of these cases being lost time injuries. Lacerations, abrasions, and cement burns are rarely lost time injuries.

ence the diagnosis. His presence at the accident site insures proper application of splints which may mean the difference between a simple fracture and a compound dirty wound, or total disability and complete recovery. The availability of medical care, furthermore, encourages men to seek treatment for even the most minor wounds, the importance of which should not be underestimated.

3. *Early Rehabilitation.* Periods of temporary total disability are shortened by cooperation between attendant and physician. The attendant, by his knowledge of the degree and kind of disability involved and the available light work the injured person can perform, frequently can return the patient to a gainful occupation many days earlier.

4. *Education of Workmen in Safety First.* The principles of safety are taught at a time when they are most acceptable to workmen: immediately following an injury. The job physician soon recognizes accident repeaters and may ascertain the basis of their carelessness, then offer some remedial measure.

Organization of An Industrial Medical Unit

1. *Equipment.* The contractor usually provides a suitable first aid room as a part of the general office on the job site or he

may erect a small one room frame structure approximately 20x10 feet in size. Hot and cold running water, electricity, telephone and towel service should be standard facilities. The initial cost involved approximates \$100; another \$75 is necessary in compressed air operations for the purchase of special equipment. The cost of a medical lock required in pressures over two atmospheres absolute is not included.

2. *Plan of Operation.* Twenty-four hour medical service may be maintained by two persons, preferably physicians; however, we have had satisfactory experience with senior medical students working under the direct supervision of a physician. These men treat and care for all injuries which can be handled on the job site, and refer those of a more serious nature or requiring X-ray for diagnosis, to nearby industrial surgeons. A well-planned system of records provides accurate and detailed information even for the most minor injuries.

This plan of first aid operation has proved successful in several heavy construction jobs. Table II illustrates the type of medical care rendered. Table III indicates the activity and Table IV is an analysis of expenditures involved in the maintenance of the medical units.

TABLE III—Medical Activity

Total number of man hours worked.....	471,651
Average per week.....	11,401
High week.....	19,205
Number of new injuries.....	2,923
Number of redressings.....	3,144
Treatment and other cases.....	1,090
Total number treated.....	7,157
Average per week.....	167
High week.....	377
Number referred for outside medical attention.....	185
Per cent referred for outside medical attention.....	6
Number of pre-employment medical examinations.....	652

The first aid station treated 27 patients on an average day; on busy days the number exceeded 50. Only 6 per cent of these had to be referred elsewhere for treatment.

Special Problems Involved

The use of increased atmospheric pressure for facilitating work under water and in water-bearing earth dates back to 1840. It soon was noted that men who stayed in compressed air for long periods often were stricken with severe bodily pains following decompression; occasionally death occurred. The mechanism of this sickness was revealed in 1870 by Paul Bert who, by animal experimentation, showed that the liberation of air emboli in the blood and body tissues was the causative factor. Time in decompression soon was recognized as the most important preventive. Thirty years later, Haldane devised his method of stage decompression, now universally employed.

Until recently, the hazards of increased atmospheric pressure were considered mainly those resulting from pressures of more than 15 pounds. We even like to consider certain lesser complaints occurring in workers in pressures under 15 pounds and referable mainly to the ear and paranasal sinuses. We make an arbitrary division of the medical aspects of compressed air sickness into those which occur under 15 pounds and over 15 pounds. In pressures over the 15 pound arbitrary division, true caisson disease is encountered.

TABLE IV—Analysis of First Aid Costs

Original output for instruments, materials and general equipment.....	\$ 104.84
Instruments and materials for treating compressed air conditions*.....	53.60
Cost of supplies and medications after original output.....	186.44
Maintenance cost per month: bandages, etc.....	18.64
Total cost of all materials and equipment for entire job.....	344.88
Overhead: attendant's pay, heat, light, etc.....	3,078.00
Total cost of maintaining first aid station for ten months, including overhead.....	3,422.88
Actual cost in material per dressing.....	0.036
Cost per patient treated: all expenses.....	0.48

*Apparatus for administering helium-oxygen mixtures extra. Mask, reducing valve and flowmeter can be purchased for \$55.00. Large size tanks of helium-oxygen mixtures retail at about \$17.00 per 1,100 gallons.

Pressure Under 15 Pounds

The damaging effects of pressures under 15 pounds are confined essentially to three parts of the body: the labyrinth, the paranasal sinuses, and the middle ear. The labyrinth, which is the organ of equilibrium, is located in the temporal bone of the skull, directly behind the ear. It consists of three bony canals located in three planes of space and contains a fluid, the endolymph. Movements of the head move the fluid and cause impulses which orient the head in space. Any change in this fluid causes disturbances in equilibrium. In compressed air workers there is a type of vertigo not relieved by recompression. It is sudden in onset, occurs one-half to two hours after decompression and is characterized by sudden severe dizziness associated with vomiting and nystagmus.

As it is not relieved by recompression, we believe the causative factor is not an air embolus but a small capillary hemorrhage into the endolymph. The viscosity of the endolymph is changed and a constant disturbance in equilibrium is produced. Although recompression is not of value here, the dizziness gradually subsides in two to seven days, leaving no permanent functional impairment.

Involvement of the nasal sinuses is manifested by severe headache and pain over the eyes or in the region of the cheek. The frontal sinuses above the eyes are affected most frequently, pain being caused by the imprisonment of air under pressure within the sinus. Treatment consists of restoring the patency of the sinus orifice and releasing the air, often accomplished by means of a simple vasoconstrictor.

Labyrinthine disturbances are rare and sinus pain is temporary. More far reaching and important to the patient and the insurance carrier, however, is involvement of the middle ear. This is a source of much lost time and often of prolonged costly ear infections. The simple mechanism is easily explained. The middle ear may be considered a chamber whose only means of ventilation is the eustachian tube, one wall of which is the ear drum. This tube communicates with the throat. Its patency allows environmental pressure changes to be equalized in the middle ear. Blockage of the tube often occurs during "colds" and other inflammations of the throat.

During compression, the ear drum is displaced inward by the air until the pressure is equalized through the eustachian tube. If the tube is closed partially, as during upper respiratory infections, the workman forces air into the middle ear, causing contaminated secretions of the nasopharynx to be carried into the ear. This often causes infections in the middle ear. If the tube is blocked completely, the resultant deformity of the drum membrane produces severe pain. The workman is unable to "make the locks" and is laid off.

This is the typical "blocked ear" characterized by impairment of hearing, tinnitus, and pain in the ear. Its most common complication is catarrhal inflammation of the middle ear; its most serious complication is suppurative ear disease. In 1,300 recorded cases we observed in 16 months, 38 per cent lost time from work and 3.8 per cent progressed to suppurative ear infection.

A routine of treatment we developed materially decreases these figures. From the point of view of prevention, each man is subjected to a general physical examination which includes a thorough scrutiny of the

nose and throat for evidence of infection. He is questioned about previous throat infections, asthma, old ear infections, and other possible predisposing conditions. Then he is instructed carefully to leave the locks and apply for treatment as soon as symptoms of blockage occur. He must not attempt to force air into the middle ear by vigorous blowing.

In the past few months we have employed helium extensively in the treatment of tubal blockage. It is an inert gas and the lightest of all elements. Its rate of diffusion, almost three times that of nitrogen, will diffuse through the eustachian tube much more rapidly than the nitrogen of the air. Mixed with oxygen to make an 80-20 mixture, it is breathed through a device especially designed for administering helium and oxygen mixtures under pressure. The apparatus consists essentially of a mask, breathing tube, spirometer breathing bag, a calibrated gravity type spill valve, and weights for producing pressure in the system.

Preparatory to the administration of the gas, the nose is sprayed with one of the common agents used to shrink the nasal mucosa. The gas then is breathed at a rate of flow of eight liters per minute and a pressure of 12 mm. of mercury. The average patient obtains relief in four minutes; more obstinate cases may require ten. The positive pressure aids diffusion of the gas through the eustachian tube. We have used this regimen of treatment in 200 consecutive cases.

Results, as compared to 200 consecutive cases in which helium was not used, are highly satisfactory. In the helium treated series, 33 per cent of the men lost time from work and 1.5 per cent of the cases progressed to suppuration as compared to 45 per cent lost time and 4 per cent suppuration in the control group. Of the patients treated with helium, 74 per cent obtained moderate or complete relief. We contend that helium-oxygen mixtures are of true value in the treatment of tubal blockage and should be a part of the first aid equipment on all operations in compressed air. The cost of the average treatment is thirty cents.

Safety Features in the Construction of Hiwassee Dam

By J. E. WALTERS

Construction Superintendent, McKenzie Construction Co.,

Marshall Ford Dam, Texas

Hiwassee Dam recently completed by the Tennessee Valley Authority, is located on the Hiwassee River, in North Carolina, approximately 75 miles from the North Carolina-Tennessee state line, and 20 miles west of Murphy, North Carolina.

All dams constructed by the Authority are multi-purpose; namely, Navigation, Flood Control, and Power Development. Hiwassee Dam does not have lock facilities for handling river traffic, but it is planned that water stored during the flood season will be released in low water season to aid navigation on the Tennessee River. During flood season the Hiwassee river contributes approximately 20 per cent to the flow of the Tennessee River.

The dam is constructed in a narrow gorge and is a high, overflow, gravity type concrete structure having a crest length of 1260 feet, and a height of 320 feet from deepest excavation to the roadway. The foundation for the dam was good, and a comparatively small amount of grout was required to prepare it for service under the high structure.

Principal items of construction were as follows:

Placing of approximately 800,000 cubic yards of concrete.

Manufacture of approximately 1,600,000 tons of concrete aggregate.

Excavation of approximately 400,000 cubic yards of material for foundation purposes.

Installation of one 80,000 horsepower Generating Unit.

Installation of approximately 10,000,000 pounds of miscellaneous steel.

In addition, there was the usual form work, erection and dismantling of plant, construction of roads, and numerous other items incidental to the construction of a project of this size.

Personnel used on this project was recruited from the surrounding area as much as possible. A peak crew of 1250 was used on the dam. The project personnel department interviewed prospective employees. All

applicants selected were given a strict medical examination, and their physical condition as well as their past experience was considered in the assignment of work.

Before reporting for work, each employee was interviewed by the project safety engineer and job conditions and safety practices were explained to him. Each employee was made to understand that he had a part in the safety program, and was expected to carry his share of the load.

Construction problems were similar to those encountered in building any high dam, with a few exceptions. One condition that was different was the manufacture of concrete aggregate from rock containing an average of 65 per cent silica. Protective equipment was used, and to the best of my knowledge none of the employees engaged in the manufacture of aggregate were harmed by the exposure to silica dust.

Natural sand and gravel were not available in sufficient quantities near the dam site, so tests were made to determine whether the local rock was suitable for concrete aggregate. Durability tests were satisfactory in every way, but the rock was a metamorphosed sandstone composed principally of quartz, mica, and feldspar, and presented a serious silicosis hazard unless suitable control of rock dust could be assured to protect the men engaged in its manufacture.

The T. V. A. medical staff, in conjunction with Mr. L. P. Hatch of New York and T. V. A. engineers, worked out a program satisfactory from a health standpoint and economical to operate. It was then decided to develop a quarry and produce concrete aggregate on the job. The program developed was as follows:

1. All employees engaged in the manufacture of aggregate were given a strict medical examination, and X-rays were made before they were assigned to the work. If there was any sign of chest congestion, they were not allowed to work at the plant. They were X-rayed each six months while they were on the job, and again at the completion of the quarry work. This procedure

provided a permanent record of the condition of all employees engaged in this work.

2. Primary drilling was done with wet drills, and no dust was produced because of the water used in this operation. Secondary drilling was done with wagon drills and jackhammers using wet heads and tests were made regularly to determine the dust count surrounding each operation.

3. The quarry face was wet down where shovels were working and the rock was again sprayed with water when it was discharged from the trucks into the primary crusher. In addition to the water spray at the primary, a 6,000 cubic foot fan was installed to draw off the dust produced by the crushing operation.

4. In the crusher building where the secondary crusher, hammer mills, and screens were located, a 25,000 cubic foot fan was installed to draw off the dust produced. Hoods were mounted over all dusty points, and a complete duct system connected all dusty locations with the suction fan. A crusher plant is ordinarily a very dusty unit, but the dust system installed was so successful that practically no dust was visible, and dust counts proved conclusively that the air in this building was maintained well below the safe operating level.

Cost records proved that the cost of installation and operation of the dust control system was more than offset by the saving in costs of maintenance of the crusher equipment, and in addition provided a clean space for the workmen and made possible a much higher efficiency. Consequently, the dust control system was transferred to another T. V. A. project where there was no silicosis hazard, after the quarry work was finished at Hiwassee.

As a final precaution, all aggregate was wet down as it was conveyed by belt to the storage piles, and again when it was transported to the mixing plant.

The rock used to make concrete aggregate was hard to drill, fragmentation from blasting was poor, and many large boulders were present in each blast. When the quarry was first opened up, experiments were made to determine the most satisfactory size, and spacing of hole to secure the best results. From these experiments, it was decided to use nine inch holes spaced 24 feet from the face and 45 feet apart. These holes were loaded solid with 75 and 50 per cent dynamite to within 25 feet of the surface, and from four to twelve holes were shot in each blast. The quarry face varied in height from 100 to 200 feet, and in length from 300 to 600 feet. The largest blast contained 45,000 pounds of dynamite, and 160,000 tons of rock were displaced by this shot. The rock was spread over the quarry floor to a depth of from 10 to 30 feet, but at times it was necessary to trim the top of the quarry face to make it safe for the workmen to recover the rock blasted, and prepare for the next shot. The rock shot down in this operation piled up on top of the first shot and made a high face for the shovels to work against to lead out the rock. When large boulders were embedded in the face extreme care had to be exercised in loading to protect the workmen.

In the early stages of operating the quarry, two fatal accidents resulted from carelessness and improper planning. Those two accidents could easily have been avoided if the same forethought and caution had been exercised as was used on other occasions. Conditions much worse were handled safely by the same supervisors on numerous occasions after those two accidents. If we analyze the majority of serious accidents carefully, we reach the same conclusion.

Numerous safety devices were used to protect the workmen engaged in form building, and other work incidental to placing concrete in the dam. Before actual construction started, equipment needs and methods of construction were carefully analyzed from a safety, as well as an efficiency standpoint, and an attempt was made to provide all the safety equipment needed and as far as possible, incorporate this equipment in the design of the construction plant. The scaffolds, stairways, and walkways shown represent a considerable investment, but our cost records show conclusively that the investment was repaid several times from the added efficiency of the workmen, besides providing a safe place for the men to work.

The scaffold was rigidly attached to each form. It increased the cost of the form approximately 20 per cent, but we used these panels an average of 50 times and consequently, we could afford to install a rigid, permanent scaffold. We have checked the cost of handling these forms with the cost of private contractors on similar work, and the comparison was favorable to Hiwassee.

Dam, notwithstanding the fact that the scale of wages at Hiwassee was 10 per cent higher for the workmen engaged in handling forms.

Three cofferdams were used to divert the river during construction. Foundation excavation inside the second cofferdam was delayed due to an unexpected number of seams, and before concrete could be started in that cofferdam, the other blocks had been poured to a height of 125 feet. Three blocks in this area were poured to stream bed level and stopped, to be used for diversion of the river during the period required to raise the blocks in number three cofferdam. After all other blocks had been poured above the control gates, these three blocks were poured by using a steel gate upstream to block off one opening at a time. After concrete was placed in this opening to a depth of five feet, the gate was moved to the next opening, and the operation repeated, until the blocks had been raised to a point where the water flowed through the control gates. A foot bridge was used by the workmen to reach the low blocks and prepare them for concrete. No disabling injuries were recorded against this work.

One of the problems at Hiwassee was to sandblast and paint two penstocks, 18 feet in diameter and 300 feet in length. One-third of the length was level, and the balance inclined at 30 degrees. A scaffold was designed by one of the supervisors on the job. It was adjustable for either level or inclined sections. A considerable saving was effected by the use of this scaffold, and no disabling accidents were recorded for this work.

One of the necessities of safe operation on work which must be performed at night is good illumination. Accidents and low efficiency can be expected if extreme care is not exercised in planning the lighting needs.

Frankly, we copied every safety suggestion we thought we could use in our work. The point I want to bring out is that we cannot afford to require the men under our supervision to work without adequate safety protection. I am convinced that our safety program at Hiwassee Dam saved us many thousands of dollars above the cost of the

program. I am further convinced that a well planned safety program will save any construction organization far more than it costs if common sense is used in planning the program.

All T. V. A. projects have similar safety programs. At Hiwassee we held regular foremen's safety meetings, and at these meetings all supervisors attended and exchanged ideas to promote safety on the job. The construction superintendent, or his designated representative served as chairman of these meetings, and the project safety engineer pointed out various conditions on the job that could be improved. Supervisors were held responsible for the safety of all employees under their supervision, but it was pointed out that they could not shoulder this responsibility if they did not enlist the co-operation and interest of each employee under their supervision in safety.

The safety engineer, accompanied by one representative of each craft, patrolled the job weekly and corrected unsafe practices and conditions on the job. Following this patrol, the group met in the construction superintendent's office and discussed conditions on the job. All employees on the patrol were assured that management had a deep interest in safety and encouraged the interest of every employee in safety. If suggestions were made by members of the patrol, that could not be put in practice, a careful explanation was given to show why it could not be done.

Housekeeping was stressed in all meetings, and each craft was required to clean up and salvage all materials left over after completing any task and supervisors insisted that workmen maintain an orderly place to work.

Employees were instructed in the safe way to perform routine work and encouraged to participate in first aid training courses.

Weekly letters were prepared by the safety organization and mailed to all supervisors by the construction superintendent. These letters pointed out the conditions causing the majority of the accidents in that period, and made suggestions to eliminate similar accidents.

Food Section

Officers 1939-1940

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Vice-Chairman (Confections)—D. R. GRANT, Beech-Nut Packing Co., Canajoharie, N. Y.
Secretary—D. M. CLARK, Society of Grain Elevator Superintendents of North America, Chicago, Ill.

News Letter Committee—ROY L. ROLLINS (*Chairman*), A. E. Staley Manufacturing Co., Decatur, Ill.

E. L. ANDERSON, Penn Fruit Co., Inc., Philadelphia, Pa.

HUGO A. KLEMM, Industrial Commission of Wisconsin, Madison, Wis.

ROBERT B. McDADE, Atlantic Sugar Refineries, Ltd., St. John, N. B., Canada.

C. F. MOBERG, Kraft Cheese Co., Chicago, Ill.

Program Committee—H. J. ALDRICH (*Chairman*), Spencer Kellogg & Sons, Inc., Buffalo, N. Y.

C. G. BENDER, Kellogg Co., Battle Creek, Mich.

*S. B. HORRELL, Carey Salt Co., Hutchinson, Kansas.

ROGER A. GRANT, Asheville Baking Co., Inc., Asheville, N. C.

D. E. PRICE, Midwest Dairies, Inc., El Paso, Texas

A. E. SINCLAIR, Kingan & Co., Indianapolis, Ind.

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CLYDE T. STEPHENS, Interstate Cotton Oil Refining Co., Inc., Sherman, Texas

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M. O. ANDERSON, King's Packing Co., Nampa, Idaho

C. MEDINA, Bamby Bakers, Tampa, Florida

Statistics Committee—C. A. LINDER (*Chairman*), Booth Fisheries Corp., Chicago, Ill.

IRVING BEALL, Channel Pic Shops, Sacramento, Calif.

F. W. BRUCE, Southern Grocery Stores, Inc., Atlanta, Ga.

*W. A. SULLIVAN, Loose-Wiles Biscuit Co., Kansas City, Mo.

Health Committee—DR. WILMER H. SCHULZE (*Chairman*), Bureau of Environmental Hygiene, Health Dept., Baltimore, Md.

A. L. BROWN, Post Products Div. of General Foods Corp., Battle Creek, Mich.

L. E. STEINER, Pabst Brewing Co., Milwaukee, Wis.

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*Past General Chairman

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Health Committee—DR. WILMER H. SCHULZE (Chairman), Bureau Environmental Hygiene, Health Dept., Baltimore, Md.
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Sugar Industries Committee Chairman—A. M. SMITH, Godchaux Sugars, Inc., Reserve, La.

*Past General Chairman

TUESDAY AFTERNOON SESSION

October 8, 1940

The opening session of the Food Section was called to order by S. B. Horrell, General Manager of Operations, Carey Salt Company, Hutchinson, Kans., and Past-General Chairman of the Food Section, who presided. Chairman Horrell briefly welcomed

the delegates, and expressed the deep sorrow of the Section Members over the passing of Fred A. Webb, late General Chairman of the Section. A formal resolution honoring the memory of Mr. Webb was passed.

Safety Requirements of the Federal Food, Drug and Cosmetic Act

By J. O. CLARKE

Food and Drug Administration, Chicago

The Federal Food, Drug and Cosmetic Act endeavors to safeguard the supply of food, drugs and cosmetics consumed by the American public. It is intended to provide safety in three broad fields for all of these products—safety from the consumption of foods, drugs and cosmetics which might be harmful; safety from the consumption of those products which might have been produced under insanitary conditions or which might be filthy or decomposed; and finally, safety from an economic standpoint by establishing certain conditions which tend to prevent the public from being cheated.

In this discussion I am going to have to use some words such as "filthy," "decom-

posed," "putrid," "poisonous or deleterious substances," "dangerous to health," etc., which are quoted from the text of the Act. I would like it definitely understood, however, that these words are not descriptive of the output of the industries as a whole and it would be grossly unfair to even imply that all the products of the food, drug and cosmetic industries can be described by such terms. I know that manufacturers generally deplore practices which lead to a violation of the law just as much as do consumers or regulatory officials.

Since you are primarily interested in food, it will be my purpose to devote most of my time to the safety features of the Food,

Drug and Cosmetic Law as it relates to food. The term "safety" means a condition or state of being safe. The word "safe" means free from harm, injury or risk. When we bear these definitions in mind and apply them to the food sections, I think we can conclude that the underlying purpose of the Food, Drug and Cosmetic law is to provide a safe food supply for the American public. This means safety from the standpoint not only of bodily harm, which might result from the ingestion of a dangerous food product, but, in a much broader sense, safety from foods which are perhaps filthy or manufactured in insanitary factories, and safety from the economic standpoint in giving the public sufficient facts about their purchases to contribute to the safety of the food budget.

While the primary purpose of the measure is safety in the interest of the public, it is inevitable that in accomplishing this end a degree of protection will accrue to the industry in tending to prevent unfair competition. The fact that the Food, Drug and Cosmetic law sets up certain basic requirements which every manufacturer must meet makes it safe for the individual manufacturer to assume that his competitors have to meet these same requirements. As a simple example, the law requires butter to contain 80 per cent of butter fat and to be full weight. The butter manufacturer, therefore, puts 80 per cent of fat in his output, sees that it is full weight and knows that his competitors are doing the same thing or will have to answer to the authorities.

From the standpoint of safety, as it relates to the protection of the public from physical harm, probably the requirement relating to poisonous substances in food is the most important. This section deals in its broadest aspects with possible abuses in the production of food whereby the product may become contaminated with poisonous or deleterious substances or may contain such substances as natural ingredients. This section is brief and is important enough to justify quotation: "A food shall be deemed to be adulterated if it bears or contains any poisonous or deleterious substance which may render it injurious to health; but in case the substance is not an added substance such food shall not be considered adulterated under this clause if the quantity of such substance in such food does not ordi-

narily render it injurious to health; or, if it bears or contains any added poisonous or added deleterious substance which is unsafe within the meaning of Section 406." It is interesting to note that a corresponding section of the Food and Drugs Act of 1906 confined the prohibition to added poisonous and deleterious substances and provided no control over poisonous and deleterious substances occurring naturally in some foods.

There are not very many foods which contain poisonous substances naturally. They are of sufficient importance, however, to justify a measure of control in the interest of public safety. For instance, some legumes contain toxic quantities of hydrocyanic acid and, as most of you know, certain types of wild mushrooms are deadly poisonous. The Food and Drug Administration is investigating at the present time another natural poison in food which may have serious implications. I refer to the absorption by some plants in certain areas of toxic quantities of selenium. This poisonous element is found in not only the plants grown in the so-called seleniferous areas but investigations so far indicate that eggs produced in the area contain selenium which probably comes from the food eaten by the chickens. Possibly, although this has not been shown definitely to be a fact, the meat of fowl and animals from this area will also contain selenium. Fortunately, these so-called seleniferous areas are not very productive of commercial food but the matter is of sufficient significance to justify the rather complete investigation which is now being made by the Food and Drug Administration.

Section 406, referred to above, authorizes regulations having the full effect of law to aid in the enforcement of the provision against added poisonous and deleterious substances in food. These substances are prohibited entirely if they are not necessary in the production of the food and, if they are necessary, they must be limited to an amount which is not dangerous to public health.

One might logically inquire into the reason for prohibiting by statute the addition of poisonous or deleterious substances to foods, since one might think that no manufacturer in his right mind would indulge in such a practice. In the modern production of food, however, it is sometimes necessary that poisonous substances be used or it would be impossible to produce the food in ques-

tion. For example, it would be utterly impossible in certain sections of the country to produce a crop of apples without the use of sprays to protect the crop from being ruined by insects. The law, however, places the safety of the public first and requires that when such poisonous substances are used they must be limited to such an amount as will not be harmful when the food is consumed. Probably the most important classes of substances which Congress had in mind were spray residues or fumigation residues, which might remain on food products after spraying or fumigation, poisonous preservatives and perhaps a few other minor items which might be necessary in the production of food.

We should bear in mind when we say "poisonous" or "deleterious" substances that we are dealing not only with substances which might be present in sufficient quantity to cause acute illness or death but with substances present in small amounts which may by their cumulative effect ultimately damage the health of the public. Personally, I have encountered only a few substances where a food product contained a sufficient amount of a poisonous or deleterious substance to cause acute illness. I have never encountered a food product in interstate commerce which contained enough of such substance to be fatal. In making this statement I am excepting certain bacterial toxins which occasionally develop in food and which I will deal with further on in this discussion.

With respect to food products containing substances which might cause chronic poisoning, I believe that the net result of the enforcement of the Food, Drug and Cosmetic law and its predecessor, the Food and Drugs Act, has been to largely remove these types of substances from the market. This does not mean that we never find food contaminated with poisonous substances. We do and it is necessary frequently to proceed against foods which are unsafe because they do contain a poisonous ingredient.

Probably the requirements of the law dealing with sanitation in the production of food in its broadest aspects are of equal interest in the eyes of the public with those sections which deal with poisonous or deleterious contamination. Two or three short, comprehensive sentences in the Act cover the entire subject. These sentences can be

further condensed into the following statement:

Food which consists in whole or in part of any filthy, putrid or decomposed substance, or which is manufactured or stored under insanitary conditions, or which consists in whole or in part of the product of a diseased animal, or one that died otherwise than by slaughter, or which is otherwise unfit for food, is adulterated. These few phrases cover first, things which might happen to a food product during its preparation for the market that might cause the development of dangerous bacterial poisons, and second, things which offend the sense of decency. Fortunately, in comparatively few instances do we find poisonous bacterial substances resulting from insanitation and most of our work in this field deals with practices which offend the sense of decency.

Among the classes of foods which formerly were sometimes found contaminated with bacterial toxins are certain types of non-acid canned foods in which bacillus botulinum occur. Some 15 to 20 years ago there were a number of deaths due to the consumption of foods contaminated with this organism. There has not been an outbreak, however, in commercially canned domestic foods for the past 15 or more years, although all too frequently deaths are caused by home canned foods which have not been properly processed to prevent the development of this bacterial toxin. Food officials and the canning industry, naturally, are constantly on the alert to prevent this kind of food poisoning. It requires no stretch of imagination to contemplate the disaster which would result if lots of canned food should be shipped throughout the country contaminated with these deadly organisms. I should also mention bacterial food poisonings which occur from time to time, which make a great many people sick but cause very few fatalities. These occurrences, usually of local significance, frequently involve bakery products of the cream-puff type, which become contaminated with certain harmful bacteria during their preparation. These outbreaks usually occur during warm weather and nearly always are the result of insanitation in the producing process.

Of first significance from a safety standpoint we consider, of course, insanitary practices which are likely to produce sickness or death. Fortunately, these serious results

occur comparatively infrequently and a great deal of the work of the Food and Drug Administration is concerned with the production of foods under insanitary conditions or under conditions whereby the food may become decomposed or rotten. In the production of foods the producer wages a continuous battle to prevent contamination with filth and decomposition. In the case of foods which are marketed essentially in their natural state the journey from the farm to the market is accomplished as quickly as possible and the product is usually protected by refrigeration from the time it is loaded into a truck or freight car until it is sold to the consumer. Decay or decomposition in this class of food is obvious to the consumer and there is need for less supervision on the part of the food officials than in those classes of foods which are processed to a greater or less degree. The original Food and Drugs Act of 1906 merely condemned filthy, putrid or decomposed foods but did not attempt to exercise control of the sanitary conditions under which the product was manufactured. The Food, Drug and Cosmetic Law, however, does attempt to establish control over sanitation in food manufacturing plants.

Examples of food products on which it has been necessary to take action in the recent past on account of having been produced in insanitary factories or on account of filth and decomposition are: flour infested with weevils in the areas of consumption, corn meal manufactured in insanitary plants and from raw material contaminated by rodents, butter manufactured from decomposed cream, candy manufactured in insanitary factories or which has been stored under improper conditions and allowed to become insect and rodent infested, fish which is decomposed or infested with parasites in the flesh, etc.

I hope you will not get the idea that all food of the classes which I have mentioned are manufactured under insanitary conditions or are filthy or decomposed, for such is far from the case. The fact that we have found it necessary to inaugurate action under the law indicates, however, that some lots of each of the above classes are improperly prepared, although by and large the food products furnished the American people are not filthy or decomposed or have not been prepared under insanitary conditions. These instances, which are usually

exceptions to the rule, merely indicate the wisdom of Congress in providing a means of safeguarding the public from the consumption of foods of this character.

In my judgment, safety from the consumption of filthy or decomposed food is of paramount interest to the public. In fact, I sometimes think that the average housewife is more concerned about sanitation in food factories than she is with either the economic features of the law or those features which more directly safeguard the health of the public. The housewife assumes that foods are free from filth and decomposition because this aspect of food production has been emphasized not only by home training but by the advertisements of food producers themselves. The housewife has a feeling of security because the law requires food to be produced in sanitary factories and she assumes that the law is enforced. It is the endeavor of the Food and Drug Administration to justify this assumption. I think the same thing is true of most of the manufacturers of food products.

However, a third class of acts, which are prohibited by law, involves economic considerations; acts which would tend to cheat the public and which would create unfair competition in the industry. Such things, for instance, as the admixture of inferior and cheaper materials in foods, such as the addition of water to butter, the substitution of cotton seed oil for olive oil, and the like. The economic features of the law provide for full weight and measure and require packages of food not to be deceptive.

All of these requirements are inevitably tied in with the labeling and for this reason the label on a food product might in itself be considered a safety device. One of the requirements in regard to labeling makes it necessary on certain classes of food to list the ingredients. Some manufacturers have thought that the public might gain the impression that the listed substances were debasing ingredients. This is, of course, far from the truth. The evident intent of Congress was to provide a type of labeling which would enable purchasers to buy intelligently and selectively, and exercise free choice where a preference existed for some particular ingredient, instead of proceeding blindly. I am quite sure that the public already realizes that this is the purpose of this requirement of the law.

Probably the most important requirement is that labeling must not be false or misleading in any particular. This is a very broad statement which prevents misrepresentation on the labeling of all food products. The labeling on a food serves a two-fold purpose. To the manufacturer it gives an opportunity to present a sales argument. To the public it gives an opportunity to find out what he is buying. When these two purposes of the label are considered and we bring into the picture the requirements that the labeling cannot be false or misleading in any particular, we realize that to the industry it provides a medium of transmitting essentially guaranteed information and to the public it gives confidence in the statements appearing on the labeling. Thus, I think we are correct in concluding that the labeling on a food product constitutes a very potent economic safety measure both from the standpoint of the public and of the industry.

Eliminating Accident Hazards in Soybean Processing

By DR. ALEXANDER SCHWARCMAN

Research Chemist and Director, Spencer Kellogg & Sons, Inc., Buffalo, N. Y.

(Editorial Note: Dr. Schwarzman spoke extemporaneously, but the following summary of his talk has been prepared and has his approval for publications.)

The development of the soybean industry in the United States is well-nigh sensational. A native of eastern Asia, it represents one of the oldest crops in history. Soybean oil was introduced to America at the end of the eighteenth century. During and after the World War, the soybean attracted wide attention especially from the United States Department of Agriculture and state agricultural institutions.

Today over two thousand types of soybeans are known and about a hundred varieties have been adapted to American conditions. The growth of the soybean crops in the United States has been phenomenal. From 1927 to 1938 the production increased from 7,000,000 to 60,000,000 bushels. The planted acreage increased from 50,000 acres in 1907 to 5,500,000 acres in 1938. In 1939 the yield amounted to over 80,000,000 bushels.

The oil is produced by hydraulic presses, expellers, and solvent extraction. It possesses

One other safety feature of the Food, Drug and Cosmetic Act deserves mention at this point. It is the authority conferred on the enforcing agency to establish standards of identity, quality and fill of container for foods. These standards, after they have been promulgated, have the full force and effect of law. Naturally, under these conditions the measure throws safeguards around the promulgation of such standards and requires that they be announced only after formal public hearings. Under certain conditions the announced standards are subject to court review. The importance of standards for foods cannot be overestimated either from the standpoint of the public or of the industry. For the public it provides an assurance that an article of food, regardless of the brand and regardless of the price, complies with certain definite standards. To the industry it provides a freedom from unfair competition.

fairly good drying properties and has been found useful in the manufacture of paint, varnish, linoleum, and allied products. The hydrogenated oil is used extensively in the production of shortening and margarine. Neutralized and deodorized, it yields a fine salad oil. Roasted soybeans are now competing with other well-known roasted nuts.

Soya flour as food for human consumption is developing rapidly; containing no starch, it is an invaluable food for diabetics. Soybean cake is rich in protein and is extremely valuable for cattle-feed and for hog feeding. It is also a valuable food for poultry, dogs, foxes, and other small animals. Various parts of the soya cake are now being used for the production of plastics, adhesives, sizing, etc.

Explosion hazards in connection with the production of soybean oil are principally due to two sources: one is due to the extraction solvent process when a flammable solvent is used, such as petroleum ether, benzol, gasoline, etc. Here the remedy is simple, namely: non-flammable solvents, which are now being produced on a large scale, should be used. Such non-flammable solvents are tri-chloro-

ethylene, tri-chlorethane, carbon tetrachloride, and especially ethylene dichloride, which is now being manufactured on a large scale in this country and is available in tankcar lots at low prices.

However, when flammable solvents are used, most severe engineering precautions must be taken to avoid fire.

The second source of possible explosion is in the grain elevators where soybeans are stored. In elevators handling soybeans, the Safety Code for the prevention of dust explosions in grain elevators, as prepared by The Dust Explosion Hazard Committee of the National Fire Protection Association, should be followed. In plants grinding or milling soybeans or preparing them for

processing, the Safety Code prepared by the same Committee for the prevention of dust explosions in flour and feed mills should be followed.

Soybean elevators and buildings, in which grinding, milling or other preparatory processes are performed, should be segregated from other sections of the plant and should have vents in the walls or roof to release explosion pressure without structural damage. Dust collectors should be installed outside or vented outside of the buildings.

Where hazardous solvents are used, consideration should be given to the practicability of installing instruments which will detect the presence of flammable vapors and give warning as to approaching danger.

TUESDAY EVENING SESSION

October 8, 1940

Through the courtesy of the Glidden Company of Chicago, the members of the Food Section were afforded an opportunity to visit their Chicago Plant and to observe the manufacturing operations of soy-bean meal and oil. Following the plant tour, a special supper was served to delegates who were grouped at tables where special discussions of Food Safety subjects were carried on during and after the service. The list included:

Baking Industry—Group Leader: R. C. Haven, Safety Director, Continental Baking Co., New York City.

Beverage Bottlers, Brewers and Distillers—Group Leader: Ray M. Seeker, Director of Personnel, Anheuser-Busch, Inc., St. Louis.

Canners and Grocers—Group Leader: C. C. Ruddick, Safety Director, H. J. Heinz Co., Pittsburgh, Pa.

Dairy Products—Group Leader: E. G. Quesnel, Director of Safety, Borden Co., New York City.

Milling Industry—Group Leader: George T. Peckham, Jr., Supervisor of Research, Clinton Co., Clinton, Ia.

Sugar Refiners—Group Leader: A. M. Smith, Safety Director, Godchaux Sugars, Inc., Reserve, Ia.

Tobacco Products—Group Leader: Charles F. Francke, Superintendent, Axton-Fisher Tobacco Co., Inc., Louisville, Ky.

Other Food Industries—Group Leader: S. B. Horrell, The Carey Salt Co., Hutchinson, Kans.

WEDNESDAY AFTERNOON SESSION

October 9, 1940

The session was planned as a Panel Discussion of miscellaneous problems in the prevention of accidents in the Food Industry. The Discussion Leader was General Chairman R. C. Haven, Safety Engineer,

Continental Baking Company, New York City. Chairman Haven called attention to the distribution of blank cards upon which it was suggested that delegates write any questions which they might wish discussed

by the Panel of Engineers and the general audience.

Chairman Haven then introduced the members of the Panel, as follows:

A. L. Brown, Chief Engineer, Associated Factory Mutual Fire Insurance Companies, Boston.

Arnold L. Brown, Superintendent, Industrial Relations, Post Products Division, General Foods Corporation, Battle Creek, Mich.

H. H. Kelly, Chief, Section of Safety, Bureau of Motor Carriers, Interstate Commerce Commission, Washington, D. C.

S. E. Whiting, Vice-President & Consulting Engineer, Liberty Mutual Insurance Company, Boston.

Tom A. Burke, Executive Vice-President, Greater New York Safety Council, New York City.

E. G. Quesnel, Director of Safety, Borden Company, New York City.

CHAIRMAN HAVEN: Gentlemen, this Panel has been selected because of the wisdom of its personnel, and these "wise" men have just been waiting to tell you what you should know. Seriously, we hope they have all the answers, and if they haven't, then we will call upon you delegates to help us out. I have received a number of suggested questions, and as we progress I want you to send others to me as fast as you think of them.

Here is the first question, and I am going to ask Mr. A. L. Brown to answer it: "What has been your experience with the water spray for fighting oil fires?"

The Water Spray

A. L. BROWN: The water spray is a relatively new development in fire fighting, and for our discussion here we can think of it as of two types, fixed equipment and portable or hand equipment. The biggest use is probably in the fixed equipment so far. These are put in for oil hazards, or when the oil hazards are the type of transformer protection, and in some cases for high pressure oil lubricating systems in power plants. Those are probably the two largest uses of fixed water spray systems. Some have been put in for tanks of flammable liquids, if you call them such, the

heavier flammable liquids, asphalts and coating materials. In general, these systems are not developed to a point where they are applicable for the most hazardous materials, such as gasoline.

The actual field experience has been rather limited, but enough test work has been done by the people who developed these systems, probably the most by the originators, Mather & Platt in England, and then the Grinnell Company in the United States, and the Spray Engineering Company and the Fog Nozzle Company; so that they are competent to lay out and install systems adequate for the protection of transformers and, as I said, high pressure oil systems. The portable nozzles are being used quite generally by fire departments and more and more by plants in their own private fire brigades. They are usually supplementary to some other type of protection.

The spray, contrary to what used to be thought, is very effective on burning oils, when these oils are of a type as heavy or heavier than kerosene. Probably that is as good a dividing line as you can have today. They are not very good on gasoline, ether, benzol, but they are very good on materials such as lubricating oils or transformer insulating oils, asphalts, vegetable oils, animal oils, most of which are rather high flash point.

One question which usually comes up in the Safety Congress is the danger of applying water spray to live electric equipment. As I said, one of the big uses is for transformer and oil switch protection. Tests which have been made indicate that the spray itself is almost non-conducting, so that there is little danger to the operator of a spray nozzle if he is at a reasonable distance away from quite high potential equipment. The spray is very fine. The drops are individual drops, and for that reason the spray stream is very resistant even to high voltages.

The objection to the use of spray on live equipment is usually the indirect hazard to the operator. It is not advisable to put water on any live electric equipment which has much energy behind it, because of the possibility of some other break-down and very severe electric disturbance which may throw oil around or produce very high temperatures, which will injure the operator

in that way and not by conductivity of the spray.

Perhaps I should have answered this question very briefly in the beginning by saying that the actual field experience with spray systems has been very limited. A number have been put in but the times they have been called upon to operate have been very few. I do not know of any cases where there have been any failures reported.

Personality and Accidents

CHAIRMAN HAVEN: I am sure that you answered that question to the satisfaction of the man who sent it in.

Now, here is a man who sends in the question, "How does personality affect your accident record? What traits do you think are the primary causes of most accidents: faulty attitude, impulsiveness, irresponsibility, failure to pay attention, fear or nervousness, worry or depression?" Arnold, I think that you are well qualified to answer that question.

ARNOLD L. BROWN: You say that is an easy question but I would say it is a pretty tough one because everything you have mentioned will cause accidents. I really think, though, that the one thing that will cause more accidents is impulsiveness. The impulsive person does not stop and think. If he sees an empty box on the line, or something of that kind, he reaches in for it right away; he is the man who is going to have an accident. He won't wait to stop the machine.

Also I think a good illustration of that is your driver. How many of you fellows have had one wheel drop off of the shoulder of a concrete road and had to fight yourself from just pulling that machine right back immediately? Many automobile accidents happen that way.

Of course, the wrong attitude can cause anything. It can cause accidents or labor difficulties or anything.

CHAIRMAN HAVEN: Then your answer is that personality does enter very distinctly into that?

MR. BROWN: Yes.

CHAIRMAN HAVEN: Mr. Kelly, here is one for you. This man says, "We are struggling with the log required by the Bureau of Motor Carriers in connection with interstate hauling. How much detail is required?"

I. C. C. Drivers' Log

MR. KELLY: There may be some happy men here who do not know about the I.C.C. drivers' log, so I will take one minute and give you the background on it. It isn't a log of the Bureau of Motor Carriers. It is a log required by the Interstate Commerce Commission itself. It is required to be maintained by drivers of interstate busses and trucks. It embodies a new principle in that type of record. In place of a sheet of paper on which a driver has been accustomed to writing entries by the hour of his various types of work, this is a sheet that has nine horizontal lines, on which the driver, by writing just a line through various spaces, shows the type of his activities.

Now it looks complicated. In reality it is extremely simple, and the surprising thing I have encountered in talking to a lot of people and carriers about it is that they are making it deliberately complicated. They are making it more complicated than is necessary. Here is the principle.

The log covers twenty-four hours of the day, which is a calendar day, twenty-four hours with little spaces to indicate. (Illustrating.) Here is the noon in the middle. Now the first line is marked "off duty." So I am a driver and I started on my job this morning at seven o'clock. I reported to the garage. I take my pencil and just run it right through this line up to the figure "seven." That means, then, during those seven hours I was at home or off duty and at that time I came on the job; and I will say that for the first half hour I helped to load the truck. So down here comes the line, starting on this line "five" and it goes on for a half hour. Then I started to drive, and I drove for an hour until breakfast; and then I drove for three hours and that takes me up to noon, and then a half hour for lunch, and so on with the driving until the end of the day.

Last week a man came to see me in Washington. He had prepared a log for what he called the hardest run in his set-up. He told me that this driver for twelve years had been working as follows: He reports every day at four o'clock in the morning and he quits every evening at seven, fifteen hours a day, six days a week. That was his story and he insisted that that had been the

operation for twelve years, despite my question as to what the wife had thought about it for the twelve years. He had taken that driver's run, full of little delivery stops, stop—that the man is making to grocery stores all through the area near Washington. These jags were so close it looked just like a comb. I explained that that was too much detail and entirely unnecessary. The important thing for that man was to run that line until four o'clock when he came on duty and to show him going to the terminal. He can mark a half hour in the terminal, and then if he has a period, say, of two hours of driving with intermittent stops, if I were the driver, knowing what the Commission is after, I would mark two hours for driving and then compensate for a half hour to make up the total of these little stops that the man is making in the store; then again for driving, the net objective being to make at least an honest report of the main points for the day, his time off duty, his time on duty, and his time of driving.

CHAIRMAN HAVEN: That was a very good description. Are there any questions?

A. G. McMAHON (Western Flour Mills, Liverpool, Iowa): Are private carriers operating interstate required to keep logs?

MR. KELLY: Effective October 15, they are required to keep logs if they are operating outside an exempt area. Now it is well to keep that area in mind. These safety regulations do not apply in such areas, namely, municipalities like the city of Chicago and contiguous municipalities, that is, the adjoining municipalities around the perimeter of Chicago and a commercial zone. In the case of the city of Chicago, it runs out for some little distance, and a map is available showing what the commercial zone of Chicago is; therefore, any truck that never goes outside of that commercial zone does not have to keep a log. If the driver does go out into what may be described as long distance operation, then he must keep a log.

Electric Burns

CHAIRMAN HAVEN: Now here is a gentleman who wants to know, "Why can a small electric burn cause death when large burns from flames do not?" Mr. Whiting, that is right down your alley.

S. E. WHITING: People do not die from burns primarily—according to the advice I get from medical men—and electricity typically gives a small, what is called puncture burn. That does not in any way jeopardize life. Men may have their hands burned off by electric shock without being killed. The thing that kills the individual is the electricity going through the inside of the body, which ordinarily flame burns do not do, and they are killed by the stopping of some vital function of the body. Two recognized by medical authorities are stopping of the so-called respiratory centers that make you breathe, and stopping the rhythmic action, or the beating, of the heart. Therefore, the burn is no criterion as to the severity of the electric shock.

CHAIRMAN HAVEN: Here is one that I am going to fire at Tom Burke. "How large should a plant be before it has a house organ? What part should safety play in a house organ?" Tom, you have had a lot of experience along that line.

House Organs and Safety

T. A. BURKE: How large should a plant be before it has a house organ? I think a house organ can start almost any time and the sooner the better. It does not have to be a printed house organ in any sense of the word. A plain letter or a mimeographed bulletin may turn out to be the finest house organ imaginable. After all, the objective of a house organ is to promote good plant relations, and a mimeographed bulletin, in the absence of facilities to get out any other type, will do the business. My recommendation on that would be that they start the house organ regardless of the size of the plant. Then when you realize that there is a need for a house organ for plant relations, go ahead with a more elaborate house organ.

What part should safety play in a house organ? As a safety man, my first inclination is to say it should take up most of the magazine, but as an editor I wonder if that is the right answer. There is no definite measuring stick in a matter of this kind excepting a fine sense of balance which we should have. If you fill a house organ magazine with too much safety, fine and noble as it is, you defeat your own objective. Keep the proportion in mind, and I would say, offhand, that it should not run more

than 10 or 15 per cent of the magazine, possibly 20 at the outside, unless, of course, it is a safety publication. I notice someone has a copy of one of the National Safety Council publications, *Public Safety*, which is all safety, nothing else but safety. But in the average house organ where you want to make a better feeling among your employees, to make them more loyal, more efficient, I would try to strike a fine balance and keep it not over 20 per cent on safety.

CHAIRMAN HAVEN: We have completed my questions to our panel. Now we are ready to receive questions from the floor.

H. J. ALDRICH (Spencer Kellogg & Sons, Inc., Buffalo, N. Y.): Can a water spray system be applied to all kinds of oil?

A. L. BROWN: It can do effective fire fighting when applied to practically all types of oil. Some people think of oils as going way down to gasoline; other people think of the heavier oils. Water spray will behave differently on different types of oil, and it will behave differently depending on the temperature of the oil. The temperature may have been a normal temperature when the fire started; it may be the temperature which has developed as a result of the fire. Whenever you apply water to any hot oil you get a certain amount of foaming and overflowing; so that in the layout of the system or even in manual fire fighting you have to keep in mind that if you have an oil which in burning reaches a high temperature, or is well above the boiling point of water when you apply the water to it, even a spray, you are likely to get foaming and you must be sure that the application has been such that it puts the fire out before the oil may overflow and spread beyond the zone of protection.

If you want to consider lighter liquids, the behavior of water is different on different liquids; for instance, alcohol behaves quite different from gasoline and it may not seem to be as effective; but I think that as a general answer to your question I can say that water can be applied effectively to everything we think of in the nature of an oil to put out fire.

MR. ALDRICH: I am interested particularly in vegetable oils and particularly linseed as compared with petroleum oils.

MR. BROWN: Vegetable oils and lin-

seed oil are much more likely to give trouble from foaming than do the mineral oils. In applying spray to a linseed oil, it is very important to keep that in mind. It can be even quite dangerous to an operator to attack a linseed oil fire with equipment that is too small, because the water can cause that oil to overflow while it is still burning and it can overflow quite violently and make quite a fire. If the operator has not been able to get the fire out before that overflow occurs, he may have quite a serious set-up there. If you are making a fixed system for protecting the kind of an oil, you either have to have, we will say, an equivalent of a dike or a confined area, or you have to be sure that your arrangement of spray nozzle is such that it will snap the fire out very quickly before it has overflowed, or else have the protection cover the entire area into which the oil may overflow.

Take transformers, for instance. A great many times transformers are quite hot before they get into trouble and it is possible that you will get quite an overflow of oil. It is customary to have the transformer arranged in a small enclosure so that if the oil overflows it will be confined and not spread over a big area. In that case the spray system is laid out so that it will protect the entire area which the oil may reach.

Tail Lights for Wagons

CHAIRMAN HAVEN: Van Quackenbush, of the Minnesota Valley Canning Company, Le Sueur, Minn., would like to have ideas for tail lights on wagon trailers. It seems that Minnesota requires a tail light on wagons. Do they still use wagons up there in Minnesota?

VAN QUACKENBUSH: We do in our operations in handling peas, that is, carrying them from the farm over to the binder.

H. H. KELLY: Is a wagon a motor vehicle, Mr. Haven? As you probably know, a few large truck fleets still believe in carrying some oil-burning lanterns on the rear of their equipment. One of the best examples is the U. S. Trucking Lines, out of Cleveland, one of the largest fleets in the country. They still insist on three lighted red oil-burning lanterns strung in addition to all the electric lights that our regulations require. They hang them on the rear con-

nected to a chain laterally across the back of the closed body, about three or four feet below the top. How they would hang them on a wagon I do not know.

MR. QUACKENBUSH: These wagons, you understand, go over gravel highways; there are no springs, of course, and they just continually bounce up and down.

MR. KELLY: That is because of steel tires on the wheels?

MR. QUACKENBUSH: Yes.

MR. KELLY: I have in the audience two safety inspectors of the Interstate Commerce Commission. I should like to ask them if they have come across any wagons. Mr. Sanford or Mr. Cox, have you seen any wagons in operation by any truck operators in this area?

H. C. SANFORD (Interstate Commerce Commission, Bureau of Motor Carriers): I have seen some kerosene lamps, some of the old type model Ford kerosene lamps on some farmers' wagons.

MR. KELLY: How are they mounted?

MR. SANFORD: Usually with a piece of baling wire.

CHAIRMAN HAVEN: Mr. Kelly, the chair objects to the way he said "baling wire." There was a little indication that he does not have much respect for baling wire. Would you kindly have him elucidate a little?

MR. KELLY: Mr. Sanford, would you tell us something about the use of baling wire in the trucking industry?

MR. SANFORD: Prior to working for the Commission, I worked for a trucking company. I found that one of the most valuable things any of my men could have in a kit of tools was a coil of baling wire. It can serve any kind of function that will aid in causing a distressed vehicle again to be placed in operation, from the splicing of a front axle to replacing wire or fuses in the electric system.

MR. QUACKENBUSH: We have a number of wagons that operate out of each of these binder stations and they do not know exactly which wagon is going to go out. Somebody will take the first wagon that is handy. We tried an extension cable, quite similar to the light on the rear of a car. That seems to be the nearest thing that we have found. It has to be something that

is detachable and can be taken from one wagon to another. We have tried everything else, for instance, large electric lanterns. We tried to attach them to the back but they shook off. It is really quite a problem, because these wagons are out on the highway after dark, there is lots of dust, and accidents could happen that would be very bad.

CHAIRMAN HAVEN: I am sure the hazard is very great. Using so many wagons up there, I should think that your district could act as sort of a proving ground in solving that problem. It must be a common problem where they have that type of equipment.

RAY M. SEEKER (Anheuser-Busch, Inc., St. Louis): Many years ago they used prestolite cylinders. I wonder whether that could be the solution, using the old prestolite lamp, fastening it on your truck like you would clamp on a fire extinguisher with a strap clamp that could be moved from one wagon to another? It might work out, but the penetrating power of your beam is another thing that you will have to consider.

Dust Cleaning Equipment

R. L. STEPHENSON (U. S. Hoffman Machinery Corporation, New York City): We make industrial vacuum cleaning equipment to many plants where they are handling combustible dusts such as are found in the grain industry. The purpose of the equipment is to minimize the fire explosion hazard, among other things. I think it is the consensus in the insurance business, that static dust, the fine dust that lays in the plant, usually is responsible for the most serious part of the explosion, and if that were not there to support a secondary explosion, many serious fires would be averted or minimized.

Now, there are many plants that have this fire hazard and that are interested in vacuum cleaning equipment. But they find that their first insurance companies will not give credit for cleaning the plant up and getting this fine overhead dust out of the plant. They give credit for good housekeeping and for the fact that the fire hazard has been reduced, but they won't give a man credit for installing vacuum cleaning equipment.

I should like to ask Mr. Brown why it is not given?

A. L. BROWN: Well, I am not in the underwriting end of the business and I do not know just why and how various rates are set up. But I can give you satisfaction to the extent that I think your idea is right. A man should be entitled to credit, but not just in the way that you would like to see it.

From our own loss prevention point of view, the problem becomes extremely difficult when you try to arrange credits for everything that a man may do to reduce his hazard. There is a difference in insurance organizations. Some organizations give credit for fire extinguishers, some give credit for different types of fire doors. It is really a question of policy, as to whether that is the best way to carry on fire prevention work or some other way. We really think that the best way is to get the plant interested in fire prevention and to do many of these things from its own interest standpoint. That is our policy.

Insurance isn't a penalty on anyone, and if it isn't a penalty, why try to reduce it in dollars and cents? I do think that as far as most insurance organizations go, they would urge people who have dust hazards to keep their plant clean, maybe with a good vacuum cleaning system, although it is the end that is sought and not the means. For instance, we think it is much better, if possible, to keep the dust from escaping than it is to let it escape and then clean it up; but you cannot always do that and there are many places where we have advised vacuum cleaning equipment.

I will reply to your question, too, about the type of dust hazard. The large, very serious explosions with which you are all acquainted, probably the worst of which occur in grain handling plants, are probably due to the secondary explosion resulting from this dust which has gradually accumulated over the structure and walls and which is liberated by some initial disturbance, either mechanical or a local explosion. In other types of industrial plants, of course, it is very possible to have serious explosions inside of equipment which is dusty at all times; so that I could not say that the only dust hazard that exists is that from a general accumulation of dust. That may be the greatest in magnitude but it isn't the greatest in number, because there are lots of pulverizing, grinding, sifting processes of heavy equipment where you

cannot well avoid having a dangerous condition inside of the equipment itself.

P. L. BACHMAN (General Mills, Minneapolis, Minn.): I wonder if he isn't getting the rate mixed a little there. Ordinarily your rate credit is on fire insurance, and our experience has been that dust is strictly an explosion hazard. From what I can find out—although the fire rates are, of course, experience rated and depend on protecting devices, etc.—explosion rates do not receive credit for protecting devices particularly.

A. L. BROWN: There again you get into an underwriting problem, and as far as my work is concerned, the explosion is included with the fire.

MR. BACHMAN: Not in all cases.

MR. BROWN: Not in all cases, that is right; and we also make a distinction in the type of explosion. When I say "explosion" I am thinking of the type which has been mentioned, the dust explosion which is a combustion explosion, and not in any way the explosion of pressure-containing equipment like a steam boiler or pressure air receiver. In our particular line of work the dust explosion, the combustion explosion, is included in the fire insurance.

Effect of Electric Current

R. C. BURROW (Liberty Mutual Insurance Company, Louisville, Ky.): I am frequently told that it is not as essential to ground direct current as it is alternating current. I would like to know if it is just as essential to ground direct current; and what is the difference if any between the action of alternating current and direct current on the human body?

S. E. WHITING: Some electrical experts insist that there is a distinction between alternating current shock and direct current shock. Our experience has not supported that. We have had fatal shock from both alternating and direct current shocks. The reason grounding has been more prominent in alternating current systems and more emphasized by the National Electrical Code is that most alternating systems are fed from high voltage systems through step-down transformers, and under such operating conditions there may be a cross between high voltage transmission or distribution system and low voltage utilization system at that transformer conversion. So

the codes develop grounding protection primarily on alternating systems. The direct current systems are not transformed down and are not connected with high voltage generation or transmission.

MR. BURROW: Is there any difference in the effect of the two currents on the body?

MR. WHITING: That is where there is some difference of medical opinion. It has been alleged that there is greater danger from the alternating current. Unfortunately, we have not been able, as engineers, to get enough experimental subjects to try the thing out on, and the criterion in any case is the human experience. All I can say with assurance is that we have had deaths with the same voltage from either direct or alternating, in spite of the tendency to consider alternating current shock more severe than direct. I do not think that distinction between the two is the dominating element in the hazard.

Wrong Attitude—?

ROY L. ROLLINS (A. E. Staley Mfg. Co., Decatur, Ill.): There was some mention of accidents caused by wrong attitudes, and I wonder if that isn't a reappearance of that old word "carelessness." We have gotten away from saying that accidents are caused by carelessness. Now what do we mean when we say that an accident is caused by wrong attitude? It is very convenient to say that it was all the man's fault because his attitude was wrong, but what do you mean?

CHAIRMAN HAVEN: Mr. Brown, we will give you first whack at that question.

ARNOLD L. BROWN: Well, by wrong attitude I would say you mean that the man comes in in the morning hating himself and hating the firm and he just is not going to be careful. He is going to do everything that his foreman does not want him to do and everything that he thinks will hurt the firm.

MR. ROLLINS: It seems to me that if we as safety men look at accidents in any way except that we could have prevented them, we do not stand much chance of solving our problem. I mean that if an accident happens in my plant I see it this way: I am primarily responsible because my job is to keep that accident from happening. If I put the blame on someone else and say it

is the man's fault, I do not think that I am approaching my job correctly, and can't we do something about this attitude?

MR. BROWN: Certainly, that is the place you can do the most. Don't put the blame on the man who has the wrong attitude; put it on the foreman or the company or somebody else; and I think it is the safety man's job to go to that foreman, or to his personnel department, or wherever he can, and see what they can do to change that attitude. It is the safety man's job to tell the foreman that this man has the wrong attitude and also to spot all he can.

CHAIRMAN HAVEN: In looking over this audience I see two or three men who are just sitting on the edges of their chairs, who want to chip in a word here.

I. GORDON (Bureau of Safety, Chicago): I have had two cases recently of right and wrong attitude. I was introduced to about fifteen men one afternoon. We were going to a safety meeting. I noticed a pair of goggles on the table in the center of the floor. I picked them up and they were literally covered with a film of solder. I said, "Hello, what happened here?" One of the men said, "Mr. Martin, the man whom you met just a moment ago, had them on the other day while making a soldered joint and there must have been some moisture because it exploded up into his face."

I looked at Mr. Martin and I said, "Are you the foreman, Mr. Martin, or just one of the men?"

He said, "I am just one of the men."

"Who told you to put the goggles on when you started to do that work?"

"Nobody. I do not wait for anybody to tell me to put goggles on when I know I am doing work that jeopardizes my eyes."

"You were not trying to protect your superintendent's eyes or your foreman's?"

"No, sir, Martin's."

"Why?" I said, "then safety must be an individual matter."

He said, "It sure is with me."

I wanted those goggles so that I could show them to other men where we have a hard time getting them to wear goggles. I wanted them as an example of what may happen. He did not want me to have them and I appreciated that because he said, "I want them for a souvenir. They are the

things that stand between me and being an absolutely blind man. I am a married man with two children. That is the reason I am a safety man and look after my own safety."

I have used that incident a great many places. I say, "What is back of Mr. Martin's putting goggles on?" Attitude, nothing but the right attitude. Right attitude toward whom? His superintendent? His foreman? Higher-ups? No, toward Martin. Safety is an individual matter. So if you can get the man to realize that safety is an individual matter, no matter where he may be doing the work, he will use care for his own individual safety.

Now, just the reverse: I went up behind a foreman. I saw sparks flying from an emery wheel. I stood behind him. He did not know I was there because the machinery was making a lot of noise. He got through in a moment and turned around and spoke to me and shook hands with me. I said, "I would not do what you have been doing for a thousand dollars right in my hand."

He said, "What was that?"

"Grinding on an emery wheel without anything to protect your eyes. Actually, it is a reflection upon your intelligence and you are a foreman and other men are seeing you do that."

He said, "I was only going to knock a little burr off the drill."

I said, "That is long enough to lose an eye."

It sort of disgusted me and I turned away from him.

We had just dismissed a meeting in which we went over the accident record, when the telephone rang, "Send Foreman So-And-So to the first aid room quickly. One of his men has been hurt." The foreman said, "Come with me, Mr. Gordon, and let's see what has happened." We hurried to the first aid room, and there was a man with his hand over his right eye, going up and down, up and down, all around the room, in great pain. The first aid man said, "He has something in his eye, but we have looked and we cannot see anything."

The foreman said, "Let me look" and he looked. Then I said, "Let me look." None of us could see a thing. I said, "What do you think it is? Just some dust that maybe was flying in the shop?"

He said, "No, I think it is something off the emery wheel, probably emery dust."

"Were you using the emery wheel when it got in there?"

"Yes."

"Did you have your goggles on?"

"No, I didn't. I was going to be there only a moment."

I said, "All right, first aid man, blindfold him, both eyes, so he cannot see and have a man take him to the doctor. Let's not probe around his eyes." And I said: "Aren't you the man I talked to less than ten days ago out in the foundry when I caught you using the emery wheel with no goggles on?"

He said, "Yes, you said something to me about it."

I said, "Then it did not soak in, did it? We safety men get peeved with men like you, but that isn't safety. Pardon me for saying that to you in this fashion. I am trying to tell you to wear goggles for your own safety's sake."

Attitude? Why sure, wrong attitude versus the right attitude.

CHAIRMAN HAVEN: I think that is a very clear illustration of what we mean by attitude.

Are there any other questions?

Industrial Fire Drills

LEIF GRYTEN (International Milling Company, Buffalo, N. Y.): Is there anyone here who has had trouble in getting men out of a building that was on fire, and, if so, what sort of trouble? No doubt during our school days we all had fire drills. I guess we have very little of that in factories. I wonder if it would not be a good thing to have them occasionally, so that the men won't act like children and do a great deal more harm?

A. L. BROWN: I think that is more of a safety question than it is a fire question, really.

S. E. WHITING: The emergency escapes from buildings, as distinguished from the ordinary exits are grossly neglected. The Liberty Mutual is in a new building and the emergency escapes in our new building were blocked, as I found on inspection, within a year and a half of the occupancy. There was an intelligent organization (or more or less so) that had had fire escapes

definitely planned for them, and they were blocked and when I made an inspection at the request of our president. And the president made the request because he had read in the newspapers that two women had been trapped in a basement when a paint plant in Camden, New Jersey, burnt down; they had lost their lives.

I am not sure whether you safety men check this kind of thing as often as you should. In case of emergency, hasty exit, you have to depend on some unused method of escape. It may be a horizontal escape into another building through a fire door, which is likely to be blocked because it normally isn't used, or down a fire escape. I have heard engineers say that they did not go down the fire escape to examine it because it looked so rickety they might fall to the ground. They were satisfied to let the crowd go down and smash it up in the emergency.

Then very often there is only one basement exit, and very often that one exit is blocked by flammable material which may start a fire, with the panic which invariably comes if there is a fire and people are afraid that they are going to be trapped. We have had that sad experience more than once where people were lost. Some of them were hurt jumping out of the second-story window, but I have heard of other cases where the panic was great and where the men were rushing more than the women, where on a crowded stairway they would jump right over the crowd to get down in their panic. Of course, you know the lamentable cases that have occurred at Christmas parties, sometimes in schoolhouses, and other such situations.

It is a subject that we, as a class of safety men, neglect because such need for those emergency escapes is rare and we pay no attention to that latent hazard. We should do something. I do not think you can get routine fire drills except with children. You can get an occasional drill to accustom individuals to a knowledge of the emergency escape, but don't make it a routine matter because you won't get away with it; but at least, as engineers, see that those escapes are clear and are properly labeled so that they can be used in emergency.

M. L. WURMAN (Bayuk Cigars, Inc., Philadelphia, Pa.): The gentlemen here for-

get that states have regulations which compel fire drills whether you like it or not.

MR. WHITING: Are they enforced?

MR. WURMAN: Yes. In the state of Pennsylvania you must have a fire drill once a month.

MR. WHITING: What kind of occupancy?

MR. WURMAN: Any kind.

C. C. RUDDICK (H. J. Heinz Co., Pittsburgh, Pa.): Three years ago a fire in a factory took the lives of 13 girls. That made my company very conscious of factory fires. We have four fire patrols, properly equipped in our plant. We have a fire drill once a month, a record of which is kept for the state factory inspector and the county fire marshal. We have 40 fire observers who take their stations in certain parts of the plant to make a written report of the actions of departments and the people in those departments when the fire alarm is sounded. We have fire cards in several places in each department which indicate where the company is to go when a certain number is rung on our fire alarm system which indicates where the fire is located. It is related to the building number of the plant set-up. Every foreman is instructed to listen to the signal to determine where the fire is, and then he instructs his people as to the proper means of egress from the building. We have those drills once a month without fail and they are very successful. With the observers' records we go to the foreman where any fault was found and correct it. So that we are on top of the problem continually, and I believe that is the only set-up, where women are employed, at least, by which you can have full protection.

CHAIRMAN HAVEN: Let me see the hands of men representing factories that have fire drills in their plants. (Numerous hands were raised.) That is very encouraging. It is too bad that we have to have a state law before we wake up to the fact that a fire drill is a good thing.

When I was with the Baxter Laundry group, one of the first things I did when I went there was to inaugurate fire drills. We recognized the very serious consequences that would result if we had fires in tumblers, etc.; and, of course, they used flammable materials and sometimes liquids.

MR. WURMAN: Another point is that:

in most of our plants of a later day we do not have fire escapes. I do not think that either Mr. Ruddick or we have a fire escape in any of our plants. We have fire towers. There is no such thing as a fire escape.

MR. BURROW: I should like to know how this regulation is enforced in the state of Pennsylvania?

C. C. RUDDICK: The county fire marshal in my county has jurisdiction over the factories in that section. In every other section of the state, the state itself has jurisdiction. I cannot answer for other counties, but I can answer for ours. The fire marshal is likely to come to the factory and ask us to put on a drill. Companies that have played around with the idea have asked for a little respite from the order or command in order to notify the departments that a drill is going to be sounded; but, of course, that is always detected and the fire marshal or his deputy or assistant is on the alert for that.

We must keep a record, which is open all the time for inspection by either the state factory inspector or the fire marshal; in other words, as proof that we did have the drill.

MR. BURROW: Do you make a report to the fire marshal?

MR. RUDDICK: No.

E. N. BRODERICK (Broderick Devices, Inc., Detroit): Why should it be necessary for the law to force people to protect themselves and to protect others?

CHAIRMAN HAVEN: Well, we have been wondering about that for years and years.

Chain Block Inspection

W. S. BREWSTER (The Masonite Corp.): I want to know a practical plan or method for a safety man in a plant to inspect chain blocks and chains. Some of them are kept in a tool room and used more or less continuously; others are kept out in the mill and used once in a while.

CHAIRMAN HAVEN: Who wants to answer that question? Mr. Quesnel.

E. G. QUESNEL: There is one way that you can be sure that your chains are inspected regularly: that is to number the chains and record the numbers, and when you make your weekly or semi-weekly in-

spection—it depends on the use of the equipment—these chains should be inspected by number. Number your chain blocks so that when a certain period has elapsed you will know that every piece of that particular type of equipment has been inspected and none has been missed; otherwise in the transfer of equipment from one department to another or back to the storeroom you may miss them. So I would suggest that you stamp the number on a link of the chain, or several places on the chain, so that if the chain should be broken and have to be welded you won't lose it, and also mark your chain block definitely, so that you can identify it, and be sure that it is inspected at proper intervals.

MR. BREWSTER: Is that necessary when you use a chain just now and then?

MR. QUESNEL: Certainly. You should have a gage with which to measure your chain link and know exactly whether it has been stretched; and if it has been stretched beyond its proper elastic limit, it certainly is unsafe and should be discarded. You can bring back the chain by annealing if you do it properly, but when a link is once stretched beyond its proper elastic limits, it is unsafe and should be discarded. You can get that information from the chain makers and your inspector should have a gage to measure the width and length of the link as to its normal position.

MR. BREWSTER: We have a plant in Mississippi where we have our heavy presses with big chain blocks. They are used maybe two or three times a year, and are left hanging up there. I have no record of them. But what inspection should I give them to know that they may not fail sometime?

MR. QUESNEL: On chain blocks there are several things to inspect beside the chain.

MR. BREWSTER: I realize that, but it is important that they should be inspected even though they may be used only two or three times a year?

MR. QUESNEL: The thing that is important is to know what type of loads are being lifted with those blocks.

MR. BREWSTER: I wonder if there is any man here who can answer my question.

ARNOLD L. BROWN: You will find that there is a safe practice bulletin out on that, which will give you some good information.

MR. QUESNEL: It takes a good mechanic to inspect a chain block. A chain inspector is not sufficient. He must know the construction of the block.

CHAIRMAN HAVEN: It is a very important item in anyone's business.

MR. QUESNEL: And they have to be inspected under load.

S. B. HORRELL (Carey Salt Co., Hutchinson, Kansas): Testing of elastic limit, so to speak, for the failure of a chain is all right periodically. I think that comes under the same classification as tools. If you do that periodically you may have one construction group that uses a chain fall or rope fall. They take it out and they damage it to a certain extent. If that chain or rope fall is not inspected right after they come back, the next man who gets it is likely to take all the risk of failure, even though it had been inspected, say, just a week before. We have inaugurated a system for handling all tools that are taken out of the storeroom, chain and rope falls, chain blocks, etc. When they come back the man gets his slip on them, but he has to put them in what we call an observation block. If our storeroom keeper is not capable of giving the chain, or the tool, the right kind of inspection, he has to take it to the master mechanic and the master mechanic has to pass it and O.K. it before he is permitted to put it back into stock and to make it available for the next man who comes along.

CHAIRMAN HAVEN: That is certainly a good safety method.

Here is a question that sort of intrigues me, it is so up to date. "What effect on the promotional side of safety has the present world unrest, and assuming that world events do affect the promotional side of safety, what are we going to do about it?" I am looking at you, Tom. I am going to call on you.

Effect of World Unrest

T. A. BURKE: There is a very decided effect, I think, in promoting safety and particularly with the newspapers of the country. I was talking to an editor in New York just last week on this same subject. He said to me: "Do you know, the biggest drama in the history of the world is going on in Europe? We are all vitally concerned with it, whether we realize it or not. The first

call on the newspapers comes from that drama and for full presentation of that drama to our readers."

He was very nice about it because he happens to be a man who is very close to the safety movement and has been for some years past, but that was his attitude.

I was present at the meeting of local Council managers the other day when one of the speakers brought up the same subject. It is floating around in the minds of many newspaper men. The editor of the *Daily Oklahoman* and *Oklahoma Daily Times* took a week off to come up here and attend the Safety Council meeting because he is interested in safety. He brought the same question up before the managers who were there, and he emphasized the fact that for the next few months, maybe for the next year, maybe for the next few years, publicity for safety work will have to be inches instead of columns. The editors are not to blame for it; the promotion side of safety is not to blame for it; but it is just one of those things, and it certainly does exist.

The second question is, "What are we going to do about it?"

Well, I am stumped there. I do not know. I do not know unless we can bear down harder than ever in our own contacts with our own people, just double our energies in our plants and with the people with whom we deal. It is a tremendous problem. We may be able to find new ways of getting into the papers, different ways. The novel always appeals to the editor, something new. He might forget about this general policy if it were something really new, something that would appeal to him, something that he could play up. It seems to me that there is a great field for the ingenuity of safety promotional men to try to bring something to the editors of our papers and our magazines that is just a little different, just a little new, just a little novel, in the form of safety promotion. I wish I had the answer, but I haven't the answer yet.

CHAIRMAN HAVEN: Mr. Quesnel wants to make an observation.

MR. QUESNEL: I commute every day from Scarsdale to New York City. A number of business men on the train have told me they have quit reading the morning papers because the news is so disturbing they can't shake it off for several hours and

it interferes with their work. Psychologists tell us that impressions on the mind remain from a minimum of fifteen minutes to hours, and the more striking the impression the more it influences our actions. In most cases we can think of but one thing at a time, one thing predominates and all else is subordinate to it.

This war influence is taking up and occupying space in our thinking over a period of business hours, and is certainly affecting our efforts. I think that we can do something about that in a general way. At least we can quit discussing it during business hours and we can discourage our men from discussing it during business hours. We can tell them that we have very good reasons for this: first, that they can do nothing about it; second, that when they are talking war they are not discussing business and they are not making sales. Besides that, they may ruffle their customers. Their opinions may not coincide with that of their customers and may cause some resentment. Time is consumed which should be used for business. I believe that management can set the example.

We had an accident not long ago and the employee told us frankly—and I really believe that he was telling the truth—that he drove three-quarters of a mile through the city without knowing what streets he had crossed and where he was when he got there. Now that is a peculiar situation, but it is possible. He had driven the route for a year, he knew all about it, and his driving was automatic. Now the reason he did not have a more serious accident en route was not his fault, of course. Other people just happened not to be where he was or they were looking after his safety and he did not know it. But he was all absorbed by the news situation, and this war certainly is occupying the minds of our men plenty of hours on duty. So I think that we can do a little about it by setting the example ourselves and not discussing the war during working hours.

CHAIRMAN HAVEN: This is a very serious problem. If you men have analyzed your accidents, I would not be surprised if you have found, as we have found in our company, that a large majority, as a matter of fact, 91 per cent in our case, are due to inattention. I think that with this war propa-

ganda and the many other things that are going on, the political problem and all that today, until we get either worse or better in the war situation, industrialists, particularly those who are operating trucks—and it applies just as well in the plant—are facing the tremendous problem of schooling our employees in the knowledge that the people whom they meet, whether they are driving cars or walking, may have their minds preoccupied by some of these very absorbing problems. This incidentally comes right down to "defensive driving" again or defensive working in our plants.

Mothers, brothers, sisters, all worried about who is going to be called by the draft. It is going to create an undesirable economic situation in all our homes. We may be taking breadwinners out of families, and it is going to stir up a lot of trouble in our homes. They are thinking about these things, and when they are crossing streets and when they are in your plants those things are bound to preoccupy their thoughts. If inattention is one of the reasons for accidents, and we know that it is, certainly these world disturbances are having a tremendous influence on the thinking of the American people today. Men, it is a more serious situation than a lot of us have recognized.

MR. BURKE: It does go beyond the plant and beyond the fleet. It goes right out into the street, as you have brought out. I do not know whether or not you gentlemen know it, but close to 80 per cent of the deaths in New York City caused by automobiles occur to pedestrians who are reading the headlines while starting across streets. Eighty per cent is a little higher than the national average, I believe, and I think that we have hit right at the crux of the situation.

W. W. WARD (A. & P. Co., Columbus, O.): Possibly someone may have a suggestion on the problem of how to get the safety message down in the best way to scattered small groups of employees who sometimes are a great many miles away from the main office. Of course, I realize that we can reach them by letters and things like that, but we cannot have the meetings that we talk about in plants. Has anybody a suggestion that would help us.

Organizing a Small Group

CHAIRMAN HAVEN: You are thinking now of a group of men working we will say, in an agency or some depot or some place?

MR. WARD: A store. Just a small group, say eight or ten men whom you want to keep safety minded.

MR. QUESNEL: I would certainly organize a safety committee if I had more than seven men. If you have a smaller group than that, appoint one man safety contact man and see that he gets the information the same as any other part of your organization regardless of your size. If you have ten men, have three of those ten form the nucleus of a committee, appoint one man as chairman and see that he holds a meeting at least once a month, or more frequently if conditions warrant; and have those records sent in officially to someone, so that he will know that it is not a lot of monkey business but that it is really procedure, and acknowledge the report and comment on it. Let them know that something is being done about it and you will keep those men energized by remote control. Send the safety material to them. If it is a small group, send enough for each man, but keep their identity and let them know that they are just as important while off in the woods as they would be in a large city.

MR. QUACKENBUSH: We have that same problem. When our peas are ready to pack the men have previously been registered. Every man has his application in and he knows what position he is to take. We have no way of getting a safety message over to the men because when the whistle blows, they immediately go to various stores and they go to their stations. When the shift is off generally they are fatigued and want to get home and to bed. I am at a loss to know just how we are going to get a safety message across to these men.

CHAIRMAN HAVEN: Hasn't Mr. Quesnel answered that question by saying to have someone who is in charge of those folks see that they get the safety instructions necessary?

MR. QUACKENBUSH: Our situation is a little different; we have perhaps a thousand or fifteen hundred at one plant.

CHAIRMAN HAVEN: Well, of course, there is room for a large safety committee

with representatives from the various departments sitting in on the central committee. It would simply follow the natural trend of an organized safety movement in your plant or in your location.

ARNOLD L. BROWN: I should like to ask both of you fellows a question: How do you get your orders across to them? How do you get your production out and how does the A. and P. get their sales out? Well, I just want to make the point that you have to have some supervision.

MR. QUACKENBUSH: You understand that this is a seasonal business.

MR. BROWN: Sure, but you have foremen and supervisors, and isn't your safety just as important as your production, and isn't it just as much of the foreman's job or the supervisor's job as the production? I agree with Mr. Quesnel that you want a safety committee. I think that if you will just put as much work on getting that supervisor to work his men safely as you do on getting him to get out production or to make sales, there is your safety.

What Is Speeding?

CHAIRMAN HAVEN: Here is somebody who wants to know "What is speeding?" There is a question for the experts. What is speeding, Mr. Kelly?

MR. KELLY: Day before yesterday I sat in the Speed Committee's meeting here. That meeting spent a good deal of the time discussing the meaning of the phrase, "Too fast for conditions," and it struck me again how much time we spend talking about words and phrases that perhaps aren't nearly as important as we think they are. Speeding is going too fast for the conditions. Now if you will just accept those words, they cover the whole gamut. They mean that you can kill a pedestrian at five miles an hour, or you can have a hell of a bad accident at sixty miles an hour, both vehicles engaged at the same speed. All through the range you have the possibility of accidents.

One thought that has come to me in my very brief knowledge of this highway safety problem is that you increase the probabilities of serious accidents as the speed goes up. You do not guarantee that you will have no fender smashes, that you will have no contact between vehicles, but as speed goes up you increase greatly the probability of a

serious accident. Now "Speed too fast for conditions" would certainly be used in formulating any definition of what speeding is.

I. GORDON (Bureau of Safety, Chicago): That is my question and I am complimented that you have answered it like I did, when it was asked me at a safety meeting. I said that I had just bought a new automobile and I would consider five miles an hour speeding. Of course, I got a big laugh out of 250 people. They said, "Wait until you get used to it and then seventy-five will be the speed perhaps."

I said, "Wait a minute. You did not wait until I had finished. Five miles an hour is speeding if you are going around a corner where there are children or pedestrians." In other words, the answer was "under the conditions."

At a safety meeting yesterday we heard a man say that he came to the safety meeting at seventy-five miles an hour. He was in a hurry to get here—coming to a safety meeting. He came up behind a truck. He did not know that there was another truck in front of this one, but suddenly the fellow in front took a notion that he wanted to talk to the fellow in the rear and they both slackened up until he had to cut away in order to avoid an accident. But he was coming to a safety meeting, traveling seventy-five miles an hour, too fast for any safety man.

CHAIRMAN HAVEN: That is absolutely right. I am going to take the liberty of repeating four rules of safe driving in our defensive driving program, which covers this very important question. We are trying to get across to our employees inside the plant, as well as to our salesmen drivers, the idea of defensive driving. (1) Maintain an area of safety in front, back and both sides of your car. (2) Drive at a speed consistent with road surface, visibility and traffic conditions. (3) Forget who has the legal right of way and do the common-sense thing of staying out of the other fellow's way. (4) Drive your car on the theory

that the other driver or pedestrian is deaf, dumb, blind, and knows little about the traffic laws.

Four simple fundamentals and yet they cover the whole gamut of safe driving.

Incidentally, I want to refer to an exhibit I have here, which we use in our plants for accident demonstration purposes. When a man comes in to tell what happened in connection with an accident, he takes these cut-outs with which you can make any type of street intersection, reverse curve, or what have you. It is made to scale, so that he can place the pieces in position to show locations of cars and other objects involved. Stopping distances are also shown on this chart. If your man says, "I was going down the street at so many miles per hour," here are the distances and you can very soon tell him that he was traveling too fast.

MR. BRODERICK: Along many highways you will see a "50 miles" sign here, then 35 miles, then 20 and then 40. Why should there not be a federal law governing all these things all over America, so that when a man goes from one state to another he does not have to pick up a pilot like a ship does when going into a new port? There ought to be a federal law, a general law, governing the entire motor traffic so that you could go from state to state and be perfectly safe provided you keep within that law.

CHAIRMAN HAVEN: I think that the National Safety Council for at least fifteen years has been working with various enforcing bodies to bring about uniform traffic laws and they are making wonderful strides. Now, that would be an ideal condition and probably it will come sometime, whether it will be a federal regulation or not, but just remember that after you do have the law you still have Mr. John Jones and Bill Smith and the rest of those fellows to educate, and the way to educate them is right in your own establishments where you are working with a large number of people.

ADJOURNMENT

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MONDAY AFTERNOON SESSION

October 7, 1940

The opening session of the Marine Section was called to order by Major W. E. Lorence, Safety Officer, Corps of Engineers, United States War Department, Washington, D. C., who presided. Chairman Lorence

welcomed the delegates, briefly commented on the extensive and diverse program which had been prepared for the several meetings, and then introduced the first speaker, Major Elliott Vandevanter.

Safety Activities of the U. S. Army Engineers—Problems and Proposed Solutions

By ELLIOTT VANDEVANTER

Major, Corps of Engineers, Assistant to the Division Engineer,
Upper Mississippi Valley Division, St. Louis, Mo.

The Engineer Department of the Army is controlled by the office of the Chief of Engineers, through eleven division offices and forty-seven district offices, which cover all of continental United States, Puerto Rico, and Hawaii.

Authority is decentralized and each district engineer is given considerable latitude in the operation of his district. There is therefore some lack of uniformity in the various districts.

Therefore a safety section is set up in each district consisting of a safety engineer and several assistants. In general the safety engineer discusses problems with the field forces, gives advice to the supervisors, foremen and others in authority, but issues no direct orders. He can, however, request the district engineer to issue such orders as may be necessary to carry out his plans. He must be a high class man, able to influence the action of the field forces and to gain the confidence of the district engineer.

In some districts the safety engineer is responsible for results. In others the head of each activity is held responsible for safety progress under his supervision and he reports to his immediate superior. In some cases he may have a safety engineer on his staff. Although the paper setup may be different, there is little variation in methods and results.

The problem presented to us is the same throughout the safety world. How can accidents be prevented?

First and most important is the fact that the higher officials must be actively interested in the work and *make their interest felt* by the men. A word of appreciation to an outstanding safe worker about his safety record will build up his morale and encourage others to increase their efforts. Interest must be carried down through the supervisors, foremen and all in authority, and to the entire working force. Once interest is lost the job bogs down.

Men must be reminded of the dangers

lurking in the shadows. Frequent safety talks must be made by foremen or safety engineers. The engineer department requires that each unit hold at least one meeting per month. The hazards must be pointed out and the men taught to avoid them. Although it is not universal throughout the department, all new men should be given training before going to work. Instructions should be given them together with a demonstration by skilled men. For several days or more these newcomers should work together with the trained men, the latter to watch them and correct mistakes. Of course this slows down the work for the training period, but it makes available at least partially trained men who will work better for the rest of their lives, and offsets many times the small amount of money expended in their training. This is one of the most important features of any safety program.

Some of our districts are using what they call the "Huddle" system. Just before starting work the foreman gathers his group together and in a short, snappy talk cautions his men about measures to be taken to prevent accidents. This appears to be an excellent idea if it does not develop into a routine performance.

Recently in many of our districts the safety section has been called in as safety consultants on plans being made by the design section. This gives the safety section an opportunity to make safety recommendations while the design is being made. It should have excellent results if the necessary cooperation exists. Much of the benefit will depend on the ability of the safety engineer.

In the Upper Mississippi Valley Division we have required that every lost time injury be investigated by one of the higher officials of the district who has no direct connection with the work on which the accident occurred. His reports go directly to the district engineer together with recommendations as to how a similar injury may be

prevented. Responsibility is fixed and disciplinary action taken when so indicated.

The department as a whole has used disciplinary action infrequently. As we progress we should be better trained and the need for such action should diminish. However, more is expected of a well trained man and it is probable that some disciplinary measures must always be necessary. For minor infractions verbal reprimands, or a letter of admonition from the district engineer, may suffice. More serious cases are awarded suspension without pay for short periods and in a flagrant case, the offender may be discharged. Disciplinary measures should be used with great care in order that justice may be done to all concerned. One unfair decision may undermine the good work which has been done.

The workers on river plant are constantly exposed to a water hazard and a number of drownings have occurred. We had ample supplies of the ordinary cork jackets, but they were so bulky that men could not wear them while working. To overcome this, a kapok jacket was developed to suit our conditions. This is a soft, light jacket, open under the arms and in the front, so that it may be as cool as possible. At first there were objections raised as to heat and a few insisted that the jackets interfered with their work and might well cause, instead of prevent, accidents. As the workers became more accustomed to these jackets and saw the beneficial results obtained, objections soon died down.

These jackets have been tested with an eighteen pound weight and they have retained their buoyancy for several days. The kapok in the jacket must be dried out after being exposed to water and dampness, and prevented from being compacted. Otherwise it quickly loses its buoyancy. To overcome this difficulty a pad of sponge rubber impregnated at six thousand pounds per square inch with nitrogen gas, has been experimented with and results have been most satisfactory. The rubber pads have little tendency to compact and do not lose their buoyancy under any conditions which we have discovered. When working in close quarters it may be found necessary to taper off the top and bottom of the pads which will slightly reduce flotation. These jackets have been very effective in reducing the number of drownings.

In 1937, 9 per cent of all men who fell overboard were drowned; in 1938, this figure increased to 12 per cent. The fact that a man could swim, even expertly, did not insure him against drowning, as 80 per cent of the engineer department employees who drowned in 1938 could swim. There was not a drowning in 1938 where a kapok vest was worn and properly fastened.

In 1939 progress was made in the prevention of drownings over preceding years, since the use of kapok vests had become more general in the department. The fatality frequency rate of both department and contract labor was reduced by approximately 50 per cent during 1939. As stated, 12 per cent of all who fell overboard in 1938 were drowned. In 1939, this figure was reduced to 7.73 per cent. Again, in 1939 there was not a case of drowning where a kapok vest was worn. However, it is only fair to state that improved conditions on floating plant during the last few years have removed many hazards.

Problem I

It is still difficult to sufficiently impress upon some employees the value of wearing kapok vests. There are those who will not wear them when the supervisor is not around. There are also supervisory employees who fail to require the use of the vest in necessary cases.

Solution I: Enforce the regulation requiring the wearing of kapok vests where the hazard of drowning exists. Continue to preach the use of kapok vests. Place the responsibility upon the proper supervisory personnel to see that the vests are worn when necessary and to take disciplinary action in cases where there is evidence of lack of foresight or willful disregard of compliance with the regulations.

Problem II

Jim Stokes had as part of his job the filling of an oil cup located on top of the gear ring of a drum. He climbed up a ladder, placed his left foot on the lower flange of an eye beam, and his right foot on the upper flange. As he leaned over to open the oil cup, his right foot slipped forward and was crushed between one of the spokes which supported the drum and the eye beam.

Solution II: These cranes have been in operation on our dams for several years. Two points worthy of notice are, First the

injured man had not been sufficiently impressed with the danger of his job. Second: the supervisory staff failed to realize that a hazard existed. The blame for this injury rests entirely with the supervisory personnel in not bringing forcibly to him the need for safe action in a dangerous situation. Also more effort should be made to spot and correct hazardous conditions before an accident occurs.

Problem III

The injured was assisting two other employees in removing old lubricating oil from the crank case of an air compressor. After the oil was drained into a bucket, the injured threw it into the fire box of a boiler containing fire. The result was all that reasonably could be expected, the effect being second degree burns to the pitcher. The injured had been instructed previously relative to the hazards associated with such acts. As an engineman he also quite likely knew what naturally would follow the contact of diluted oil with flame. His injury was a consequence of his own failure to think and to plan a safe means for disposing of the refuse oil.

Solution III: The conclusion is that this man was not safety conscious. Again lack of sufficient instruction is evident. Perhaps the supervisor should not be blamed as it would appear that the injured should have his sanity tested as well as his burns treated.

Problem IV

A commercial tow consisting of five barges and a towboat entered the lock. Two lockmen and two deckhands were handling

the lines. The first check had been made at the upstream entrance and the line moved to a snubbing post farther down the lock. A signal was given to slack off but the line remained taut until approximately 100 feet of line had been pulled across the mooring bitts of the barge. When the tow was about five feet from the face of the lock chamber, a man's foot was hurled across the water and fell against the side of the control house. No one actually saw what happened, but apparently the man's foot was caught in a loop of the rope and either squeezed or pulled off against the mooring bitts.

It can be seen, when wind and river conditions require tows to be checked into lock entrances or to lock walls by means of lines, there are definite hazards when such lines are under strain and at the same time being slacked off. Should an employee's foot be caught in the loop of the line and forced against the kevel, chock or check post, it is probable that serious injury will result. Also, should the line not be in good condition, or good judgment not be used in the slackening off operation, the line may break suddenly and cause injury.

Solution IV: Lines should always be well coiled before use and recoiled when and as overhauled. Where excessive checking is necessary, a second deckhand should be on hand to keep the line cleared up and feed it to the man doing the checking. He should not stand directly behind the line under strain, but rather to one side. He should give close attention for evidence of parting strands or other signs of failure.

The Education of Ship Owners in Safety

By GEORGE MARTINSON

Safety Director, Pickands Mather & Company, Cleveland, O.

I shall probably approach this subject in an unorthodox manner. My experience in the shipping business leads me to believe that the ship owners do not require much education to interest them in safety. It is rather the ships' officers and crews that need this education.

Management, which keeps a close watch on the cost sheet, knows full well that ac-

cidents can be a large item in operation costs, and ship owners and management are just as anxious to keep that cost down as is the manager or owner of a plant located ashore. When the time comes that the officers and ships' crews put in as much time and thought on accident prevention as management does, we simply will not have accidents involving personal injury.

Management, however, may become discouraged when their efforts along these lines are of no avail and accidents continue to recur again and again. It is our function, not so much to educate management, to interest themselves in a safety program, but to keep them interested, to show them that efforts to prevent personal injuries are not in vain and that a well thought out program that is efficiently managed is bound to have results.

If management loses interest, many times it is our fault because we do not present the problems to them in the proper manner. When they have been willing to spend the money necessary for such a program they want results, and if we lose heart and become lackadaisical in our efforts, we cannot expect the management to continue to support the program.

All men are responsive and react favorably to incidents that can be dramatized. All like to know that their desire to help their organization, and they are usually pleased to have nice things said about the program that they are sponsoring. For instance, in our program I have attempted to keep management interested, first of all by trying to do a good job, never being discouraged and being always hopeful that we can prevent too frequent repetition of the same types of accidents. In addition, I have attempted to call attention to the little personal human responses that come from our men. For instance, several years ago we instituted a program of health examinations for our licensed men and later extended it to our unlicensed personnel.

I have had many letters from individuals who have been benefited by this activity. I have picked out the best of these letters and sent them to the management. As an example, men have been told that their vision could be improved materially if they wore glasses, after having had the glasses fitted they have written in to tell us of the benefits they have derived. One man said, "Thank you, Mr. Martinson, for the interest that the company has shown in me. I have my glasses and I did not realize how badly I needed them. As a matter of fact, the whole world looks different to me now." That type of letter surely warms the heart of a manager who sees it.

Two years ago we started on a program to increase the use of goggles. We all know

that this entails some expense, and no doubt there was some question as to whether this expense was justified. However, this summer a fireman was wearing goggles while breaking coal, when a lens of his goggles was broken by a chunk of coal. There is no doubt that the use of goggles in this case saved the man's eye. I saw to it that the management saw these broken goggles and also saw a photograph of the young man whose eyes had been saved.

This summer we placed aboard all of our ships a number of Kapok vests to be used when men were handling lines on the docks. Early in July one of our deckhands fell into a ship while handling lines and was easily rescued because he was wearing the Kapok vest. This incident was called to the attention of the managers and to all members of all ships' crews.

Several years ago we furnished hard hats to be used while sweeping up cargo holds and for coalpassers when they are working in the coal bunkers. Just a few weeks ago, in talking with a deckhand, I learned that he had had an experience with a hard hat. While engaged on the dockside of the ship, a chunk of ore had fallen from a bucket, striking his head. This deckhand figured that if he had not been wearing the hat he would have suffered head injuries which even might have been fatal. I was able to obtain the hat from him to bring it to the office and it was shown to the managers.

In all of these cases I am sure that these little things called to the attention of ship owners have impressed them with the fact that the money they had spent for these purposes was well spent, and I am sure that there will never be any desire in the near future to do away with health examinations, nor will we ever be denied the money necessary to purchase goggles, Kapok vests or hard hats.

I have several reasons why I firmly believe that many times when management loses interest in an accident prevention program it is because we who have the responsibility do not do our job.

The first reason is the fact that some men who are engaged in accident prevention work desire to use their jobs as a stepping stone to some other type of job. Men who are in this position often fail to do their safety jobs well enough to warrant promotion, and therefore are responsible for

some of the poorly planned programs. Secondly, some men are only doing accident prevention work as a side issue and are unable to devote the time and effort that is necessary to get results. These are the men who usually throw up their hands and proclaim loudly that the problems cannot be solved.

In the next place, it is sometimes unfortunate that many of us who are engaged in accident prevention work are also responsible for the settlement of claims that arise from accidents. I know from personal experience that it is sometimes quite difficult to see an accident in its true perspective, because the first thought that comes to mind when the report comes to us is, "How much is it going to cost?" rather than "What can we do to prevent a recurrence of this kind of an accident?" However, these two jobs of accident prevention and settlement of claims can work very well together if we will consider, first, what we can do to prevent this type of accident, and after that, determine, if we can, what the cost will be. Unless we are very careful when there is this combination of work it is extremely difficult to think of prevention first, rather than the cost of the accident.

I have saved to the last what in my mind is the greatest handicap that we must overcome. There are a number of ships' officers who will tell you that sailors are an altogether different type of men from those who are engaged in other industrial pursuits. Officers may be sincere in this belief, but I prefer to think that men engaged in sailing are just as responsive to a decent approach as men engaged in other lines of industrial work. I know that these men have the same ambitions and the same aspirations as other men. But I also appreciate the fact that through the years they may have built up in their minds a fatalistic attitude toward their job and they may be inclined to take what appear to be unnecessary chances. This attitude on their part does not indicate to me that they cannot be educated to do their job with due regard to their own safety.

We had to meet the same problems when we began accident prevention work more than a quarter of a century ago in the iron mines. I recall very well that it was not unusual at that time to see men opening

kegs of black powder with a cigarette or pipe in their mouths. Many men were killed or severely injured as a result of this very bad practice. However, by continued education we now find that men are much more careful in the handling of explosives, and I firmly believe that sailors can be taught to do their job safely, just the same as other men can.

After many years spent in promoting safety programs I have come to the conclusion that the men can be educated or trained to give more regard for their personal safety. They will not be responsive, however, if we do not have this faith. I believe that we should not lose heart or let our jobs get us down if things seem to go against us. I know that it is many times discouraging when, in spite of all our efforts, serious injuries do occur.

I like the spirit that was evidenced in a recent experience which I had with my father. My father is well over 80 years of age, and one evening I attempted to help him down a flight of steps. I took him by the arm, but he jerked his arm away very quickly, and I knew that he was provoked. After he had gotten down the stairs I explained to him that it was dark and he might fall and injure himself. He turned to me and said, "Well, if I fall down, I will get up again. I have had to get up many times and am still able to do so." If we adopt this spirit of "getting up again," we will be better able to meet the new problems as they arise.

I believe further that in order to conduct an effective accident prevention program we must be sold absolutely not only on the necessity of such a program, but we must have a keen desire to do this type of work. We must be happy in our jobs. As I have grown older I naturally have thought about my past life and I have always come to the conclusion that if I had my life to live over again I would want to do the same kind of work that I have been doing. I have often thought how fortunate I am to be permitted to do the type of work that I like best and then get paid for it. I am sure that if you approach your job in this manner with sincerity and courage, you will be able, when you get along in years, to look back with real happiness upon your efforts in preventing accidents.

Physical Examinations—Standard Requirements—Expense

By W. C. GARBUTT

Casualty Manager, Pittsburgh Steamship Co., Cleveland, O.

The Marine industry has been slow in following other large employers of labor in instituting pre-employment physical examinations. This is perhaps understandable when it is remembered that the Government has for many years required certain physical standards of sailors. Unfortunately, once the physical examination was passed, there was no definite periodic check-up to see that the standard was maintained.

With the institution of the Continuous Discharge Book in 1936 and the certifying of a man for a particular position aboard ship, this condition was improved to some extent, but once the possessor of a certificate, its owner can become halt, lame, blind or diseased without penalty, unless he should seek a raise of grade, which would require a further physical examination.

The growth of the iron ore business is perhaps responsible to a greater extent than any other factor in the improvement in the type of men enlisting today in the American Merchant Marine.

If anything has been neglected, it was physical fitness; that was left pretty much to the men themselves. Although it was common knowledge that some form of physical fitness was required by the Government, the exact standards were known to only a few. Until recent years, the requirements were interpreted by the local inspectors to suit the case and men turned down at one port often passed at another. The men themselves did not know what defects were disqualifying and what were not. Even today men are found almost ready to take the original license examination as far as required time is concerned, who cannot pass the Government visual test. These men have worked and studied for three or four years, preparing for pilot or engineer license, only to find that they are physically disqualified.

In 1938, the preachings of the nation's greater insurance companies began to be felt on the Great Lakes and pre-employment physical examinations was a topic of discussion at many meetings. Top executives were far from opposed to the idea, but the lean years of the depression were still a painful memory. Anything that meant spend-

ing real money was given the most careful consideration and there was as much surprise as satisfaction for the casualty managers who obtained permission to go ahead. That the results of the first year's experience induced other companies to fall in line, is somewhat surprising when it is considered that, naturally, many mistakes were made. Standards were too loosely set up. Examining physicians were not familiar with the Government requirements nor were they all conversant with the type of work required of the various ratings.

Unlike most industrial plants, the examination of mariners could not be conducted at one central point. The crews leave their home towns in the spring of the year, and in many instances travel considerable distances to the port where their vessels are fitting out. The obvious thing was to have them examined before leaving home, if possible. This necessitated appointing field doctors, who would report their findings to the home office doctor, or medical director. These medical men were strangers to one another and naturally of different temperaments. That more errors and unfairnesses did not develop reflects to the credit of their profession.

In 1938, one pioneer company examined 1,400 men, who were medically rated as follows: A—1,076; B—266; C—15; D—43. Grade "A," of course, being those who were physically able to perform manual labor of practically any nature; those graded "B" had minor defects, such as caries, etc.; the grade "C" men were borderline cases—potential hernias, poor vision and other defects, which could or should be corrected; the grade "D" men—3 per cent of those examined—were totally unfit for maritime employment. From the inception, food handlers were given blood tests and many possible sources of infection were removed.

Examining physicians were not permitted to disqualify an old employee, except for contagious diseases. The field doctor reported to the medical director, who in turn advised top management, whose function it was to accept or reject.

At the close of navigation in 1938, a study

of the results was made and it appeared evident that fictitious injury claims had been reduced, with a corresponding reduction in casualty expense. Labor turnover had decreased. Many men had been guided into other vocations for which they were better fitted. Others were persuaded to enter marine hospitals for major or minor correction. Some of the results were, of course, distinctly of benefit to the company, but others were so obviously in the interest of the man, that any thought of suspicion or distrust of motive was quickly allayed.

The next step was a conference of field doctors with the medical director. From a round table discussion of the actual experiences, many concrete difficulties were ironed out and a portion of the director's report to the management is worth quoting:

"Numerous authorities among medical departments in industry have been consulted. Government requirements have been closely scrutinized. The opinions and ideas of our examiners have been carefully weighed. As a result, a manual has been prepared for the guidance of the company physicians, which presents a set of standards and a uniform plan for conducting the examinations. This makes it possible for the examiners to determine each man's physical fitness simply and without bias—so accurately that each examiner's evaluation will check with the other's. With this Manual to guide us in the future, we hope that in it we have covered every question that may arise. However, since progress is not static, we aim to keep an open mind and if changes prove necessary or desirable, they will be made."

In 1939, the same company examined 2,845 men and only 2.7 per cent were rejected. Although the number of employees had more than doubled, the percentage of undesirables had decreased. Through August, 1940, the number examined is 2,988 with 61 disqualified or 2 per cent.

The principal reasons for rejection, stated in the order of frequency, are: defective vision, hernia, positive blood tests and chronic heart conditions. Several of the affected, particularly those with hernias, have been corrected and reinstated.

The instructions to field doctors on the conduct of examinations and the recording of findings may be of interest:

"All applicants are to be examined completely stripped. Normal findings may be

indicated by a check, negative findings by O. Do not be too brief with positive findings. Remember that all records are reviewed in the Home Office and that the reviewing physician sees the applicant only by the picture given on the card. Therefore, avoid use of vague terms. Be brief, terse and concise; at the same time be complete and use such descriptive terms as will present a definite picture. For example: under "general appearance" the term "good" is not especially useful. It is better to say "erect, robust, healthy" or "heavy, but hard and muscular." Other useful terms in this connection are "obese, flabby"—"obese, flushed"—"pale, undernourished"—"stooped," etc."

The question of what disabilities should disqualify an applicant was one which gave the medical director and his associates the greatest concern. The results of their deliberations can be briefly enumerated as follows:

Contagious diseases and infectious skin diseases until cure can be effected.

Trachoma or other infectious diseases of the eye. One eye. Less than 20/70 vision in one eye and 20/100 in the other without glasses, corrected to 20/30 in one eye and 20/50 in the other.

Hearing—inability to carry on an ordinary conversation without ear strain at a distance of five feet with one or both ears.

Organic heart disease.

Hypertension and hypotension.

Pulmonary conditions such as tuberculosis or severe bronchial conditions.

Developed hernias.

Active venereal diseases.

Varicoceles of extreme degree, until cure can be effected.

Various conditions of the back.

Various conditions of the extremities, such as varicosities, ulcers, rheumatism, ankylosis of major joints.

Diseases of the nervous system.

Diabetes, unless mild, controllable by diet.

Syphilis, if a food handler. If under treatment with no skin lesions and not a food handler, may be accepted.

If applicant for galley gives history of typhoid and Widal tests are positive, should be rejected on possibility of being carrier.

The cost of pre-employment examinations

can, of course, vary greatly. In one company the medical director is paid a yearly salary and is available for consultation on personal injuries, expert testimony, or any other duty within his sphere. His salary, however, is charged entirely to physical examinations. The field doctors are paid on a fee basis, usually \$3 per examination. Laboratory tests are, of course, an additional expense, which varies in different states. Rechecks are paid

for at rates proportionate to the extent. The home office expense includes stationery, etc., and the only addition to the staff was a nurse-stenographer, whose duty it is to keep all records, which naturally are confidential.

The auditor's report for 1939 shows that the 2,845 examinations, 394 blood tests, 13 rechecks including x-rays, and all incidental expense together with overhead, cost slightly under \$12,000 or approximately \$4 per examination.

Hazards of River Transportation

By G. O. GRIFFIN

Manager, Safety Department, Dravo Corporation, Neville Island, Pittsburgh, Pa.

The United States Bureau of Marine Inspection and Navigation, about ten years ago, started a program of testing river towboats for stability in the Ohio River District. Accidents from towboats turning over, which had caused some loss of life prior to that time, have been practically nonexistent since. Through the cooperation of the towboat owners, stability questions and hazards from boiler explosions have been materially reduced.

We hear of a boiler explosion on the Ohio River possibly once every two years. Fortunately, of late they have caused very little loss of life. Occasionally, one of the old wooden towboats will burn, although the crews are generally able to get ashore with no injuries except those incurred when they return to fight the fire. In case of severe damage to the towboat by storm or otherwise, causing danger of sinking, it is almost always possible to ground the boat before it goes down. This also, because of the circumstances, rarely causes injury, and the resultant property damage is generally comparatively small.

Collision between towboats, or tows of towboats, is rare; although there are often cases of towboats colliding with fixed objects, such as dams, locks, or their appurtenances, or docks. These cause slight property damage and injuries but rarely. These accidents sometimes have their amusing side. A year or two ago two of our barges at the head of a tow were pushed part way over a fixed concrete dam and stuck there. These were unloaded and refloated with apparently little damage. In 1934 with the

water nine feet above flood stage a sand and gravel company's whole fleet broke loose in the river. Every towboat in the Pittsburgh harbor that could tie up its tow joined in the chase. One unit, a derrick boat, caught the point of its boom under the decking of the Smithfield Street Bridge and punched a hole in the bridge floor.

Frequently river construction work creates navigation hazards. The U. S. Engineering Department frequently places a towboat at the "chute" to help tows through. There was an incident, I believe, at Winfield, W. Va. on the Kanawha River, where during high swift water, a tow coming down stream got out of control. The towboat could not hold the barges and they went through a partially completed roller gate dam. The towboat cut loose and went around over the lock walls and caught the tow below.

The greatest loss of life in recent years has been caused by encounters between towboats and those using the water for pleasure, i.e., in motorboats, outboards, skiffs, canoes or when bathing. The following are examples:

Two boys while swimming were allegedly hit by barges and drowned at Donora, Pa.

One occupant of a small unlighted motor boat drowned as a result of a collision with a motor towboat.

Recently there were two deaths on the Ohio River below Pittsburgh under peculiar circumstances. The lone survivor, a woman, claimed a towboat had struck them but did not know its name. Their motorboat gave evidence of there having been an explosion.

All three had been seen apparently intoxicated earlier in the evening.

Bathers and occupants of home made row-boats are the worst offenders.

This has become a very serious situation and numerous efforts have been made to solve it. At one time it was necessary for the city of Pittsburgh's river police to give the excursion steamer, which was plying in local waters, an escort from the city line to its wharf. Unfortunately, because of the ignorance of "the rules of the road" on the part of most small boat owners, the river boat captains have been somewhat slow in acknowledging signals when they do receive them from small boat operators who are familiar with their responsibilities and duties. On the whole, however, the river boat pilots are blameless in these accidents. An educational campaign, being conducted by the safety committee of the local Propellor Club, with the cooperation of the U. S. Coast Guard Reserve and other bodies, appears to be making some slight headway but is much too slow.

Crew accidents follow a general pattern with the one exception of drownings. These are naturally higher than they are in most other forms of marine work, due to the proximity of the crew members to the water and the fact that they are continually out on barges reassembling tows, etc. No solution better than the Kapok life vest, worn at all times when outside of the cabin of the towboat, has been found for this hazard. It has been exceedingly difficult to sell the members of the towboat crews on the need for this comparatively cumbersome and uncomfortable piece of safety apparel, but some progress is being made.

Incidentally, there have been three drownings of fleet watchmen in the Pittsburgh District within the last eight months. These men should be compelled to wear Kapok jackets at all times when working.

Drowning is just one part of the general type of accident, known to all of you as "slips and falls." Falls follow the usual pattern except with respect to falls into empty or partially loaded hopper barges which frequently have serious consequences, i.e., fractures of arm, elbow, leg, rib or shoulder blade. Members of the deck crew occasionally get their feet caught in lines, or suffer crushing injuries of the feet or hands while placing blocking between barges

being assembled into a tow. The breaking of large connectors, cables and chains occasionally causes injuries generally to the leg.

Although it is not very strange, I have always wondered why diesel powered boats report so many fewer injuries than steam powered boats. However, in our experience, this has proved true. The engine rooms on some of the older towboats leave something to be desired in the way of guards, but the more modern boats are well cared for in this respect.

An additional hazard on steam powered towboats is the necessity for wheeling coal from the fuel flat generally towed alongside of the towboat to the boiler room. You can well imagine that wheeling wheelbarrows full of coal over more or less temporary runways at night, subject to the jarring and tipping of a boat, is a comparatively hazardous proposition. A considerable number of injuries have occurred in this operation.

With the abatement of boiler explosions, another explosion hazard has arisen. That is the growing transportation of petroleum products by barge. To date fortunately all serious accidents have occurred when the barges were separated from tows. To my knowledge there have been two explosions of barges, a fire involving four barges, and severe burns resulting from gas soaked clothing. The Bureau of Inspection and Navigation's regulations cover the situation adequately but towboat crews sometimes do not sufficiently respect the hazard involved. This is particularly true when only one harge of gasoline is included in a mixed tow.

Galley hazards on a river towboat are but little different from those of any other boat except that the galley on a river boat is somewhat smaller because of the fewer number of people served. Injuries reported range from illness due to inhaling the escaped gas from the electric refrigerator to the usual cuts with the butcher knife. Despite the hazards mentioned, many towboat crews go for several years without a disabling injury.

With the exception of the small boat hazard, the present unsatisfactory situation regarding life vests and that concerning tanker barges, none of the hazards mentioned are insurmountable.

MONDAY EVENING SESSION

October 7, 1940

The session followed a "Marine Section Progress Dinner," and was planned to present "Facts and a Look Into the Future" of the Marine Section. After the service, the meeting was called to order by General Chairman Byron O. Pickard, Chief Safety Engineer, Waterfront Employers' Association of the Pacific Coast, San Francisco, who presided.

The reports of the General Chairman and of the Standing Committees of the Section were received in detail. The Report of the

Nominating Committee was received, and officers for the Section to serve during the coming year were elected, as presented elsewhere in this record. The new officers were introduced individually by the General Chairman.

The closing feature of this session was a "Progress Pageant," presented in extemporaneous fashion by Arthur M. Tode, Past General chairman of the Marine Section, as Master of Ceremonies.

TUESDAY MORNING SESSION

October 8, 1940

This session was a "Coastal Regions" Breakfast and Conference. It was called to order, after the service, by Rear Admiral R. R. Waesche, Commandant, United States Coast Guard, Washington, D. C., who presided.

The closing feature of the session was a "Round Table Discussion" upon the subject:

"How to Aid the United States Coast Guard for Safety in the Coastal Regions of the United States." This topic included the report of each Regional Chairman of the Marine Section as to local problems affecting safety of life at sea, on rivers, lakes and other navigable waters. Plans for future safety action were discussed.

TUESDAY AFTERNOON SESSION

October 8, 1940

This session was called to order by Commander Herbert N. Perham, United States Coast Guard, Washington, D. C., who pre-

sided. Chairman Perham briefly introduced the various scheduled speakers on the program, as follows:

The Coast Guard Reserve—A Safety Organization

By REAR ADMIRAL R. R. WAESCHE

Commandant, U. S. Coast Guard, Washington, D. C.

The Coast Guard is the oldest maritime service in the history of our Government. It was called into being 150 years ago by our first Secretary of the Treasury, Alexander Hamilton, who recognized the need for a coastal patrol to enforce the youthful republic's laws and to safeguard in other

ways its maritime interests. On August 4, 1790, President Washington approved the Act creating the new service, known as the Revenue Marine, later the Revenue Cutter Service.

In 1878, the Life Saving Service, another federal safety-at-sea service, was organized

and earned for itself an enviable reputation. In 1915, the Revenue Cutter Service and the Life Saving Service were combined under the name of the United States Coast Guard.

In 1939, the Lighthouse Service, a historic Service, rich in tradition and accomplishment, and engaged wholly in safety work, was transferred to and consolidated with the Coast Guard.

The first Coast Guard vessels built in 1790, six in number, were cutters; that is, small, fast, one-masted sailing vessels. Our most modern Coast Guard vessels, still referred to as cutters out of tradition, 327 feet in length, turbine driven, heavily armed and carrying a seaplane are a long step from that small beginning.

A Vital National Force

The Coast Guard indeed has played an important part in the peace time development of the nation and its territorial possessions and an honorable and significant role in time of war. The suppression of smuggling, the saving and protecting of life and property, the maintenance of aids to navigation, the enforcement of the seal, halibut and whaling treaties, the boarding of vessels to enforce safety and other federal laws, the International Ice Patrol, the patrol of marine regattas, ocean weather observation for the safety of transatlantic aircraft, control of movements of all merchant vessels in territorial waters of the United States, supervision of handling explosives, inflammables and other dangerous cargo in our ports, the training of merchant officers and seamen and the organization and administration of the Coast Guard Reserve—all are steps in the progressive development of our basic function.

Coast Guard officers and men, to carry out these duties efficiently, must, by education, training and experience, be at home in sea and surf, in fair weather and foul; they must be alert, well-disciplined, fearless and self-reliant; they must be familiar with maritime laws, rules and regulations, particularly those pertaining to merchant seamen; they must be well-drilled and organized along military lines.

It is not surprising that such a force, which was established and is maintained primarily for peace time service, should be a part of the military forces of the United States, should conduct its military drills

while carrying out its peace time duties and should become an integral part of our naval forces in time of war. Today the Coast Guard is working at top-speed to increase the armament of its vessels and to take other measures to increase its usefulness to the Navy should war or other emergency require that national defense become temporarily our paramount duty.

Well-trained and disciplined officers and men efficiently navigating and operating watercraft, large or small, for business or pleasure, is the first requisite for safety at sea; it is also the first requisite for a Navy auxiliary in time of war and therefore the Coast Guard feels that the training of merchant marine officers and men and the administration of the Coast Guard Reserves are among its most important duties.

The Coast Guard Reserve came about in this way. Each year thousands of small vessels are involved in accidents of various kinds, many of them resulting in injury or death to persons on board. Statistical records compiled at Coast Guard Headquarters over a period of years has indicated that the majority of such casualties are caused, directly or indirectly, through carelessness, negligence, or incompetence on the part of those handling the vessel. The majority of these casualties were strandings, explosions, fire and engine break-down. Unquestionably, most of these accidents were preventable. It is evident that some of the operators of small craft have little knowledge of the basic laws of seamanship, rules of the road, aids to navigation, motor boat laws, navigation laws, or the operation of the vessel's engines; that in many cases they operate their craft with inadequate or faulty equipment or in a careless manner.

I do not imply that the majority of motor boat owners fall within this classification. They do not. But with over 300,000 motor boats traversing our navigable waters, there need be only a small percentage incompetently operated to produce a large number of accidents. The American Power Squadrons have been doing excellent work to improve safety in the operation of motor boats and the Coast Guard is glad to support their program and to help to enlarge their activities.

Laws containing fundamental requirements for safety have been passed by Con-

gress for the protection of motor boats and the lives of persons on board those vessels. The Bureau of Marine Inspection and Navigation and the Coast Guard, in close cooperation, have been enforcing these laws for years. However, in view of the number of accidents, still further steps appeared necessary.

The Coast Guard has always taken the attitude in its law enforcement work that in dealing with the unintentional violator of the law a spirit of cooperation rather than a crack-down policy would produce the best results. The problem, therefore, was how best to cooperate with the boat owner and through his voluntary assistance carry out a program of education and training to increase the safe operation of motor boats. And so, as a new approach to the problem, there was created by the Act of June 23, 1939, a voluntary, non-military organization unique in the annals of the Federal Government—the Coast Guard Reserve. Its principal purpose is to increase safety at sea and on navigable waters through training and instruction and by securing the cooperation of yachtsmen and other small boat owners in the dissemination of information and knowledge pertaining to the operation of boats.

In addition, Reservists may assist the Coast Guard in certain of its duties, such as patrols of marine parades and regattas, and in the saving of life and property. There are now operating in our waters nearly a half million small motor boats of various types and classes. The Reserve is the principal medium through which the Coast Guard may reach this large field of maritime activity in order to make available the best safety knowledge and practices. In return the Reserve can give to the Coast Guard, in these days of national emergency, valuable information regarding the activities of suspicious motor boats and motor boat owners.

The Reserve is non-military; members cannot be called to active service nor can their boats be commandeered for Coast Guard duty. Any citizen over eighteen years of age who owns not less than a 25 per cent interest in a motor boat or yacht may become a member of the Reserve provided he satisfies the Coast Guard that he is a competent boat operator who keeps his boat ship-shape and safely equipped. Distinctive

insignia which may be worn by members, and flags which may be flown from their boats, have been prescribed and may be displayed in testimony of their proficiency.

The basic operation unit of the Reserve is the flotilla, which consists of not less than ten boats. Flotillas are grouped into divisions appropriately designated by geographic names and divisions, and are in turn grouped into districts which coincide with and bear the same names as districts in the Coast Guard field organization. The Reserve is organized so as to be largely self-governing with the necessary assistance and administrative supervision by the Coast Guard. Unit officers of the Reserve assist the Coast Guard district commanders in the administrative Reserve work. Committees of Reserve members within a flotilla working with Coast Guard representatives inspect boats and examine applicants for membership in their knowledge of the rules of the road, aids to navigation, boat handling and navigation laws.

Rapid Growth

The Reserve has now been in active operation one year. Its progressive development during that period has been highly gratifying. 3,000 persons have been enrolled into 130 flotillas. 2,500 boats operated under its flag. These groups, in every section of the nation, the coastal regions, the lakes, the rivers, form the nucleus for future development.

It has not been the aim to expand the Reserve rapidly and thus create a large, unwieldy organization, but rather progress slowly and surely by having an interested, competent and cooperative group which would carry forward the work and the purpose for which the Reserve was created in a competent manner. Practical instruction and training in the safe and efficient operation and navigation of small craft, advice and information regarding the laws and regulations applicable to motor boats, are being given to an ever increasing number of motor boat owners through the medium of the Reserve organization and we are beginning to see results. Coast Guard reports show that there has been a material decrease in the number of violations of law by motor boats and this is, indeed, gratifying.

Safety in Ship Design and Construction

By COMMANDER H. L. VICKERY

(CC) U. S. N., Senior Assistant to the Chairman, U. S. Maritime Commission
Washington, D. C.

The features of ship design and equipment which contribute to safe operation can be placed in two broad categories:

1. Preventive features which tend to prevent the occurrence of accident to ship, to cargo, or injury to those on board.

2. Remedial features which come into play after an accident has occurred and which limit and localize the loss sustained.

It would be very desirable if, by the use of features of design in the first group, it would be unnecessary to consider the second group, but we all know the ship that cannot either founder or burn is yet to be designed and that the dangers of collision or grounding are always present.

Fire and foundering are the principal dangers to a vessel at sea, and it is to overcome these hazards that most of the work of the technical designing staff of the U. S. Maritime Commission has been directed. The requirements of Senate Report No. 184, and the International Convention for Safety of Life at Sea (1929), have been complied with, or exceeded, in all cases. As a result, the standards of safety from fire and foundering, which have been incorporated into the design and construction of the new high speed cargo and passenger vessels of the Maritime Commission replacement program, greatly exceed those even attempted by other countries.

Foundering may occur due to severe weather causing seams to open or hatches to be stove in, or through damage caused by collision with some object or another vessel. The chance of damage to a vessel through stress of weather is reduced to a minimum by building vessels to the highest standards of strength, and providing rugged propulsion equipment.

The problem of safety from foundering is closely related to the structural strength of the vessel, particularly its hull girder or beam strength when acted on by waves in a storm. The double bottom and decks, the wing bulkheads, if fitted, and the shell of the vessel are suitably braced by framing or stiff-

eners and by transverse bulkheads to form an extremely strong beam.

On the *S.S. America* there are 10 decks, four of which are continuous from bow to stern, and on the Commission's cargo vessels there are three decks, two being continuous. Where openings are cut in these decks, for machinery casings, hatchways, or stairways, or holes for ventilation trunks, elevators, etc., ample reinforcement is used to transmit the stresses. It is not the policy of the Commission to use expansion joints in the uppermost decks on large passenger liners as is the practice elsewhere, and all decks contribute their share to the hull girder strength of the vessel.

Welding has been adopted by many of the shipyards building vessels for the Maritime Commission, and this method of joining the plates and shapes that enter into the hull structure is rapidly replacing riveting. Increased joint efficiencies with the same scantlings or dimensions of plates and bars insure a stronger vessel.

The use of steel hatch covers on the uppermost or "Weather Decks," in lieu of wooden hatch boards covered by canvas tarpaulins, has resulted in greatly increased safety.

In order that a vessel may be kept under control in heavy weather, in fog, and in other times of emergency, the vessel's propelling equipment and auxiliaries must function. Many foundering and collisions can be traced directly to failure of some vital part of the machinery installation. To prevent such an occurrence the Maritime Commission ships are being built with propulsion equipment with inherent ruggedness.

Also, wherever practical, we have provided a standby unit capable of performing the duty of the unit normally operating, or a satisfactory emergency unit is available. For example, main generators, boilers, auxiliary machinery, and other important units, are in duplicate. Main reduction gears for any one shaft driving a propeller are not in duplicate because of inherent ruggedness which insures their safe and continuous operation.

For example, their lubricating oil supply is cooled, filtered, a constant supply provided, and oil vapors from cases carried out of machinery space. In the event the oil supply becomes low, or pressure falls below a pre-determined point, the operator is warned by signals and the unit shut down. During this shutting down period, oil is supplied by gravity to the reduction gears for a period of at least three minutes. Thus a minor oil supply failure, which might result in the ship being disabled, is averted and the ship's safety enhanced. On diesel driven ships of the single screw type, two engines are generally employed, rather than one per main shaft and, barring damage of reduction gears, the safety of the ship is practically doubled.

On single propeller ships the high and low pressure turbines are fitted with cross-connections which permit running of either the high or low pressure elements singly for emergency ahead operation. Under these conditions approximately one-quarter normal ahead shaft horsepower is developed which will permit the ship to maintain reasonable headway and is an added factor assisting safe operation. Ability to operate ahead with either the high or low pressure turbine during an emergency is, of course, based on unimpaired reduction gears.

Safety of operation is further enhanced by the proper location and grouping of machinery controls, alarms and warning signals. This places the control of the ship in the hands of experienced operators, who are on the alert and ready to obey instantly the instructions from those in command.

Steering gears are provided with duplicate feeders for the motors, dual power plants, a trick wheel control and at least two distant control stations. A gyro pilot system is also furnished which provides an additional means of steering control independent of the tele-motor equipment generally provided in the pilot house.

Aids to safe navigation, provided on all Maritime Commission vessels, help to prevent grounding or collision, particularly in a fog. By far the most important element is the radio, by means of which the vessel maintains constant communication with its shore office, and with various agencies which assist in checking time and the vessel's position and providing weather reports.

On a cargo vessel where a 24-hour watch

in the radio room is not maintained, the auto-alarm permits 24-hour reception of distress signals. The radio compass, which depends both on wireless and on the gyro compass, is used to obtain bearings from shore stations. The gyro compass and repeater system provides an indication of the true heading of the vessel and the true bearings of other vessels or objects, but a complete installation of three or more magnetic compasses, all corrected and ready for use, is also provided. Beside the radio compass, two important auxiliaries depend on the gyro compass system for their operation. These are the automatic course recorder and the gyro pilot, "Metal" Mike or automatic steering system. The radio installations on American vessels are closely supervised by the Federal Communication Commission.

An automatic indication and recording of the depth of water within the 15 to 300 fathom range is provided by the fathometer. For depths of less than 15 fathoms (90 ft.) the hand lead line is used, and for depths greater than the range of the fathometer, the electric sounding machine is used. Minor devices which increase the safety from collision or grounding are the electric wind-shield wipers provided in the wheelhouse, which insure visibility during storms, and searchlights which permit safe docking or handling of boats alongside at night.

When, in spite of the preventive measures mentioned above, a vessel sustains a damage and water finds its way into the vessel, the features of design classed in the second group as "remedial features" come into action to confine the results of the damage within safe bounds.

Although Senate Report No. 184 does not require cargo vessels (carrying not over 12 passengers) to be sufficiently subdivided to prevent foundering in case one compartment is opened to the sea, as by collision, underwater explosion, or gunfire, the Maritime Commission has insisted that all cargo vessels built under its replacement program and receiving a construction subsidy be "one compartment" ships. This requirement results in the installation of a greater number of main watertight bulkheads than might otherwise be used. These extend from the inner bottom (double bottom) up to the "bulkhead deck." There are 14 main watertight bulkheads on the *S.S. America* which would permit the flooding of any

three main compartments without endangering the safety of the vessel.

Where the main watertight compartments are pierced by openings, as the door between a shaft alley and the engine room, or between groups of passenger staterooms, mechanically operated sliding watertight doors with remote control must be provided. Cargo ports located in the side shell below the "bulkhead deck" are, of course, of watertight construction and strength equal to that of the hull.

Before its attack by American designers, the problem of securing safety from foundering had been approached principally from the standpoint of protecting the buoyancy of a vessel to prevent sinking. Records of losses, however, show that large vessels generally capsize before loss of reserve buoyancy would cause the vessel to founder.

The Maritime Commission has adopted the policy of providing sufficient stability on all classes of vessels, so that the vessels are equally safe from capsizing as they are from foundering from loss of buoyancy.

The Bureau of Marine Inspection and Navigation is responsible for measuring the stability of passenger vessels by means of inclining experiments. Although the Bureau does not require inclining experiments on cargo vessels, the Maritime Commission has insisted that the builders conduct these experiments to determine the initial static stability of one vessel of each type constructed at each shipyard.

As a final safeguard against foundering, we provide a drainage system of ample capacity which is served by several pumps which will rid the hull of water due to rivet leaks, small cracks, etc.

The problem of preventing fires on board ship is a difficult one, especially in respect to fires in cargo holds. The Maritime Commission has followed Senate Report No. 184 and is constructing its vessels with incombustible materials, so that practically all that can burn is the cargo, certain stores, and the personal effects, bedding and drapes, etc. of the passenger and crew accommodations.

To prevent cargo from catching fire from spontaneous combustion, the holds are provided with mechanical ventilation. The air intakes and outlets are screened to prevent sparks or lighted cigarettes from being thrown into the hold spaces.

Improved electrical equipment, including the use of armored cable, adequately protected control, ground detector lamps, thermal overload relays, and proper choice of motors to prevent excessive overloading, have all contributed to long life expectancy and freedom from serious fire hazard.

If a fire breaks out, the remedial features of construction come into play. The vessel is divided by vertical fire resisting bulkheads into main zones not over 131 feet long, beyond which a fire in any cargo hold, living or working space could not spread. Where bulkheads are stepped, the section of deck in way of the offset is made equal to the bulkhead in fire resisting qualities. The material in the bulkhead will not only resist the passage of heat for a specified period, but the bulkhead must be able to maintain its integrity for the same period. Doors piercing the main fire bulkhead between zones are of the same construction as the bulkheads, and are required to be closed mechanically by remote control on large passenger vessels. Dampers are placed in all ventilation ducts or trunks which may be closed from the bridge to avoid "chimney action" and spread of fires vertically. Stairways for escape from each main zone are of steel, enclosed with fire resisting material of the same construction as the main fire bulkheads. Two protected means of escape are provided from each living or working space, one at each end of the compartment.

At first, many American ship owners, and almost all foreign operators, considered that the use of construction materials which would limit the spread of a fire, and would not support combustion themselves, would prove too expensive to be practical. This fear has proved groundless.

Experience gained in the actual work of installing materials and detailed construction types (forms, shapes, etc.) has resulted in standardization with resultant economies.

Although the greatest relative improvement in remedial features has been made in preventing the spread of fires by means of fire zoning and the use of fire resisting construction and furniture, great progress has been made in fire detection both automatic and by patrols, and in fire extinguishing methods and equipment.

Fire detection is both automatic and by systematic patrol including permanent watchmen's records. Between the hours of 10

p. m. and 6 a. m. a fire patrol every 20 minutes is required where public spaces are not fitted with fire detecting systems, and every hour where such safeguards are provided. In the case of cargo spaces, an automatic smoke detector system is used to give an alarm visible on cargo ships and visible and audible on passenger ships, in case a fire or smoke is present in any cargo hold space. The smoke can be seen in the fire detector cabinet, issuing from a numbered orifice, indicating the space where smoke is present. A continuous sampling of air from each space is played on by a beam of light; a photo-electric cell and relay system is used to give an audible alarm and show on an annunciator in case the slightest trace of smoke shows in any sample. The air samples can also be discharged into the pilot house so smoke can be detected by smell. The same tube used to draw the sample from a space may also be used to flood the compartment with CO₂ gas, which will extinguish the fire without damage to cargo or electrical machinery. On diesel vessels, where CO₂ extinguishing systems are used to protect the machinery spaces, this method is employed for fire extinguishing in the cargo holds, but on steamers it is also common to use steam for extinguishing fires in cargo holds; chemical foam is used for machinery spaces particularly in the boiler rooms. Hand directed hose streams have been found to be most effective for fighting fires in passenger and crew living and working spaces, and a generous number of such hoses are provided about the open decks and in the living accommodations. A fire plug is also placed near each hatch top for pouring water into an open hatchway should necessity arise, either at sea or in port.

Metal lifeboats and motor lifeboats, meeting the high standards of the Bureau of Marine Inspection and Navigation in number and construction are provided. On cargo ships boatage is provided to accommodate all persons on board on each side of the ship. On passenger vessels the total boatage will accommodate all persons on board, and in addition buoyant apparatus is provided to support in the water 25 per cent of all persons on board. Floodlights are provided to enable the safe and easy embarking of people into the boats. Power operated lifeboat winches are provided in passenger boats to lower the boats.

Lifeboats having a capacity of 60 persons

or more are fitted with hand operated propellers. The propeller is operated by means of numerous hand levers which require no skill or great strength to operate so that most all persons in the lifeboat can help to propel the boat. At least one motor lifeboat is provided on all passenger vessels and it is fitted with searchlight and wireless to guide rescue ships.

So far I have spoken only in relation to safety of the ship and cargo and to life saving equipment. Considerable attention in design has been paid towards providing features to safeguard crew and passengers from accidents especially in connection with the following items:

1. *Cargo and Lifeboat Handling Gear.* The builders' designs of the complete installation, including masts, kingposts, derricks, booms, trolleys, hoists, davits, winches, wire and manila ropes, blocks and other gear, are carefully checked by the Maritime Commission, ample factors of safety being used. The complete installations are protected with a substantial overload, including raising, swinging and lowering of actual weights. The Bureau of Marine Inspection and Navigation supervises the testing of lifeboat davits, winches and falls. The arrangement of boat and cargo handling gear for convenient, safe operation is considered, as well as the strength of each element.

The test requirements for booms, blocks, wire rope and assembly tests are certified to by representatives of the Manufacturers, Shipyard and Maritime Commission, and copies of the certifications are furnished each vessel in form called "Register of Cargo Gear." This form has been accepted by other Maritime nations as indicating the cargo gear meets with their own regulatory requirements.

2. *Guard Rails, Hand Rails and Grabs.* A study is made of all conditions where men must pass or work and the necessary safeguards provided, including handrails on ladders, guard rails around hatchways and at the side of all weather decks, and hand grabs aloft. Portable sections in guard rails are fitted where necessary, as for side ladders.

3. *Non-slip Treads and Flooring.* Non-slip tile is provided in galleys, and the flooring in passages leading to weather decks has

non-skid properties. Inside and outside ladders are provided with non-slip treads.

4. **Lighting.** All cargo hold and other working spaces, all passages and public spaces, and all open deck areas where cargo is handled are adequately lighted to prevent accident.

5. Finally, the U. S. Public Health Service safeguards the health of the crew by inspecting all vessels at frequent intervals to determine their condition as to freedom from rats and other vermin, and purity of drinking water. The tanks, pumps and piping systems for drinking or culinary water are segregated from other fresh water sys-

tems, hence labels are often seen over faucets, "Wash water—Unfit for drinking." The elimination of rat harborage has progressed greatly due to welded steel fireproof construction and the elimination of loose wooden dunnage wherever possible. A combination of good design and good housekeeping has made it almost impossible for a rat to exist on board. Any space is rat-proof if an inspector can shine a flashlight into it and see clearly all parts with his naked eye. Any pockets that cannot be so examined must be closed to rats with heavy wire or solid metal. Fumigation for rats or in cases of infectious diseases, is carried out by the Public Health Service.

How Safety Inspections Prevent Accidents

By CAPTAIN W. W. STOREY

United States Navy, Bureau of Marine Inspection and Navigation,
Washington, D. C.

As you are all aware, the Bureau is vitally concerned with the safety of the traveling public and the personnel employed on shipboard. I am particularly gratified with the progress we are making in the matter of accidents to passengers, such accidents having been reduced to the vanishing point. During the past four years there have been no fatal accidents to passengers in inspected vessels.

Accidents among the crews of our vessels still occur in spite of the fact we have, in our opinion, the safest and best vessels in the world, but we are making definite progress in cutting these down by constant attention to details and thorough drilling and instruction in the use of the various types and kinds of lifesaving, fire-fighting and emergency equipment.

I have a few figures from the Bureau's records which will clearly illustrate the progress we are making. These figures cover five year periods from 1921-1925, 1926-1930, 1931-1935, 1936-1940. During the first period, 1921-1925, the annual average loss was 17 passengers and 89 members of the crew; 1926-1930, passenger lives lost were 35 and crew 98 per annum; 1931-1935, passenger lives lost were 36 and crew 62; and from 1936-1940 the average was but 2, or one passenger in five years and 28.2 crew. During the last three years there have been

no lives of passengers lost on inspected vessels and 26 crew members per annum.

Careful and thorough investigation of all casualties, regardless of the gravity, and application of the lessons learned therefrom are effective in reducing accidents, and continued instruction and supervision is preventing recurrences.

In bygone days, boat drills held in the presence of our inspectors were in a great many cases rather perfunctory and were featured by the crew crowding around the boat and swinging it out and in. Nested boats were a problem and it was seldom that the lower boat was lifted from its chocks and swung out. We now make a regular practice in getting out nested boats.

It is the practice at sea to lower the boats to the embarkation deck, which is greatly facilitated since gravity davits and wire falls have come into use, and in a number of instances vessels have been stopped at sea and all boats lowered to the water. In addition to being good training for the crew, such drills make a particularly favorable impression on the passengers.

The use of round bar davits and manila falls always tended to create confusion, as a number of seamen were required to lift the boat and swing it out accompanied by shouted directions from various members. However, with the latest type of davit, which

only requires the releasing of a toggle and one man to control the lowering brake, pandemonium is absent.

As far as actual handling of the boats in the water, there has not been much change except that a number of our new boats are hand-propelled and do not require knowledge of rowing. We are training more men in the art of rowing. It is common practice for our inspectors to require and get every crew member, including stewardesses and maids, into the boats and many of the women have proved to be experts with the oars. We claim that we have the best trained crews and the safest ships afloat.

A life preserver drill held some years ago often employed an obsolete type of life preserver and was often held when no passengers were present. Nowadays we have a stewardess instruct passengers, and in this connection I might say that the passengers on our vessels have shown a spirit of co-operation in the efforts made for their safety that is extremely pleasing. The passengers are really enthusiastic over the opportunity to take part in drills and their appreciation is evidenced by the many commendatory letters the Bureau is receiving.

When the boats arrive at the embarkation deck, the passengers are instructed as to their duties in entering the boats and are told about the equipment in the boat. One feature about these drills is that they are held at sea when the vessel is actually under way.

Now a few words about fire drills. Due to many losses of life in gas filled compart-

ments or where there is a deficiency of oxygen, we have stressed the importance of respiratory apparatus and considerable time has been given to instructing the personnel on board our ships in the uses and limitations of the various types of gas masks, oxygen breathing apparatus and flame safety lamps.

All our larger passenger boats and many small ones have emergency squads ready to respond to any alarm with a large assortment of tools and equipment. Some of our vessels include asbestos clothing in their fire-fighting equipment. Our traveling inspectors conduct classes in the use of respiratory apparatus.

One important addition to the life-saving equipment is the loud speaker system which has demonstrated its value in sending orders to the boats and passengers.

In addition to life-saving and fire-fighting equipment, important strides have been made in navigational apparatus. It is incumbent upon the personnel to be familiar with all types of equipment. The master can determine the ship's position by means of the radio direction finder. The fathometer will give the depth of water every few seconds by means of echos from the bottom.

As stated before, we are reducing the number of what might be termed occupational accidents among seamen, but still have some way to go to reach the irreducible minimum and I believe that only through constant instruction and education and continued maintenance of the highest standards of inspection that ideal condition can be attained.

WEDNESDAY AFTERNOON SESSION

October 9, 1940

The session was called to order by Capt. E. C. Holden, Jr., Manager, Safety Department, United States P. & I. Agency, Inc., New York City, and Chairman, Advisory Committee, Marine Section, N.S.C., who presided. The session had been planned to discuss the "Maritime National Defense Safety Program."

The first speaker was Capt. A. A. Nicho-

son, Personnel Director, The Texas Company, New York City. Capt. Nicholson made one of his well-known oratorical efforts, speaking on the subject, "Safety as an Aid to Better Industrial Relations in National Defense." Unfortunately, since he spoke extemporaneously, no report of the address is available here.

The second speaker was Commander

Ralph H. Roberts, United States Navy, Washington, D. C., who spoke on the subject, "Maritime National Defense, Industry and Humanity." His fine inspirational address

was made extemporaneously, however, and no adequate record is available for these pages.

Safety Education and the Training of Seamen

By W. N. DERBY

Commander, United States Coast Guard, Washington, D. C.

The *Morro Castle* disaster in September, 1934, demonstrated tragically the penalty for failure to build safety into a vessel and to train crews in safety measures. When the vessel burned off the New Jersey coast, 124 of the 548 persons on board were lost, or almost 25 per cent.

The investigation of this disaster revealed that the design and construction of the vessel were favorable to the quick spread of the fire, and it also revealed the shocking incompetence of the crew from the captain and chief engineer down. There were individuals who performed their duties bravely, but the crew was unorganized and untrained in the use of the available fire fighting equipment, and it was pitifully incompetent in handling the lifeboats.

The Government took prompt and effective action in applying the lessons taught by the rapid spread of the fire. Extensive tests were made of new materials, and specifications for new construction were drawn to provide maximum protection against fire hazards. These changes provided much safer vessels; but as long as ships burn oil and carry flammable cargoes, fires will occur, and at sea you cannot call for the fire engines and the hook and ladder. The crew must know how to use their fire fighting gear, and they must know how to handle their life-saving equipment.

In its program for rehabilitation of the merchant marine, the Maritime Commission did not overlook the problem of the seagoing personnel. Admiral H. A. Wiley was particularly active in fostering an adequate training system.

The Maritime Commission turned to the Coast Guard for advice in connection with personnel training, with the result that in September, 1937, the U. S. Maritime Service was established as a part of the Maritime Commission with Coast Guard administration. Training stations were immediately

opened at New York for unlicensed personnel, at New London for licensed officers, and at Alameda, California, for both licensed and unlicensed seamen. Because of protests from labor organizations that the industry was already overmanned, enrollment was restricted to men with service on seagoing and Great Lakes vessels.

Seamen enrolled at Atlantic, Gulf, Pacific and Great Lakes ports were given free transportation to the training stations, provided with quarters, food and uniforms, and offered instruction in seagoing subjects by competent instructors. During the three months' instruction period, licensed officers were paid \$125 a month, and unlicensed men \$36 a month. These three training stations are now excellently equipped to provide instruction for 600 licensed officers and 2,800 unlicensed seamen a year, for periods of three months each.

In November, 1939, the first class of 250 apprentice seamen was received on board the training ship *American Seaman*. They were selected from CCC camps, from applicants between 19 and 23 years of age whose camp records were good. Today the capacity of the special training stations and ships for apprentice seamen is 400 at St. Petersburg, Florida, and 500 at Boston. Another training ship and training station with a total capacity of 500 apprentices will be in operation early next year in Southern California. The total capacity for apprentice seamen will, therefore, be about 1,400, and the stations should make available each year for the merchant marine about 2,000 selected and trained recruits. Since well over 5,000 new men must enter the industry annually as replacements, jobs for the Maritime Service apprentice seamen should be available without causing displacement of experienced seamen.

During the three months' period of instruction at a Maritime Service Training

Station, a seaman is given practical and theoretical instruction suited to his grade: navigation and seamanship for deck officers; steam, diesel, and electrical machinery for engineer officers; lathe operation and welding for unlicensed engine-room ratings; cooking and baking for men of the steward's department. These courses are intended to make the students more competent in their daily work and to prepare them for advancement.

But in laying out the training schedules, due consideration was given to the importance of training seamen in safety measures. On a passenger liner half of the firefighters and lifeboat crews will be the cooks, waiters and utility men from the steward's department. Where can such men get the training needed for emergencies? Boat drills are held on shipboard as required by law, but seldom is a lifeboat lowered into the water, and few are the occasions when men are practiced in boatmanship.

Having in mind the safety of both travelers and seamen, the training program must have two objectives: first, to familiarize seamen with modern equipment, methods and organization. The second, and more important from the view point of safety at sea, is to develop a new morale in the present seamen, and to provide, as replacements become necessary on our ships, young Americans, selected and trained with care. The quality of men now entering the industry will largely determine the quality of ships' crews five years hence.

During the past few years, morale in the Navy and the Coast Guard has been high, while in the merchant marine it has dragged near bottom. Much of the difference in spirit is due, I believe, to the very careful selection of recruits for the naval service, as compared to the casual entry into the merchant marine of good, bad, and indifferent characters. In the past, the merchant service has depended largely on aliens, and then on low-priced citizen labor. Now the alien seamen can no longer be employed extensively, and the wage level is no longer low. Improvements during the past few years in the living and working conditions of American seamen make both practicable and necessary a higher standard of seagoing personnel.

Although the fundamental personnel problem of safety at sea is to secure high grade men for the industry, the immediate problem

is to provide adequate training for the seamen now in the merchant marine. The training schedules of the Maritime Service Training Stations have been planned with the thought that every man aboard ship is a seaman, and should have a basic understanding of seamanship. To that end every enrollee, whether deck sailor, engine room man, or cook, is given instruction and drills in rowing and boat handling, elementary seamanship, and fire fighting. All men are required to attend classes in which instructive marine disasters are described and discussed.

As a result of Coast Guard administration, boat drill is a major subject at the training stations. On board a merchant vessel a seaman has little opportunity to learn how to row or to handle a lifeboat, but at a training station he averages an hour a day in a boat and gets instruction in boat stowage and equipment. Upon completion of his course, an enrollee has every right to feel well-trained in the duties of a certified lifeboat man.

Recognizing that fire represents the greatest hazard at sea, studies are made of the causes of fires, precautions to be observed, firefighting equipment and methods, and the organization of rescue parties. A study of the *Morro Castle* fire reveals the failure of the ship's personnel to sound an alarm promptly, to use fire hoses, to close fire screen doors, to stop the ship so as to reduce the strong draft which fanned the flames, to send radio calls without delay, to direct passengers along safe interior passages, or to make effective use of the lifeboats. Instruction at the Hoffman Island training station for unlicensed men is given in classrooms well equipped with all approved types of fire extinguishers. The care and use of each type is explained by competent instructors, and the apparatus is laid open for inspection. Likewise, various types of smoke and gas masks are discussed, and students fitted with smoke masks are required to enter a specially constructed smoke room.

In the classes for licensed officers, the properties of certain dangerous cargoes are studied, and the most approved safety precautions considered. Studies of the fire-fighting organization of a ship's crew, and the requirements of law and of good seamanship are included in the course.

From the nature of his job, the seaman is liable to injury or sickness without hope

of prompt or skilled attention. At the training stations medical officers of the U. S. Public Health Service conduct classes in hygiene and first aid, in which the special problems of seamen are discussed. Venereal diseases must, of course, be considered almost an occupation hazard along the waterfront, and an authoritative lecture on the

dangers, prevention, and treatment of such diseases is properly classed as safety instruction. The dangers of vermin, poor ventilation, noxious fumes, and poisonous gases, are included in the medical lectures. In addition to instruction, first class facilities are provided at the training stations for the medical and dental treatment of enrollees.

U. S. Navy Motion Pictures

The closing feature of this session was the presentation of United States Navy Motion Pictures, with sound effects. They in-

cluded "Navy Wings of Gold," "First Line of Defense," and "A Good-Will Cruise Around South America."

THURSDAY LUNCHEON AND AFTERNOON

October 10, 1940

This session was a joint meeting with the Propeller Club, Port of Chicago. The meeting was called to order by the Chairman, P. J. Riley, Principal Surveyor, American Bureau of Shipping, and President of The Propeller Club of Chicago.

The Toastmaster was Arthur M. Tode, Honorary President of The Propeller Club

of the United States, New York City, and Past General Chairman, Marine Section, and Past Vice-President, National Safety Council.

The Guest of Honor, who introduced the speakers, was Cornelius H. Callaghan, Manager, The Maritime Association of the Port of New York, New York City.

The Future Safety of the American Merchant Marine

By CHARLES H. C. PEARSALL

Vice-President, Atlantic, Gulf & West Indies Steamship Lines, New York City

We must take steps to assure the further strengthening and permanency of the American Merchant Marine.

New ships, faster, more efficient and more economical than anything previously built in this country are now being delivered at the rate of one a week. Eight ships will have been launched in the two weeks ending October 12th. The Maritime Commission is doing a splendid piece of work. The need for a continuing ship replacement program has been obvious for years, but it was not until Admiral Land, the present chairman of the Maritime Commission, decided in true Navy style to go ahead and worry about criticism later, that real progress became apparent.

It has been said on many occasions that if the percentage of our foreign commerce

transported in American bottoms could be increased from 30 per cent to the neighborhood of 50 per cent, the need for government financial aid to the shipowner would disappear—that American shipowners could then pay the full cost of building ships in the United States, and all that capital cost entails in the way of depreciation, insurance and replacement, and be able to afford the wages and other costs which go hand in hand with our standard of living.

Today, in many trades, American ships have reached that Utopia in which foreign competition is practically non-existent. We all know the reason. In just a little over a year, whole nations have been wiped off the map, and others have become vassal states of a ruthless conqueror. All but one of the nations thus demolished or conquered was

a maritime country. Their shipping, as well as that of the aggressor nations and Great Britain, has been completely dislocated.

A large part of our own Merchant Marine was thrown out of joint by the Neutrality Act, but the demoralization of other nations' shipping and tonnage losses resulting from submarine and mine warfare have diverted business, which was formerly handled by foreign flag ships, to American vessels. The destruction of tonnage has strengthened the world shipping situation; the old law of supply and demand has resulted to our advantage; but American shipowners are not charging all the traffic will bear. Rates have not been increased to anything like those reached during the first World War.

Almost every American flag line in foreign trade has purchased or agreed to purchase new ships, built in the United States, and is receiving the benefit of the construction differential and operating differential subsidies. Yet I venture to say that, if these subsidies were withdrawn, they could not see their way clear to continue for long, for the reason that no one can predict the situation that will follow the war; how long the war will last; and—most important—whether the United States may be forced into it. American owners have no assurance that they will be able to retain their present percentage of the business when the war is over.

One thing they do know; that unless the present combatants annihilate each other, American ships are going to be confronted with the toughest kind of competition. The warring nations, financially exhausted, will do everything possible to regain their former status in world trade; they will have to do this in order to restore their trade balances. American shipping must be well fortified to withstand this onslaught. The safety of our Merchant Marine requires that there be no diminution of government financial aid in the present crisis or in the future, so far as we can see today.

Another reason for the continuation of this aid is the degree of control the government itself retains over our shipping. Under the present arrangement, the government can requisition any ship it has helped build or subsidize, during any emergency declared by proclamation of the President. The law provides that the owner shall be paid the "fair, actual value" of the vessel at the time of taking. The government has al-

ready requisitioned a number of the newest ships flying the American flag. Up to now, it has not been called requisitioning, but purchase, and the government in each case has driven a hard bargain.

I should like to again point out a condition to which I have referred on several previous occasions. We all know that a merchant vessel has an economic life of but twenty years. We also find that for centuries major wars have occurred in cycles of approximately twenty years. Two decades ago, the world was just beginning to take stock of itself after the first World War. At about the turn of the century there was our own Spanish-American War (which wasn't much of a war, but demonstrated the value of a Navy and a Merchant Marine), the Boer War in South Africa, and, a little later, the Russo-Japanese War. In the preceding period between that time and our own Civil War, there were numerous conflicts, chief of which perhaps was the Franco-Prussian War. The American Civil War—1861 to 1865—marked the end of the era in which our Merchant Marine had dominated the seas.

Without government assistance, and sometimes despite such aid, peacetime has usually meant operating losses or slim profits for the shipowner. But wars invariably bring about a demand for shipping. For this reason, and bearing in mind the 20-year war cycle and the 20-year life of the ship, there never has been a time in modern history when the owner of a ship could not, at some period during the vessel's economic life, make sufficient profit, either by operation or sale, to pay the original cost of the ship.

Today, insofar as the greater part of American shipping in foreign trade is concerned, this would be impossible. I am not arguing that the shipowner who accepts subsidies should expect to reap huge profits in wartime. But I do say that for reasons of national defense, for the safety of our foreign trade, and for the safety of the Merchant Marine itself, events of the past year and the present situation completely justify the expenditure of millions of dollars for new vessels.

Nor do we in the Marine Industry believe that there should be any let-up in the Maritime Commission's ship construction program. The Commission has no thought of applying the brakes. But it has been sug-

gested frequently of late that every energy of the shipbuilding industry should be devoted to the construction of naval craft and that merchant shipbuilding can wait until the naval rush is over. We all know the fallacy of such reasoning. We know that the Navy needs vessels of the merchant type so badly that it has already taken over a number of new ships from the regular lines and intends to take more. As a matter of fact, the acceleration of the naval program of building demands the acceleration of the merchant shipbuilding program.

There are shipowners with old ships on their hands—I am familiar with one company with ten of them—which they could sell at present world prices, but they cannot be assured of replacements for several months or even years. Meanwhile they are compelled to run the old ships, with all the expense of operating obsolete or obsolescent property; when the time comes that they may secure replacements, they probably won't be able to get better than scrap prices for the old ones.

There is another angle which relates to the safety of our Merchant Marine, and that is the matter of personnel training. Through the United States Maritime Service so ably conducted by the Coast Guard, some 3,000 seamen and officers have taken advantage of the opportunity to improve their knowledge of seamanship and shipboard duties. The Maritime Commission has made a good start in the training of future officers with its cadet system, and the several state nautical schools have for many years produced the finest kind of merchant officer material. One more step must be taken, and that is one which the steamship companies must take of their own volition.

I refer to the training of the shore staffs—our future shipping executives. Many colleges now offer courses in foreign trade, transportation and related subjects. Too often the graduates receive little if any encouragement when they apply for employment with steamship companies. Too few of these young men, possessing the theory, ever get an opportunity to acquire actual experience.

Also, there is the young man who lacks a college diploma, but who has secured a job in the shipping business. I know that in this country of ours, any young man who really wants an education can get it if he is will-

ing to work for it. But why should not the steamship companies insist that their younger employees acquire the education, aside from routine experience gained in the office or on the pier, necessary to preparing them for advancement and greater responsibilities? Banks, insurance companies and many other businesses encourage this sort of thing, and many insist upon it. Why not, I repeat, the steamship companies?

And now, in conclusion, I come to the question of public relations, which has aptly been called Industry's No. 1 job. It is certainly that to the Marine Industry. If ever an industry has suffered by reason of a lack of public understanding and appreciation, it is the American Merchant Marine. Too many within the industry itself have closed their eyes to this problem—and, believe it or not, there are some today who profess the belief that inasmuch as our shipyards are overflowing with work and our ships sailing with their holds full of cargo, the ultimate goal has been reached and any effort to improve our relations with the public is a waste of time, energy and money.

This is a joint meeting of the Marine Section and the Propeller Club—both organizations vitally interested in the American Merchant Marine—and it is not necessary for me to recite the Propeller Club's objectives. Yet only recently I was informed that a pretty big man in the shipbuilding field had suggested that the Propeller Club might well suspend activities until the war is over!

I believe, and I think you will all agree, that now, while public appreciation of the need for an American Merchant Marine is on the upgrade, we should double our efforts.

And let us always keep in mind the fact that with any company, or industry, good relations outside grow from good relations within. You must begin at home and work from the inside out. If the immediate family is not happy and informed, those whom it meets outside will not be.

To those who have been working for a good many years for improved safety in the marine field, these words must have a familiar ring, for they sum up the chief problem encountered in making the Marine Industry safety-conscious.

And by the same token, the safety of the

American Merchant Marine can best be assured when understanding and mutual respect exist between top management, the

man on deck, the man on the dock and the man who figures the bills of lading, as well as all those who come in between.

Train Seamen for American Ships

By COMMANDER ROBERT C. LEE

Executive Vice-President of the Moore-McCormack Lines, Inc., New York City

The modern ship presents all the risks to be found in an industrial plant. It is in fact a small city with all the varied enterprises of a city, and in addition it must face the perils of the sea. Certainly here we need a trained personnel.

Not long ago, in Rio de Janeiro, the Admiral of our South Atlantic squadron invited me aboard his flagship, the heavy cruiser *Wichita*. The ship is a maze of complicated machinery, great guns, anti-aircraft batteries, airplanes and airplane garage, mine sweeping and mine laying equipment, torpedo tubes, and all the paraphernalia of war at sea. She was in an absolutely perfect state of upkeep. You could see that men who knew their jobs and loved their jobs officered and manned that ship.

These boys were the kind that some people like to refer to as "plow jockeys." Many of them, truly, were very recently from the farm lands of this country. A few months with the right kind of training had made them into the finest seamen the world has yet produced.

When I entered the Navy thirty-four years ago it was just at the end of a period of changing over of personnel. The cream of the old-timers was still left in leading petty officer positions. They were mostly Scandinavians, but there were some Portuguese, Italians, and Greeks that I recall. The new Navy was coming along fast. Instead of manning our Navy from the waterfront, we Americanized them, and to do this it was necessary to go to the inland, take young men with no sea experience whatsoever, put them into training stations for six months, and then dispatch them to the ships. The Navy really started going places when this occurred. It was necessary to give the men better living conditions, better treatment, but in turn we got better men and consequently an infinitely better Navy.

As a mighty step in the direction of safety, including national safety, I think it

is fitting that we examine for a few moments the present personnel of the American Merchant Marine and the United States Maritime Service which proposes to train it.

I took a count of the birth places of the crews of 19 of my ships today. The total number of men's records examined was 1,911. Of these 77 were actually aliens and 774 were foreign born, now naturalized. 1,060 are native born. Now, I am not criticizing my crews because about half are foreign born. Foreign born does not necessarily make a bad sailor. However, the setup is wrong. The kind of men we are getting is not the kind of men that are valuable for this important duty. They are not anywhere near the same class of men that are going into the Navy, and they will not be, so long as present conditions exist, because the class of men that we want will not associate with the present setup.

In the Navy, improved living conditions had preceded the improvement in personnel. Unfortunately it lagged behind in the Merchant Marine. Where dollars were invested strong-arm methods were necessary. However, several years ago I personally spent many days in Washington with the old Copeland Committee, the majority of which were labor leaders, and we wrote into the law vast improvements in living conditions.

Personally, I am of the opinion that most shipowners are in favor of effective labor unions, and those that are not will have to obey the law, anyway. I know that we are strongly in favor of responsible organization for our workmen. I refer only to those who are properly classed as laborers, because that is the only group that labor unions are good for. The labor unions should be strong and well knit, and not in any way controlled or influenced by the company in its decisions and actions. The policy of a labor union, however, that attempts to destroy company loyalty, is political in its philosophy, and is using the

union for political purposes and not for the recognized American purpose, which is to improve the condition of the workman. It loses sight entirely of the fact that the condition of the workman can only be improved in exactly the ratio that the improvement of the company occurs.

We are sometimes inclined to believe that the greatness of America is her vast natural resources. These natural resources were all here for untold years and were completely neglected by the few thousand Indians who roamed the country. The greatness of America today is her people, who have known how to utilize these vast riches. Such a people can build a Merchant Marine when it becomes necessary. We need such a kind of people today in our ships and we are going to have them sooner or later—I hope sooner.

Another thing, there is in my judgment no place on the high seas, in American ships, for men who are afraid to fight. One of my ships recently raised three hundred dollars from the poor sailors to send delegates to the All American Youth Congress meeting in Chicago against war. Now, this is not the kind of men that make a Navy. Such men are no good for defense. For a Navy you want men that are a little thick on the side of their Government; a little too ready to fight, if anything. The Navy proved this when she changed her alien born crews for young Americans.

What has all this to do with safety? Just this. A Navy without bases, without a train, is no Navy at all. Already in peace time, with a slight expansion begun in our Navy, they have had to take from our Merchant Marine our Cadets, several of my ships, several of the Maritime Commission ships, and more are to follow. A Merchant Marine is a defense. In the United States it has no other justification as it is not a profitable venture of itself. It is a commercial defense at all times and a vital military defense in time of war. Our Merchant Marine should be as carefully manned and as skillfully trained as is our Navy.

The United States Maritime Service was established by the Commission on July 14, 1938. By agreement with the Secretary of the Treasury, it is administered for the Commission's account by the United States Coast Guard under rules and regulations prescribed by the Commission.

The *American Seaman* placed in service in May 1939 and the *American Sailor* which

is nearing completion, are two of the finest training ships in the world. These vessels are of ten thousand tons deadweight, and were reconditioned at a cost of a little more than one and one-half million dollars each. They are equipped with the most modern, up-to-date equipment such as machine shops, safety devices, lifeboat handling gear, navigating equipment, and galley equipment for the instruction of apprentices.

The *American Seaman* is attached to the St. Petersburg Station, Florida, with an annual capacity of 333 apprentices. The *American Sailor* will be attached to the Hueneme, California Station with an annual capacity of 333 apprentices.

Also, the full-rigged ships, the *Joseph Conrad* and *Tusitala* are for the instruction of apprentices and are presently attached to the St. Petersburg Station.

In addition, there are several cutters attached to the various training stations.

There are two training schools for Licensed Officers, one located at New London, Conn., with an annual capacity of 360 men covering a three months' course and 180 men covering a one month course. The other is located at Alameda, California with an annual capacity of 180 men covering a three months' course and 60 men covering a one month course. These schools are well equipped and have a variety of subjects such as navigation, maritime law, signalling, safety precautions, emergency drills, history disaster, internal combustion engines, boilers, etc. The school at New London, Conn., also has the facilities of the Coast Guard Academy for instruction purposes.

Hoffman Island has an annual capacity of 1,880 men covering a three months' course and 600 men covering a one month course.

The Alameda Station has an annual capacity of 240 men covering a three months' course and 120 men covering a one month course. Both of these stations are for the Deck, Engine and Stewards Departments.

These schools are exclusively for the seamen who have had at least twelve months' sea experience. They are taught subjects such as nomenclature, electric welding, emergency drills, boatmanship, hygiene, breeches-buoy drills, machine shop work, and with special emphasis on lifeboat drills. Graduates of the deck, engine or steward's department are fully qualified lifeboat men.

There are three schools for apprentices, namely, St. Petersburg, Florida, with an an-

ual capacity of 666 men (including the *American Seaman*); Gallups Island, Boston, Mass., with an annual capacity of 667 men; and Hueneme, California, under construction, with an annual capacity of 500 men (including the *American Sailor*).

Upon enrolling in the Maritime Service, these young men are given preliminary training in hygiene, discipline, etc., at the various receiving stations. After their adaptability for the various departments has been determined, they are then sent to sea on the full rigged sailing ships and the training ships *American Seaman* and *American Sailor* for training in their respective departments.

The course is for one year, after which the men are certificated by the Bureau of Marine Inspection and Navigation as cooks, butchers, waiters, ordinary seamen, and various ratings in the Engine Department; also, every graduate is a certificated lifeboat-man.

Apprentices at Gallups Island are being trained as Radio Operators. Licensed Officers receive \$125 per month, unlicensed personnel in the deck, engine and steward's departments are eligible for \$36 per month and Apprentices \$21 per month. These men are furnished subsistence, lodging, clothing, together with free medical and dental care.

Graduates who have served at least eight months at sea in the twelve months are eligible to return to the school for one months' course each year, and in addition to their month's pay they receive an additional month's retainer pay.

What more could any Government do to train its seamen?

Notices of this training are posted in all CCC Camps. The Civilian Conservation Corps assembles applicants at Fort Dix, New Jersey, from all over the country. The material that has been assembled so far has been excellent.

It is possible that this splendid and neces-

sary training may fail in its purpose. As you know, ignorance and incompetence breed fear. Some organizations seem to be scared to death of this training service and instead of assisting it in every way possible, appear determined to undermine and destroy it.

It is a dead intellect indeed that considers that there can be too many skilled workers. We are spoiling altogether too many good bricklayers in an effort to make doctors and lawyers out of them. In Pennsylvania the other day the Frankfort Arsenal opened its gates for three thousand skilled workmen. Of the first five hundred who applied only eighteen were considered even worthy of trying out. The Civil Service Commission also took applications from two hundred, out of which ten were skilled workers. For safety's sake let's get some trained men from our youth.

The greatest safety Act of all times is the Conscription Law. It is high time this country woke up to the difference between license and liberty. We have been producing altogether too many people of late willing to accept the soft side of life; willing to partake of the good things that America has to offer, but entirely unwilling to pull their oar in the boat. Here again the fault is not inherent in the breed, but lies in our namby, pamby, broken down processes of education. Our educational systems need an application of sand and canvass. But under the Compulsory Service Law, by 1945 and perhaps sooner, there will be at least four million citizens of this country who will be vastly improved mentally, morally, and physically, and will begin to have some faint conception of what life is all about. From this will come safety, not only the safety of our country from enemies without, but safety from the rots that have been developing from within. Upon this Law hangs the future of democracy, the future of America.

Presentation of National Safety Council Awards in the Marine Section Safety Contest

Outstanding facts in the contest were described briefly by Mr. Arthur M. Tode, Consulting Engineer, New York City, who also presented the awards in the name of the National Safety Council.

The enrollment in the 1939-40 contest ex-

ceeded participation in all previous competitions. One hundred and twenty-four units employing 115,992 people who worked 230,347,305 hours during the year participated.

The average frequency rate was 26.10. Rates ranged from 9.53 in the Harbor

Equipment Division to 239.09 in the Coastwise Stevedoring Division.

Frequency rates averaged 41 per cent above rates in the previous competition. The increase is due principally to sharply higher rates in the Shipbuilding & Repair Division.

One out of each 19 employees had a reportable injury during the year.

Nine contestants went through the contest period without a single reportable injury.

The awards consisted of handsome Trophies in the form of Bronze Plaques, each displaying an eagle in flight and the Universal Safety Emblem, which were given to winners of first place in the contest; and Certificates of Merit in the shape of a lettered scroll, which were given to winners of second and third places. In the lists below, winners of first place are indicated by the numeral (1), and winners of second and third places are indicated by the numerals (2) and (3) respectively.

Harbor Equipment Division Group A

1. U. S. Engineer Department, Missouri River Division, 1,876,578 hours, 7 injuries.

2. U. S. Engineer Department, North Atlantic Division, 2,337,519 hours, 17 injuries.

3. U. S. Engineer Department, Lower Mississippi Valley Division, 5,771,299 hours, 39 injuries.

Harbor Equipment Division Group B

1. Standard Oil Company of Louisiana, Baton Rouge, La., 512,615 hours, no injuries.

1. The Chesapeake and Ohio Railway Co., Newport News, Va., 165,515 hours, no injuries.

1. The Atlantic Refining Company, Philadelphia, Pa., 160,761 hours, no injuries.

1. Pan American Petroleum Corp., New York, N. Y., 99,775 hours, no injuries.

1. Atlantic Coast Line Railroad Co., Port Tampa, Fla., 79,450 hours, no injuries.

1. Union Oil Company of California, Los Angeles, Cal., 61,624 hours, no injuries.

Cargo & Passenger Vessels Division

1. The Chesapeake and Ohio Railway Co., Newport News, Va., 97,909 hours, no injuries.

2. Standard Oil Co., Indiana, Chicago, Ill., 347,188 hours, 1 injury.

3. Lykes Coastwise Line, Inc., New Orleans, La., 617,711 hours, 2 injuries.

Tankers Division

1. General Petroleum Corporation of California, Los Angeles, Cal., 412,256 hours, 1 injury.

2. Lago Shipping Co., Ltd., Aruba, N. W. I., 1,771,168 hours, 7 injuries.

3. Tide Water Associated Oil Co., Eastern Division, New York, N. Y., 1,215,120 hours, 7 injuries.

Shipbuilding & Repair Division Group A

1. U. S. Navy Yard, Puget Sound, Wash., 10,579,782 hours, 32 injuries.

2. U. S. Navy Yard, Boston, Mass., 11,798,296 hours, 50 injuries.

3. U. S. Navy Yard, Norfolk, Va., 15,919,295 hours, 124 injuries.

Shipbuilding & Repair Division Group B

1. U. S. Engineer Department, North Pacific Division, 297,613 hours, no injuries.

1. U. S. Engineer Department, South Atlantic Division, 244,272 hours, no injuries.

3. U. S. Engineer Department, Lower Mississippi Valley Division, 1,730,358 hours, 3 injuries.

Great Lakes Stevedoring Division

1. Canada Steamship Lines Limited, Hamilton, Ont., 115,445 hours, 3 injuries.

2. East Chicago Dock Terminal Co., East Chicago, Ind., 84,064 hours, 3 injuries.

3. Canada Steamship Lines Limited, Point Edward, Ont., 220,761 hours, 8 injuries.

Deep Sea Stevedoring Division

1. Lago Oil & Transport Co., Ltd., Aruba, N. W. I., 454,520 hours, 4 injuries.

2. Waterfront Employers Association of San Francisco, Cal., 6,776,743 hours, 581 injuries.

3. T. Hogan & Sons, Inc., New York, N. Y., 810,890 hours, 85 injuries.

Coastwise Stevedoring Division

1. Lykes Bros. S. S. Co., Inc., Boston, Mass., 101,386 hours, 16 injuries.

2. Lykes Bros. S. S. Co., Inc., Baltimore, Md., 144,271 hours, 35 injuries.

3. Lykes Bros. S. S. Co., Inc., Houston, Texas, 228,054 hours, 56 injuries.

Meat Packing, Tanning and Leather Industries Section

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Secretary—RAY GILLET, The Rath Packing Co., Waterloo, Iowa.
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Engineering Committee Chairman—TOM MILLER, Crocker Packing Co., Joplin, Mich.
Poster Committee Chairman—W. C. RUMBLE, Chilhowee Co., Newport, Tenn.
Program Committee Chairman—M. O. ANDERSON, King's Packing Co., Nampa, Idaho.
Publicity Committee Chairman—A. S. SOLTAR, R. H. Buhrke Co., Chicago, Ill.
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 C. M. MENSE, Lehigh Safety Shoe Co., Allentown, Pa.
 *WILSON PALMER, United Shoe Machinery Corp., Beverly, Mass.
 R. R. ROACH, Geo. A. Hornel & Co., Austin, Minn.
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Poster Committee Chairman—W. C. RUMBLE, Chilhowee Co., Newport, Tenn.
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Publicity Committee Chairman—A. F. SOLTAR, R. H. Buhrke Co., Chicago, Ill.
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 C. T. HEALY, John Wenzel Co., Inc., Wheeling, W. Va.
 H. V. E. HUNTER, Hunter Packing Co., East St. Louis, Ill.
 *WILSON PALMER, United Shoe Machinery Corp., Beverly, Mass.
 *PHILIP G. RHOADS, J. E. Rhoads & Sons, Wilmington, Del.
 FAYETTE SHERMAN, Geo. A. Hornel & Co., Austin, Minn.
 *A. E. SINCLAIR, Kingan & Co., Indianapolis, Ind.

*Past General Chairman

ADJOURNMENT

TUESDAY AFTERNOON SESSION

October 8, 1940

The session was called to order by General Chairman H. G. Schaffner, Treasurer, Schaffner Bros. Company, Erie, Pa., who presided. In his opening remarks the Chairman welcomed the delegates and commented briefly on the activities of the Section and

of Sectional Committees during the past year.

The Report of the Nominating Committee was received, and officers for the Section for the ensuing year were elected, as presented elsewhere in this record. The Chairman then introduced the first speaker.

Safety in Handling Live Stock

By H. R. SMITH

General Manager, National Live Stock Loss Prevention Board, Chicago, Ill.

In handling live stock on farms probably the most common accident is goring or trampling by a bull. Dairy sires seem to be more unruly than beef sires because of their nervous temperament. The disposition of the animal is greatly influenced by the care given. Many assume that all bulls are ugly and proceed to use a club or pitchfork whenever they enter the yard. Under such conditions, the bull learns to defend himself and may strike back.

Proper feed, good watering facilities and kindness in treatment are the best means of preventing bad dispositions. There are cases where a bull is naturally ugly and under such conditions should always be handled with a staff in the nose-ring. If not particularly valuable as a sire, such an animal should be sold for beef.

We rarely hear of accidents with unruly hogs and these are nearly always confined to boars that have been mishandled.

Sheep are virtually harmless. I have known of a few butting rams, but these are usually made unruly by teasing boys.

Kicks from horses are not uncommon. Many of these could be avoided by a careful approach in the stall with quietly spoken words and gentleness on the part of the attendant.

The excitement of loading animals on trucks or cars is often conducive to kicking by cattle, especially when electric prods are used. In such cases, it is not so much the pain as the surprise. A man using an elec-

tric prod on cattle should always stand well back.

The relatively few accidents to yard men in our live stock markets is astonishing. For example, the receipts of cattle at the Chicago market have averaged nearly 3,000,000 annually during the past forty years, yet during that time there have been, according to statements of old-timers, only three men killed, two from goring by bulls and one from a swinging gate on a very windy day. There have also been a few cases of broken legs and arms, and other minor injuries.

Some shippers notify their commission firms that the load contains one or more unruly cattle. All should do this. The change in surroundings and the excitement of the public market affect animals differently. Some salesman, forewarned about an ugly bull, finds him perfectly subdued by the strangeness of stockyard activity; other cattle, known to be quiet on the farm, are in a few instances excitable and obstreperous in the public market.

One explanation of the small number of accidents to stockyard operators is their daily experience in handling large numbers and their almost automatic guarding sense. Another is that more than 80 per cent of the cattle sold are hornless.

The story of injuries to animals by man is a different one. I am ashamed to say that farm animals are much more considerate of men than men in general are to animals. I do not wish to indict all men; many are

born with humane instincts. They take pride in their live stock on the farm, get much satisfaction in seeing them comfortable and always handle them carefully to avoid injuries. These are invariably most successful because farm animals respond to good treatment.

There are others who lack these qualities. They are undisturbed by injuries and suffering they inflict on animals by the use of clubs and other such objects. They lose their tempers easily and are unnecessarily cruel under such circumstances. If farm animals were as combative and abusive toward man as man is to animals, our hospitals would be full to overflowing with injured patients. Injuries to animals occur not so much with intent as with carelessness and a lack of knowledge as to how easily an animal may be bruised under the skin and therefore unseen at the time.

The economic as well as the humane aspects of careful versus careless handling of live stock is worthy of the consideration of every citizen. The annual waste that occurs from injuries to live stock on farms, in transit, and at the markets is of concern to all and does not reflect credit to the live stock industry as a whole. Much progress has been made in breeding and feeding animals for efficient and economical production and great strides have been made in the control and elimination of diseases. We have heretofore neglected the waste that is so general in the marketing process.

It was because of this situation that the National Live Stock Loss Prevention Board was organized in 1934 through the initiative of producers, transportation companies, stockyard and commission agencies, live stock insurance companies, meat packers, tanners and humane societies. In 1935 an exhaustive survey was made to determine with some exactness the extent of these losses. The stockyard companies of the nation were called upon to furnish statistics giving the total receipts of each class of animals and the number that were found dead and crippled on arrival. The various packing companies were asked to conduct bruise tests on enough consignments of live stock to give an accurate picture of the extent of losses from bruising. In these bruise tests conducted at fifty packing plants from coast to coast, experts determined the weight of the bruised meat that is always trimmed out, and the loss that resulted from

these products going into a lower grade to be sold at a discount.

It was found that on the basis of receipts and slaughter of live stock in the United States during 1935, the loss on animals dead and crippled on arrival was approximately \$3,000,000 that year and the loss from bruising was approximately \$9,000,000, making a total loss of \$12,000,000 in one year, much of which was the result of improper handling and, therefore, preventable. It would be impossible, of course, to market live stock without some losses of this character. They are so susceptible to injuries and to mortality in transit under certain conditions that some losses are bound to occur. However, with more careful methods this waste can be reduced at least one-half or perhaps two-thirds eventually.

The work of this Board has been largely that of research to learn the causes of crippling and mortality in transit and the causes of bruises to countless more animals that are not crippled or killed in transit. The problem has become greater with the increased use of trucks in transporting live stock. This is because so many trucks are not properly equipped to carry live stock safely. Then too there has been a tendency to let any man who knows how to drive a truck take these animals from the farms to the markets. Unfortunately, there are far too many who are unfamiliar with the habits of farm animals and, furthermore, do not have the humane instincts that are so essential for safe transportation.

Transportation by rail is by no means perfect, but these records show that on the average the losses by truck are much higher, particularly when the animals are hauled long distances. In bringing together these records from the five river markets—Kansas City, St. Joseph, Omaha, Sioux City and St. Paul, it was found that the number of meat animals dead and crippled on arrival by truck was more than twice as great as the number of meat animals dead and crippled on arrival by rail in proportion to number hauled. These markets were selected for this study because practically all of the live stock that is received there comes direct from the farms and not from other markets.

Combining the data at the five markets, during the year 1939, nearly three times as many cattle and calves were found dead and crippled on arrival by truck as by rail in proportion to number hauled. Only 10

TUESDAY AFTERNOON SESSION

October 8, 1940

The session was called to order by General Chairman H. G. Schaffner, Treasurer, Schaffner Bros. Company, Erie, Pa., who presided. In his opening remarks the Chairman welcomed the delegates and commented briefly on the activities of the Section and

of Sectional Committees during the past year.

The Report of the Nominating Committee was received, and officers for the Section for the ensuing year were elected, as presented elsewhere in this record. The Chairman then introduced the first speaker.

Safety in Handling Live Stock

By H. R. SMITH

General Manager, National Live Stock Loss Prevention Board, Chicago, Ill.

In handling live stock on farms probably the most common accident is goring or trampling by a bull. Dairy sires seem to be more unruly than beef sires because of their nervous temperament. The disposition of the animal is greatly influenced by the care given. Many assume that all bulls are ugly and proceed to use a club or pitchfork whenever they enter the yard. Under such conditions, the bull learns to defend himself and may strike back.

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The work of this Board has been largely that of research to learn the causes of crippling and mortality in transit and the causes of bruises to countless more animals that are not crippled or killed in transit. The problem has become greater with the increased use of trucks in transporting live stock. This is because so many trucks are not properly equipped to carry live stock safely. Then too there has been a tendency to let any man who knows how to drive a truck take these animals from the farms to the markets. Unfortunately, there are far too many who are unfamiliar with the habits of farm animals and, furthermore, do not have the humane instincts that are so essential for safe transportation.

Transportation by rail is by no means perfect, but these records show that on the average the losses by truck are much higher, particularly when the animals are hauled long distances. In bringing together these records from the five river markets—Kansas City, St. Joseph, Omaha, Sioux City and St. Paul, it was found that the number of meat animals dead and crippled on arrival by truck was more than twice as great as the number of meat animals dead and crippled on arrival by rail in proportion to number hauled. These markets were selected for this study because practically all of the live stock that is received there comes direct from the farms and not from other markets.

Combining the data at the five markets, during the year 1939, nearly three times as many cattle and calves were found dead and crippled on arrival by truck as by rail in proportion to number hauled. Only 10

per cent more of the hogs were crippled by truck, but three times as many were dead on arrival by truck.

The greatest contrast was with respect to sheep. The number dead and crippled on arrival by truck was more than four times as great as by rail in proportion to number hauled. There is a great deal of room for improvement in the transportation of live stock by truck.

It should be stated that there are some truckers who have the equipment and give such care that the live stock they haul reaches the market in just as good condition and with just as few losses as in rail shipments. It is the indifferent and careless trucker who lowers the average. We find the greatest defects in truck transportation something as follows:

There is a tendency on the part of some to overcrowd in order to get the weight they think is necessary to make it a profitable haul. Many do not use adequate bedding to prevent slipping. Sand gives much better footing than any other material; some of the worst bruising is caused when animals slip and fall down in the truck. They are often unable to rise if crowded and are badly trampled. Sand should be covered with straw in the winter, but not in the summer for hogs. These animals suffer greatly from excessive heat and it is most desirable to wet the sand thoroughly during hot weather. Many truckers fail to do this. Railroads have showering facilities at intervals en route.

One of the common defects in the trucking system is the lack of partitions in mixed shipments. While there has been a great improvement in this respect, there are still too many that permit hogs to run under cattle, which is certain to cause some of them to be injured. Calves likewise are injured by being permitted to mingle with cattle. Most truckers do separate sheep from other classes, which, of course, must be done. Still, as pointed out, sheep are frequently injured in trucks and the mortality is high. One difficulty is that sheep covered with wool are very bulky and, if badly crowded, it is not uncommon to have some of them suffocate. One reason why the losses are so much greater with sheep delivered by truck than by rail is that many of the rail shipments come from the western states in straight loads and are not overcrowded

because they are loaded by expert sheep men.

Rail tariffs require partitions in mixed shipments of live stock. These are not always enforced, but partitions are much more generally used in rail deliveries.

We have all seen some trucks with bulls running loose, under which circumstances they cause injuries. No doubt all of you have seen sheep lifted by the wool which causes bad bruising under the skin. I have seen many trucks where hogs, sheep and calves have been pushed from the upper to the lower deck in unloading, without the use of a cleated incline. This is decidedly objectionable. There is great need of more loading chutes on farms. Careful haulers carry the collapsible kind on their trucks if stationary or portable chutes are not available at the farms.

While a large proportion of the live stock hauled by truck is covered by insurance, the farmer pays for the insurance and is, therefore, the direct loser. When losses occur in rail shipments, if they are not covered by insurance, they are paid by the railroads out of revenues received from shippers. The packers take the direct losses from bruising, but it stands to reason that every buyer knows that after slaughter a certain number of bruises are likely to be found and trimmed out and he can't pay quite as much as he could if the animals were known to be free from these defects. Therefore the producers, as a whole, eventually stand a large part of these losses indirectly and should be vitally interested in reducing them.

The National Live Stock Loss Prevention Board has regional managers at a number of the markets who devote all of their time to this loss prevention work. The cooperation of a large number of other organizations has been enlisted in these efforts to the benefit of the entire industry.

Many of our activities are with the younger people such as 4-H Clubs, vocational students of agriculture in high schools, animal husbandry students in colleges, etc. A large number of 4-H Clubs, particularly in the middle-west, are training teams to give demonstrations on live stock losses and how to prevent them. These demonstrations are illustrated by model truck racks, partitions, stock cars, damaged hides, photographs of bruised meat, information charts, clubs and canvas slappers. These demonstrations have much educational value.

A preliminary contest is held in connection with a county fair. The winning team goes to the state fair where it competes with winners from other counties. The first prize team from the state fair goes to the interstate or regional contest and the winners there to the national contest held each year during the week of the International Live Stock Exposition in Chicago. Mr. Thomas E. Wilson has for several years given cash prizes to the winning teams at the national contest. The educational value of these demonstrations is primarily at the county fairs where many farmers and truckers are present.

There are now more than 8,000 high schools teaching agriculture. We supply our booklets and annual reports to nearly all of these vocational teachers and many of them request a sufficient number for distribution in their classes. They are also teaching this subject to their adult classes in the evening, consisting of farmers. We supply on request a sufficient number of these booklets for distribution among students in live stock marketing in our Colleges of Agriculture and Universities.

Recently the U. S. Department of Agriculture, with our cooperation, prepared a two-reel sound motion picture entitled "DO UNTO ANIMALS—" that deals entirely with proper and improper methods of loading and unloading live stock in trucks and cars. The pictures showing the trimming out of bruised meat in the packing plants are particularly valuable because but few producers ever see the inside of a packing house cooler and many of them are totally unaware of the vast amount of bruising that takes place on the farms and in marketing unknown until after slaughter. Exhibits of bruised meat a county, state and national fairs have proved helpful.

The elimination of these losses is almost entirely a matter of education as to causes. Some have urged that State and Federal laws be passed to compel better methods. Such laws, of course, would require a large number of enforcing agents and if legislation of this kind is passed in one state, the same type of legislation should be enacted in others to prevent the diverting of shipments from one market to another because of such compulsory legislation.

During recent years we have been trying out in Wisconsin a voluntary plan of certifying good truckers who measure up to high specified standards. Those that have

demonstrated they can live up to these standards have been given certificates of merit and a metal shield to be carried on their trucks, on which are the words, "Approved Live Stock Truckers, National Live Stock Loss Prevention Board, No. ———."

These shields are owned by the Board and are loaned to the trucker to carry as long as he lives up to the requirements. Under this plan, an inspector is required to see to it that truckers do not deviate from the specifications. These inspectors in Wisconsin are furnished by the Humane Societies, as they are vitally interested in lessening animal suffering. The truckers who have been given this recognition take pride in it and many say it has given them prestige in their business. Slaughter records have shown decreased losses on live stock hauled by these approved truckers. We hope soon to inaugurate the plan in Minnesota.

Through all of these activities including those of cooperating agencies throughout the country, there have already resulted decreased losses in transit. Records on animals dead and crippled on arrival at the various markets show a decrease of 15 to 20 per cent in the last three years. If this work can be continued on a larger scale, there is reason to believe that the declines in losses will continue, particularly so when more of these young people are operating farms. The 4-H Clubs throughout the land have aided materially in bringing about these improvements. Their cattle are seldom bruised. If all producers could somehow attain the high standards of care set by these youngsters, larger gains from feed consumed would result and if producers, carriers and other handlers would exercise the same care in marketing, these losses described would be greatly reduced.

There must be inculcated in the minds of all handlers—farmers, truckers and railroad, stockyard commission men and packer employees the knowledge that farm animals are very susceptible to injuries, that careful handling will prevent much of the loss incident to these injuries, and that it is to the interest of producers, middlemen and consumers to reduce this waste to the minimum. The appeal should be made from humane as well as economic considerations for, after all, why should any of us cause unnecessary pain and suffering to these animals that, through domestication, have become our charges?

Safety in the Manufacture of Leather Gloves

By EDWARD R. GRANNISS

Director, Industrial Division, National Conservation Bureau, N. Y. C.

As early as 1190, the first organization of "Glovers" was established in France. Its purposes were the regulation of the manufacture and sale of gloves and the general welfare of workers in the industry. Now, over 700 years later, we find a large portion of this industry transplanted to the United States and a most efficient organization, The National Association of Leather Glove Manufacturers, working constantly to improve the welfare of employers and employees.

Occasionally glove makers still tan, dye and otherwise prepare skins and hides before performing subsequent manufacturing operations. This practice is now largely discontinued, however, and possibly the more serious health hazards have been left with the tanner and dyer. Anthrax infection and chrome poisoning were outstanding. Foreign hides often carried anthrax germs and spores, and chrome poisoning or ulceration resulted frequently from handling tanning solutions which contained chromium salts.

These hazards have now been partially overcome by the increased use of domestic skins and hides. Sterilization of equipment, chlorination of waste water, medical supervision by anthrax specialists, cleanliness and improved housekeeping, good washing facilities and the provision of personal hygiene equipment, the removal from sources of exposure of highly susceptible individuals and the use of protective rubber clothing are other means of prevention.

In the glove industry there is handling of bulky materials. Upon arrival of skins at the factory they are sampled and sorted to detect flaws. An employee goes over each skin with a sharp knife and cuts through every defect. The skins are then sorted for weight, texture and color, taken from storage to the treating department, soaked in water and rolled in fabric to keep them moist, and again unwrapped and inspected. Skins must also be stretched. The cutter, so that he may cut the maximum number of "trunks" or pieces the size of the glove pattern from a hide, pulls and stretches the skin as far as possible.

All of this handling and pulling provides opportunity for strains and hernias and

the manufacturers consider this type of injury hardest to control. Some of these injuries are, no doubt, aggravations of pre-existing conditions and the need for pre-employment medical examination in the industry is apparent. Also, there is need for more education in proper methods of lifting and handling of heavy loads. The effective use of posters and other literature would undoubtedly have a good effect. Supervisors, also, could take a more determined stand in correcting bad practices. A number of glove plants have installed shaving machines for the preparation of hides, to remove any unevenness from the flesh side of the skin.

The shaving machine operates much like a rotary sander in a wood shop. The skin is passed between two rollers, one of soft rubber and the other of polished steel. A third roll which is covered with sand paper, revolves against the skin, reducing it to a pre-determined thickness. A foot control releases the skin from pressure of the rubber roller and also serves as a safety release in the event the operator catches his finger while feeding skins into the machine. At one time these machines contained two rubber rollers and injured fingers were much more frequent. The steel roller has proved a safety factor and, as well, an economic one because of its longer life and greater precision.

Another danger, however, may be involved. Because of the dusty nature of shaving operations, the shaving department is located away from the others, frequently in the basement. As process steam is used, fire is always carried under the boilers. Although not considered dangerously explosive, leather dust finely divided and suspended in air in the proper concentration possesses explosive possibilities, and the presence of open flames or hot surfaces should be avoided. Spontaneous ignition in leather scrap has also been reported.

The dust apparently has no toxic qualities and may be classed as one of the "nuisance" variety. Pelts from moles, seals, sheep, rabbits and beaver are frequently used in glove linings and less frequently,

the fur of squirrels and monkeys is used. The trimming of these furs creates animal and sometimes chemical dusts.

Some persons are allergic to these dusts. Also, cases of dermatitis may arise from continued irritation of the skin. The promotion of cleanliness and personal hygiene on the part of employees will, however, control these conditions to a large extent. Exhaust systems, which remove the dust at its source, are, of course, necessary.

The cutting room makes use of skilled workers. The trunks are either hand cut by scissors or, usually in the case of heavier skins, die-cut manually by steel dies and a wooden mallet. Crowding in this department creates a considerable hazard, as does poor light or ventilation. Another possible source of injury is from the heavy scissors which, if left near the edge of the table, provide a falling hazard. Slivers from poorly maintained table tops are also a potential source of doctor's bills.

Certain machine hazards are involved in the slitting and sewing of gloves. Slitting is a machine die-cutting operation. Several trunks are laid on a steel die of the desired pattern which is then forced upward against a solid block. Little mechanical hazard is involved in this operation. Sewing, on the other hand, while a light machine operation, calls for a high degree of concentration and alertness.

The sewers are mostly girls whose fingers, to the unpracticed eye, move with a rapidity hard to follow. The speed of the work, together with the noise and vibration of the machines tends to bring on quick fatigue, unless pleasant and healthy surroundings are provided. As machine sewing is wholly a sedentary operation the need for proper sitting posture is evident. It is highly desirable that all seats be adjustable to conform to the size, height, arm length and natural posture of the individual worker.

Needle guards are rarely used in the industry. This may be because the types of seams sewed are often highly intricate, two, three and sometimes four needles being used simultaneously. In the triplestitch seam the needles make two stitches forward and one backward. Needle wounds occur, but skill apparently compensates in a measure for this machine hazard.

Under the tables, however, lies further possible danger if countershafts and belts

are not completely covered. Girls storing work shoes, umbrellas or other objects may easily be injured in reaching below the work table if even the smallest openings leading to moving parts are permitted.

Two other conditions may develop among machine operators; namely, near sightedness because of the closeness of the work, and dental damage from the habit of biting thread instead of using scissors or a knife. The eyes of the workers can be protected most effectively by providing adequate illumination and also by the use of corrective glasses, when necessary. Periodic eye examinations are suggested. While sewing machine operations cannot be classified as hazardous, nevertheless care must be taken that the general standard of health of the operators remains good.

In the laying-off room, workers fit gloves over heated frames and prepare them for their final shape and finish. Gloves are shaped on forms heated up to 200 degrees F. and as a consequence, high humidity from escaping steam may penetrate the laying-off room. Provisions for controlling humidity and temperature are, therefore, desirable for the comfort of the workers.

In one case, a glove worker in the laying-off department received a slight burn on his elbow. He failed to report his injury to anyone and within a week's time became seriously ill. A few days later he died. The cause of the death was reported as a streptococcus infection and it was stated by the doctor who treated this case that if the employee had reported the burn immediately and received medical attention, his life probably would never have been endangered.

Frequently, serious infections develop because of the nonreporting of such minor injuries as cuts, pin and needle punctures and slivers. More education is needed to convince employees of the danger of delayed medical treatment, and possibly more pressure should be brought on the supervisors to make them more alert in detecting minor injuries and in insisting on the proper first-aid treatment.

Manufacturing processes usually leave the gloves soiled and this calls for cleaning. Naptha and benzol may be used, in addition to other detergents. Carbon tetrachloride, methyl alcohol, hydrofluoric acid and carbon bi-sulphide are frequently used on spotting tables. Although solvents are seldom used

in large quantities they call for special precautions.

The two chief hazards to be guarded against are danger of fire or explosion and health hazards from poisoning or dermatitis. These hazards must not be disregarded because solvents are used only in small quantities. Carbon tetrachloride and carbon bisulphide have a definitely poisonous effect on the human body and the danger is more insidious because the toxic effect may accumulate in the body from repeated exposures to small quantities.

The usual spotting table holds a number of small bottles or containers of various cleaning fluids. Often these containers are not well marked so as to be easily and properly identified. It is wise to provide a single and distinctive container clearly labelled and provided with a tight stopper for each solvent. *Milk bottles should not be used for this purpose.*

The cleaning solutions are usually applied with a small sponge, cloth, pad, chamois or brush. These permit the employee's hands to come in contact with the liquid many times each day. Solvents have a drying or degreasing effect on the skin. This may make it desirable to use a hand cream or lotion daily, preferably one with a lanolin base. Employees should be taught the necessity of careful observation of their hands, and to report immediately for treatment at the first sign of skin trouble.

Good ventilation in this department is necessary for the removal of solvent fumes. This may require a lateral exhaust vent which will draw the fumes across the top of the work table from front to back. Solvents have vapors both lighter and heavier than air. Open windows and fans are not dependable. The effective removal of fumes also assists in reducing fire hazards.

For cleaners, which are sold under trade names with no indication of their composition, treatment should be the same because most of these "special" materials contain one or more of the solvents mentioned.

An interesting feature of glove manufacturing is the return to one of the early manufacturing methods—that of having work done in the homes of employees. In the home, the glove maker usually has one machine operated by a small motor. The operators of home machines are usually women, and the machine is presumably so

guarded that there is little danger of being caught in moving or reciprocating parts. A truckman delivers materials and picks up the finished gloves.

The making of gloves under home conditions may not be desirable in all instances. Such enterprises are apt to be conducted under inferior conditions of sanitation. There may be overcrowding, overheating, underlighting and the usual postural deficiencies. There may also be conditions favorable to the transmission of contagion between operators and sick persons in the same family. The use of child labor is not commended and the home glove maker may be troubled by all subnormal living conditions of his or her family. The making of fur-covered gloves at home exposes the entire family to undesirable dust.

In general, glove making may be said to closely resemble garment making. There are few hazards in this industry which are not also common to other industries. Health hazards lurk in the sedentary nature of the work. Excessive and repetitious noise, high temperature and humidity, and the incidental possibility of abnormal fatigue through all of these operations, are all hazards which also take their toll in inefficiency.

Poor housekeeping, the enemy of all good safety records, exists in many glove plants. Scraps of paper and leather trimmings frequently litter the floor, and while this condition is bad in any plant, it is far too common in the glove industry. Supervision is not strict enough. Rules for "no smoking" are constantly and openly violated and a serious fire hazard is always present. This is mostly true in the cutting department, although the rest of the plant is by no means without blame. The second serious condition lies in the fact that inadequate and improper building equipment is often used.

Buildings originally designed as living quarters in many instances accommodate large numbers of workers. Stairways are usually inadequate and the means of safe exit in case of fire are questionable. This, coupled with overcrowding and a high percentage of female help concentrated about batteries of sewing machines suggests the idea of conflagration and consequent panic that one hopes will never materialize.

The visitor to the glove makers comes to the conclusion that the industry presents no

new problems in safety and health, but rather needs to realize the safety status it could attain. Safety committees of supervisors or employees are apparently untried and plant inspection from an unsafe condition or unsafe practice viewpoint is at best infrequent. There is opportunity for im-

proved personnel work to relieve the strains that develop from concentrated and high speed work in confined quarters. Once the economic and humanitarian importance of safety is brought home to employers and employees alike, accident rates in the glove industry should decrease to a very low level.

THURSDAY AFTERNOON SESSION

October 10, 1940

Safety in the Meat Packing and Tanning Industries

Panel Discussion

This session was planned as a Panel Discussion of the general subject, "Safety in the Meat Packing and Tanning Industries," and a list of specific problems had been prepared and presented to delegates in the program, as will appear in order during the general discussions to follow.

The session was called to order by General Chairman H. G. Schaffner, of Schaffner Brothers Company, Erie, Pa., who presided. Chairman Schaffner conducted some preliminary business of the meeting, including the election of officers (a list of whom appears elsewhere in these records), and then introduced the members of the Panel, listed as follows:

Wm. Dunn, District Engineering Manager, American Mutual Liability Insurance Company, Chicago.

A. R. Graham, Safety Engineer, Bituminous Casualty Co., Chicago.

John H. Lee, Resident Engineer, Liberty Mutual Insurance Company, Rockford, Ill.

E. S. Lusk, Director of Safety and Personnel, Peter Eckrich & Sons, Inc., Kalamazoo, Ind.

CHAIRMAN SCHAFFNER: We are engaged in quite an undertaking in these days of stress and strife, when we need safety for defense. The hiring of employees is a most important problem, especially when we consider that many men have what may be called "warped minds." No employer wants to hire a workman who is physically

unfit, who is afflicted with some weakening disease, defective sight or other serious deficiency. But what about the applicant with a warped mind? What about the abnormal or poorly adjusted personality? A worker in an office or factory with the wrong kind of mental equipment may do more damage than one with a contagious disease.

The first subject in our panel today is: "What protective equipment should be worn to prevent head injuries? Where? When?"

Head Protection

Maybe the fellow who comes in with a warped mind may have had an injury before, and perhaps the injury may have affected his mental attitude. But we can take it by the forelock by testing that man early in his employment; that is, testing his mental ability before we hire him. You know they say that thinking lengthens one's life. The doctor says, "Yes, that is all right if you think quickly enough." You have to think pretty quickly these days. We are moving at a rapid pace.

To start off this panel, then, I would like to say something about protective equipment for head injuries. All of us in the packing industry realize the dangers from overhead trolleys, the hanging rails, the chains, the sausage racks, and so forth. I do not know exactly how many head injuries we have had up until two and one-

half years ago—but they were running into great numbers.

It was necessary to instruct the men to wear safety helmets. Up until last week, we had had no head injuries in two and one-half years.

But last week, about five-thirty in the morning, I got a telephone call saying that one of the night men had suffered a head injury, a deep scalp wound, caused by a hook coming off of an unguarded switch.

The first question I asked was, "Was he wearing his helmet?" They said, "No." We sent him to the hospital, and it was necessary to have four stitches taken.

When I saw him on the following day I asked him why he didn't wear that helmet; and he said, "I never had a head injury before. I didn't know that hook was going to come down on me." But if he had obeyed his orders and worn his helmet, he would not have had a lost-time accident.

Now I am going to throw the meeting open for discussion. Perhaps some of you have had experience which might help all of us in solving some of our head injury problems.

ERVIN M. MINTZLAFF (Oscar Mayer & Co., Madison, Wis.): I had trouble in getting men to wear helmets while loading beef in a car. Of course, the trolleys have to be taken off the rails to get the beef in the cars, and danger exists. Some of these men lose their helmets, as they are in the way when they carry a quarter of beef on the shoulder. Is there anybody here who has some idea as to the type of helmet that might help in this situation?

CHAIRMAN SCHAFFNER: That is a very welcome question. I have had that same difficulty. I found some of the men putting padding under their white caps, but it would not save them very much if a heavy hook fell on them.

C. C. O'CONNELL (Mine Safety Appliances Co., Chicago, Ill.): I wonder if the helmet Mr. Mintzlaiff mentioned was one with a brim?

MR. MINTZLAFF: No.

MR. O'CONNELL: Cap style? On some of the caps, it is possible to adjust the inside cradle so the head will penetrate farther into the cap. It may be, if they have it adjusted so it fits too high on the head, it could be too easily knocked off.

CHAIRMAN SCHAFFNER: I have noticed in the exhibits of the various safety appliance companies downstairs some helmets that do not have a rim. They are more like a jockey cap. Perhaps some of those would answer our purpose for beef loaders.

MR. MINTZLAFF: That is the type we are using.

CHAIRMAN SCHAFFNER: And they are not proving satisfactory?

MR. MINTZLAFF: No. Generally, when a man throws his shoulder under a quarter, he brings his head down, and it just lifts the hat off.

WM. DUNN (American Mutual Liability Insurance Co., Chicago, Ill.): It might be a good idea to use the old type of helmet they had for hockey players. We had a helmet with a strap across. It might solve your problem.

ELIJAH MAHAN (Hunter Packing Co., East St. Louis, Mo.): I have a case where a fellow complains of a headache from a helmet, and he really should wear a helmet because he works with a pole, putting hooks on the rail 25 feet in the air.

CHAIRMAN SCHAFFNER: We are having our cooler men wear lightweight helmets. It was hard to get them used to it. They didn't want to put on anything that was hard or cumbersome, but after they got used to wearing this helmet and found out how lightweight it was and how protective it was, we don't have that trouble any more.

MR. DUNN: You see, with the hard helmet, you strike here. There is no "give" to the helmet.

CHAIRMAN SCHAFFNER: There is a cradle on the inside of the hat that does give.

MR. O'CONNELL: It is possible to get chin straps in both hat and cap styles.

CHAIRMAN SCHAFFNER: That may be an answer to it. Let some of us try to experiment a little on the suggestions we have had here this afternoon, and perhaps at our next Congress, or even through our News Letter, we may develop something. Our News Letter Editor is always grateful for any experiences that you may have.

Our next subject is: "Should safety shoes be required on all operations? If not, why not?"

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MR. GRAHAM: We have had some success with that, but in very rare instances. We get them to get these small steel caps and place them on the shoes, tack them on the sides and wear them until their probationary period is over. Then, of course, when they are hired, they can secure the regular shoe.

MR. BONNELL: Does the man furnish those himself, or does the employer get a few for the temporary employees?

MR. GRAHAM: It has been my experience that the employer has bought them and then sold them at cost. Some plants have furnished them, but in most cases the men are obliged to buy them.

MR. BONNELL: He might as well buy the shoes as the caps.

MR. MANDIA: What do you do if you find a fellow has flat feet? Do you let him go along, or send him to a chiropodist? It seems to me that might interfere with your safety program if you allow too many of these fellows to pretend bad feet so they get out of purchasing the shoes.

MR. GRAHAM: That is right. Some of the bigger institutions do send these men to chiropodists to be examined and put in shape, if they can; but some of them can't. The requirement is not to hire a man unless he can have his feet corrected. If you make an exception in one case, you have to make hundreds of exceptions. If you are going to make a rule, it is best to abide by that rule.

With regard to the smaller plants, that is a different problem. It is a problem we haven't solved yet, and I would like to know it myself.

CHAIRMAN SCHAFFNER: Many men will risk their lives more readily than they will risk their money. When they come into a plant they will take the protection that the operator of that plant gives them. For instance, they will use a pair of goggles which the plant owner generally furnishes for them to use; but when it comes to furnishing their clothing, you are putting quite a strain on the employer. The employee doesn't take into consideration that the employer is trying to protect him rather than to have him spend his money uselessly.

W. W. FLYNN (Aetna Casualty & Sur-

ety Co., Des Moines, Iowa): I would like to ask what the attitude has been of the local unions in these various plants, toward requiring men to wear safety shoes and other protective clothing?

MR. GRAHAM: As a rule, most of the unions that I have come in contact with are in favor of protective clothing. They know if their man is disabled, he is going to be the loser and he is going to suffer; and they are going to get complaints back to the local union. Then that is going on up higher. Of course, you will find exceptions here and there, but I am thinking of one plant where it was unionized. We introduced a court system in that plant. Everybody thought at first there was going to be union trouble but we never had trouble in that plant. We went 28 months without a lost-time accident and had 95 punch presses. That shows you what can be accomplished in a union shop by requiring protective clothing and devices. The union was with us.

CHAIRMAN SCHAFFNER: These experiences are just the sum and substance of what we would like to get out of these panel discussions. It is going to help solve somebody's problem.

JOHN W. STAPLES (A. P. Green Fire Brick Co., Mexico, Mo.): I have had a lot of experience with safety shoes and safety caps. We tried to enforce safety shoes 100 per cent in our plant. We ran into corns and bunions. The men kept kicking. We have now stopped it.

We had four different shoe companies come in. You can get a good safety shoe and fit a man as well as with any high-priced shoe. We have men with feet wide and short. They will fit them in shoes especially made for those types. We find that 50 per cent of the men would rather wear these caps over the top of the shoes. We have found that they do just as much good.

E. S. LUSK: Mr. Chairman, just a word of warning. In safety shoes, so-called, watch out for the one that does not have a steel toe. We had a rather unfortunate experience in one of our plants, in a garage. One of the mechanics was changing a tire, and the wheel and tire fell over on his foot and mashed the toe. He found that the cap was made of pressed paper. Be sure it is made by a reliable shoe company that has a steel safety toe.

Aprons and Gloves

CHAIRMAN SCHAFFNER: We will go on with Problem No. 3. "Should aprons and gloves of special construction be worn by employees using cutlery? What types?"

We are going to leave that to Mr. Dunn to give us his version.

WM. DUNN: Mr. Chairman: It seems there couldn't be any argument at all about employees wearing special type abdominal protectors or heavy leather aprons. These should be provided especially to the butchers using knives, where they draw the knives toward themselves. Serious abdominal accidents have occurred where the men were not wearing heavy leather equipment. The provision of this equipment will eliminate those types of accidents.

As far as the fellows boning, we generally suggest that they wear what they call a wire mesh type finger-guard, and, in addition to that, the guard for the forearm where cutting is done with knives.

This type of protective equipment has reduced considerably the high frequency of cutting accidents that formerly occurred in the packing industry. Of course, it takes time to convince the old-timer and sometimes the younger employees of the advisability of wearing these different types of protective equipment.

That is one of the greatest problems you will have—educating some of your older men, especially, to see the advisability of wearing this equipment. After you have put on a program of education for a while, however, and the men have worn such equipment they will realize that it prevents numerous cuts. I think experience has shown that they will ask for it after you have once educated them.

I think, also, that with guards to knives, pouches or racks should be provided for the men so the knives can be carried in a safe manner. When the men are steeling the knives it would be advisable to insist that they wear the wire mesh guard and also a leather guard so that the knife won't come back on the hand.

CHAIRMAN SCHAFFNER: The difficulty we have is in getting the men to wear the guards. We have provided them, asked them to wear them, almost forced them to wear them. They will work with them for

a few minutes, and when you go through the plant again, the guards will be off.

I know the larger plants, through the safety directors and so forth, do require them; but I would like to know if someone in the smaller plants has been successful in having the worker use the guards continually.

MR. LUSK: We have made it a requirement that all employees on our boning bench buy this three-fingered mesh glove. We experimented with a number of finger-type gloves, to begin with and furnished them, as you did. They were coming up missing, frequently. We adopted the three-finger mesh glove, and each man pays for it himself. He does not lose them any more. We have reduced our finger cuts almost 100 per cent since we adopted that glove a number of months ago.

B. F. HAYWARD (Zurich Insurance Co., Chicago, Ill.): I had a case like that out west, of getting the men to wear the mesh gloves on boning operations. It has done wonderful work. Every time I have been there I have found the men wearing the gloves on the boning. I also tried to get the men to wear the gloves on skinning operations, but I haven't succeeded. The men claim that as soon as they get hold of the skin and start pulling, the hand slips right off, it will not hold the hide, so to speak.

CHAIRMAN SCHAFFNER: We have had that, too; it doesn't seem to work on the killing floor. For some reason they just can't get the hang of things.

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CHAIRMAN SCHAFFNER: How about on the hog kill? They are using them on that?

MR. MAHAN: Yes.

Slipping Accidents

CHAIRMAN SCHAFFNER: Question No. 4: "What types of footwear have been found the most effective in reducing the number of slipping accidents? Foot injuries?"

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Slipping Accidents

CHAIRMAN SCHAFFNER: Question No. 4: "What types of footwear have been found the most effective in reducing the number of slipping accidents? Foot injuries?"

I would like to present Mr. Lusk again.

E. S. LUSK: We do no killing. It is all dressed cuts which we process. But we have found on the floors where the slipping accidents are most likely, a composition sole and a cordovan shoe is very good. I don't think manufacturers' names would be in order here but it is a cord type of sole. It has worked most satisfactorily in preventing slipping, along with other types of floor surfacing.

The use of salt might come into the next question. The use of sand in paint around the ice-boxes, or the use of carborundum in paint has also served satisfactorily, and I believe ties in pretty well with the type of floorwear in slipping or hazardous places.

Of course, where water is used, boots with the safety toe are a required piece of safety equipment, which our men furnish themselves.

I do feel that that personal responsibility for a man's own safety gets down to the meat of any safety program, whether it is in meat packing or otherwise.

HENRY D. TEFFT (Institute of American Meat Packers, Chicago, Ill.): Has anyone here had much experience with the overshoes that have cords on the bottom? You know what I mean?

MR. LUSK: Yes. It is either a boot or a safety shoe with a composition sole, or rubber in some instances. I don't like those because they still are a slipping hazard after the tread has worn down a bit.

CHAIRMAN SCHAFFNER: How are we getting away from the slipping on our killing floors, where blood and grease and water is a constant hazard? What are some of you men using? Salt, mostly, soda ash?

R. W. HUTCHINSON (American Mutual, Indianapolis, Ind.): How do you prevent salt and soda ash and so forth from being washed into the drain on a killing floor, when the floor is constantly flushed?

CHAIRMAN SCHAFFNER: As a rule, it is flushed right with the rest of the residue and it needs constant replacing. That is the reason I would like to find out if there is something else that has been found that will prevent slipping.

MR. MINTZLAFF: There is one thing that can be done in the construction of the floor. That is to use carborundum right in the concrete itself. It keeps the rough finish a whole lot better than ordinary concrete will.

CHAIRMAN SCHAFFNER: Broom-brush cement over the top of your bricks helps a great deal, too.

MR. HUTCHINSON: Isn't brick the material ordinarily used on a killing floor?

CHAIRMAN SCHAFFNER: Ordinarily, although I have seen some concrete floors.

MR. MINTZLAFF: Our new installations are concrete floors.

MR. HUTCHINSON: Has that proved more satisfactory than brick?

MR. MINTZLAFF: Seems to be.

CHAIRMAN SCHAFFNER: They can give a rougher grip.

MR. GRAHAM: Can't you go over it before it is finished?

CHAIRMAN SCHAFFNER: Before it is finished, they broom brush it, and it makes a rough foothold.

MR. MAHAN: First we had a wood block floor; that was in good shape. Then they replaced the floor with asphalt. That was all right only it went to pieces. Now we have a glazed brick, and they are having all kinds of accidents.

CHAIRMAN SCHAFFNER: Glazed brick is the slipperiest floor I know of. We have thrown it out in every department that we could because it really is a hazard unless it is brushed over.

MR. GRAHAM: Mr. Schaffner, don't they lay asphalt down and then put sand on it before it is dry, which gives it an abrasive effect?

CHAIRMAN SCHAFFNER: There are some of the newer floor coverings that have an abrasive right in the covering itself. When it dries and hardens, it has a carborundum effect. I don't know whether there is carborundum in it but it is that type of effect on the floor.

MR. DUNN: On some naval vessels they used to paint the floors with asphalt cement. When it was dry it could be washed. You have to renew that every so often.

MR. MAHAN: We got that asphalt paint base. We washed the floor off with gasoline, put the base on it, and let it dry for two days and it lasted three weeks.

MR. DUNN: You shouldn't use gasoline.

CHAIRMAN SCHAFFNER: There are other solubles I think could be used that will not affect the floor. I would think that would be a hazard in itself.

MR. HUTCHINSON: The general consensus is, to prevent slipping hazards on the killing floor, look first at the construction of the floor rather than the use of any non-slip soles.

CHAIRMAN SCHAFFNER: I think that is your basic objective, to first look at the floor itself and then complement it with your non-slipping soles.

MR. TEFFT: I think the chief reason for brick floors has been their wearing surface. By the increased use of rubber-tired truck wheels, the need for such a hard surface is disappearing.

CHAIRMAN SCHAFFNER: That is a good thing to bring out, Mr. Tefft. In using those in the plants I think we have done a lot to save our floors.

I think the question that Mr. Lusk answered ties in very well with the question to follow. No. 5 says: "What types of floor surfaces tend to reduce slipping?" I think we covered that along with the footwear. So, if there is nothing further on that, the next question is No. 6: "Should industrial truck operators be given special training? Why and how?"

That question I am going to give to Mr. Lee for discussion at this time.

Truck Operators

JOHN H. LEE: When my colleague was talking about shoes and so forth, I kept wondering, "Do they still have them, the kind I used to wear?" Are there any packing house men here or are they all insurance company representatives? Is there anybody here who actually works in the cooler, smokehouse, and all that, and knows what a knocking pen is?

CHAIRMAN SCHAFFNER: Let us have the men who are in the packing house stand up. (About two dozen.)

MR. LEE: This business about truck drivers: You know a great many of these big concerns have what they call personnel directors, safety directors, safety committees, and so forth, where the recommendations and the instructions come from the big fellow with the brass collar. He sends out definite instructions on driving and backing up hazards and turning from the wrong

lane at intersections, and so forth and so on. Who gets those instructions?

If you have anything to dish out, if you have anything on the hazards of driving a truck, give it to the fellow who is driving it. "Should industrial truck operators be given special training?" Well, if they are not given it, then to whom will you give it, if it is going to do any good? Why do they give it to some safety committee? That is as far as it goes.

I wouldn't presume to say why you should give the training. I am not so sure of the "how" part of it. I am quite a nut on this so-called visual education. I don't like the word "education." That is all right in the classroom or institution of learning, but I go very sparingly on that word in talking to the men, the rank and file of men who do the work. Because if they get the idea that you are going to educate them, they won't like it; they will resent it. Call it something else. Among ourselves we can call it that, if we want to.

My thought would be on the "how" of it, go out and get a camera. Don't talk about cost. Don't you know that one thumb costs one thousand bucks in workmen's compensation? The camera or projector he is asking for costs maybe three or four hundred dollars. To save at the spigot and let it run out at the bung is false economy. I would go out and get pictures of these accidents.

Suppose you are driving meat trucks, all right get some old jalopies, and get them to take a colored film, and some still pictures and show them on the screen. You can't beat the old stereopticon slide when it comes to detail for a round table discussion. The movie moves too fast. It is a case of on-again, off-again, Finnigan, before you can fix in your mind what is wrong.

Unless you take plenty of time and have lots of slow shots so you can show the boro coming around the corner and cutting across the corner in front of the fellow with the coupe, it will not do any good. What goes in the eye stays there, not that he can't understand what you tell him when you talk. He is not so dumb. It is just a case of going in one ear and out the other. Long ago he took too seriously the adage about don't believe anything you hear and only half of what you see. We can get 50 per cent over, if he sees it.

I say, sure, give him training, anything in the way of training. Give it to the fellow behind the wheel, who is driving the truck.

CHAIRMAN SCHAFFNER: Now we are ready for questions for Mr. Lee on that subject, "Should industrial truck operators be given special training? Why and how?"

W. L. HANAU (Fidelity & Casualty Company of New York, Chicago, Ill.): I thought the purpose of that question was to discuss industrial trucks instead of commercial trucks.

MR. LEE: What is the difference?

MR. HANAU: There is a lot of difference.

CHAIRMAN SCHAFFNER: We would like to have your opinion on it.

MR. HANAU: I know it is necessary for a man who drives a commercial truck to have training before he is put on the truck. In other words, he is a professional driver. On the other hand, we take a man off the street and put him in our plant, with insufficient training and ask him to operate an industrial truck. The only difference is that he is jeopardizing the lives of our own employees rather than the general public.

I would like an expression of those who are in the packing industry as to what training they actually give the men who are driving industrial trucks in packing plants.

CHAIRMAN SCHAFFNER: I think you have reference there to the tractor type truck that is pulled around in the plant.

MR. HANAU: There are a dozen different types.

CHAIRMAN SCHAFFNER: You have reference to interplant trucking?

MR. HANAU: That is right.

CHAIRMAN SCHAFFNER: Would you like to give us something on that, Mr. Lee?

MR. LEE: Of course, the inter-plant truck, the truck you run around the plant, is a problem in and of itself, depending largely upon local conditions.

CHAIRMAN SCHAFFNER: Should they be given special training? Personally, I believe we should.

MR. LEE: I agree with you.

CHAIRMAN SCHAFFNER: I don't believe any operator of those trucks should be allowed to operate unless he is a licensed motor vehicle operator. I don't know whether all the states represented here require operator's licenses for motor vehicles but we in Pennsylvania do. Whether it is a motorcycle or whether it is a pleasure car or whether it is a truck or a tractor, they must have a motor vehicle operator's license.

MR. HANAU: Only if they use the highways, isn't that right?

CHAIRMAN SCHAFFNER: Only if they use the highways. But don't you think it would be a good plan to carry that out in our own plants, give them some sort of an examination similar to the examination given by the state, and requiring those operators to be trained men, rather than to put Tom, Dick or Harry on, as they come into the plant?

MR. HANAU: I know a lot of the packers use industrial trucks, and I know some very severe accidents have happened. It has been my observation that they put in charge of those trucks a younger group of men. In other words, it is a job that doesn't require any skill, and it is a good job to give a man until you have a chance to peg him or get a line on him to find out whether he is going to adapt himself to the industry. Consequently, we put in his hands a very important instrument, it can be a very dangerous instrument, and we are not training him in the use of it.

MR. GRAHAM: Mr. Chairman, I was in a plant in Indiana not long ago where they do train their truck drivers. When they hire a man, they give him regular training, that is, send an older man with him. They show him all that it is necessary to know about the truck. Then they have regular traffic rules in that plant. In other words, if a truck goes down an aisle, it has to go on the right side. If it comes back, it has to come on the other side. They have to follow those instructions. If they don't, they are penalized in some way.

You probably have noticed that on many of these trucks they have a little platform on the back. That platform has nothing in back of it. Many times these fellows stand on the edge of it and, if they are not trained properly, when they back up, they back into some object and break the heel or

break the foot. Those ought to have protection around that lower section.

MR. HANAU: I think you will find that most of the new equipment is coming out protecting not only the feet but the hands. With some of the older types, if you make a turn too short you are liable to be pinned or capsize. I think the new design takes care of most of that, providing the truck is intelligently handled. That is what we are after, to see that they are being handled intelligently.

CHAIRMAN SCHAFFNER: I think that would be a fine thing to incorporate in one of our News Letters, to get some reaction from the men who are using those trucks as to what they are doing about driver training.

MR. LUSK: I suggest further that the Bureau of Information of the National Safety Council be requested to find some qualified author or writer of an article of that kind in one of the plants and submit it to the industry through the *National Safety News* as well as through our own News Letter?

CHAIRMAN SCHAFFNER: We will incorporate that in our minutes.

P. A. SPRINGER (Liberty Mutual Insurance Co., Chicago, Ill.): I attended the meeting on Plant Transportation in which an address was given by Mr. C. E. Wooliever of General Motors. I would suggest that all of you read that paper in these Congress Transactions. They have a definite set of operating rules. Every truck operator has to have a certificate before he can operate a truck in the plant.

Safety Stunts

CHAIRMAN SCHAFFNER: Our last question: "Safety stunts that have helped us maintain good housekeeping."

May I say in the beginning—one of the safety stunts that we have taken on in our plant in the last few months is the first aid training of employees. We got an approved Red Cross first aid instructor and selected 27 men and girls from various parts of the plant and asked them to take that first aid course. There were about 19 or 20 who finished. When the certificates were awarded to them, we gave them a dinner and we tried to stress that the first aid course was actually their training in accident preven-

tion work. That is one of the fundamentals of first aid.

The consequence is that, each of them, going out into their various departments, has taken a little responsibility for good housekeeping. They come in and report hazards that the foreman doesn't even see. By the way, most of those who took the course were not foremen. There were salesmen and office workers, and there were bacon packers and slicers and girls from the sausage kitchen and all over the plant; but the foremen, with the exception of one or two instances, showed the least interest. They dropped out of the class for some reason or other. But these girls and boys are becoming more or less convinced now that good housekeeping is part of their accident prevention work.

MR. SPRINGER: Mr. R. W. Laughlin, Liberty Mutual Insurance Co., Portland, Maine, gave a very interesting talk this afternoon at the Paper and Pulp Section, "A Bag of Safety Tricks." He gave various demonstrations on walking and slipping hazards and falling and lifting, and so forth.

CHAIRMAN SCHAFFNER: I will ask our News Letter Editor to get a copy of that to incorporate in one of his future publications.

MR. LUSK: I volunteer this suggestion. It is hardly a safety stunt but it has helped in good housekeeping, and that is the painting of traffic lanes at all corners where there is likely to be a collision between hand trucks or employees without hand trucks. A yellow band about four inches wide, dividing the two aisles, around corners, has helped to prevent not only slipping injuries but in slowing the boys down when they come toward the blind corner.

Our own experience in connection with first aid is comparable to yours except in addition to those who finished the advance course, one of them went on through the instructor's course and this year is going to instruct one of our plant's new classes.

J. WYLLIE (Industrial Accident Prevention Association, Windsor, Canada): I would like to offer an idea that was advanced by Mr. E. G. Quessel at a meeting of the Food Section yesterday. He recited cases of accidents occurring through the drivers jumping on the hub of the rear wheel of their delivery trucks. To overcome this hazard, they provided a step; but this

simply created another hazard, because there was a temptation for youngsters to jump on the moving vehicle. They have evolved a new type of step so that the moment the truck starts up, one revolution of the wheel, the step drops out of position and remains that way until the truck comes to a standstill again.

MR. LEE: I was in one of the large plants here in Chicago where they use quite a few trucks that run around through the departments. At intersections of the aisles they had large mirrors at such an angle that the fellow coming up one aisle could see the fellow coming from another direction.

MR. HANAU: I would like to ask one of the leather men or tanning men whether they have ever seen a guard on a staking machine or roll jack as specified in, I think it is, A.S.A. standards, which says that a fence should be provided around the thing so that a man can't get his hand under that. I have seen pictures of them, but I don't recall seeing one that worked.

CHAIRMAN SCHAFFNER: Mr. Clover, can you answer that?

MR. CLOVER: As to the Slocum staker you have in mind, where a man puts the hide in on the side and has to work it through—

MR. HANAU: Either the side or front. There is an arm that comes down.

MR. CLOVER: I don't know of any guard that is put at the point of operation. They do bring the guard up to a certain point on the arm, and they cover the fly-wheel below. As to actually guarding the point of operation on this staker, I don't believe it has been done. With the exception of sole leather, the glazing jacks have been guarded. They are guarded at the point of operation by having a basket type guard around them, with provision made at the front, point of operation, to slide the skin from the left to the right or the right to the left, whichever way it is. If their hand or the skin of the hide is jerked in, the hand is knocked loose before it goes into the roller. There are some very good guards that you can make up to suit your condition.

MR. HANAU: Can you tell me where I can see one of those in operation in this area?

MR. CLOVER: I can send you some pictures of them.

MR. HANAU: I will be glad to have them.

MR. TEFFT: Mr. Lee referred to visual education. I would like to tie that up with a discussion of aprons, if I may. Cuts from beef boning operations are rare, but when they happen they are horrifying. I know of one man who bled to death in ten minutes. He cut a big artery.

Do you think it would be of any value if pictures were taken of beef boning operations to show the men how many times a day that knife almost cuts them but doesn't, and use those in a slow motion picture? Then they might take to some of the aprons a little bit more readily than they do at the present time.

MR. LEE: I think so. My suggestion would be that you have the still picture or the stereopticon slide first, because it seems to me that is the best medium for detail information and round table discussion. Then, after that, show the movie. The movie, in the first place, would be too fast. If you have it first in the still picture and go through the fine points and what he did and what he should have done, and so forth, then show him actually doing it in the picture, I think that would be ideal.

MR. TEFFT: I had in mind that you would have to take a motion picture because those fellows work so fast you can't see where the knife is. If you took the motion picture, then you could pick out the proper stills and make the stills from your motion pictures.

MR. LEE: Yes.

MR. HANAU: I saw a demonstration of that yesterday, in the Metals Section. Somebody took some shots of a punch press operator. He caught a particular operation he was interested in and then he made a loop film; in other words, he cemented the two ends and kept running in through his machine. It was very effective.

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MONDAY AFTERNOON SESSION

October 7, 1940

The session was called to order by General Chairman H. J. Griffith, Manager of Safety and Welfare, Jones and Laughlin Steel Corporation, Pittsburgh, Pa., who presided. Chairman Griffith, in commenting on "Activities of the Metals Section" during

the past year, took the opportunity to praise the chairman of many standing committees.

The Report of the Nominating Committee was called for, and officers for the Section were elected, as presented elsewhere in this record.

"True or False?"

The session had been planned as a Panel Discussion of a number of safety problems, called a "Quiz." These problems had been mimeographed and distributed to the delegates, who found below each problem the words "True or false?" The list complete is as follows:

1. When new machinery is installed, the Safety Engineer should have final say as to whether or not the machinery is safely guarded before it is put into production.

True _____ False _____

2. When an employee works on an operation which necessitates the wearing of

goggles, he should be allowed to pick the type of goggle which he is to use.

True _____ False _____

3. When a new employee is put to work, the foreman should give him instructions in accident prevention and not merely show him the operation and tell him to be careful.

True _____ False _____

4. Education in off-the-job accident prevention is an essential part of a plant safety program.

True _____ False _____

5. Extra remuneration for service with an employee safety committee, stimulates interest in accident prevention.

True _____ False _____

6. A foreman is primarily responsible for safety in his department.

True _____ False _____

7. The posting of money losses from injuries is a good selling point for safety.

True _____ False _____

8. The number of accidents in a plant goes up or down in relation to the reporting and correcting of unsafe practices and conditions.

True _____ False _____

9. The increase in accidents during the year 1939 as compared to 1938 was principally due to the failure of equipment.

True _____ False _____

10. One of the chief means of reducing the number of accidents is by the supervisors holding group safety meetings with their men.

True _____ False _____

11. When instructions are given on how to do the job safely, it is not necessary to follow up and make sure that the instructions are being carried out correctly.

True _____ False _____

12. Men transferred from other departments should be treated like old men and not given any particular safety instructions or training.

True _____ False _____

13. New men should be allowed to decide for themselves whether or not they should wear the safety equipment in common usage in their department.

True _____ False _____

14. Minor injuries should be disregarded and no report made of them.

True _____ False _____

15. Salt tablets or other means of providing salt should never be used in the winter time.

True _____ False _____

16. It is not necessary for foremen to spend much time observing the actions of

workmen with years of experience and good safety records.

True _____ False _____

17. Employees get more safety training from group safety meetings conducted by the foreman than they do from foreman who holds no safety meetings and talks to him on the job.

True _____ False _____

18. Setting up a deposit charge for goggles has a tendency to keep the men from using them.

True _____ False _____

19. Impending lay-offs increase accidents.

True _____ False _____

20. The physical requirement of new men is more important than the moral or mental requirements from the standpoint of safety.

True _____ False _____

21. An accident in a department tends to lower the morale so that other accidents follow soon thereafter.

True _____ False _____

22. The word "carelessness" is used loosely in trying to cover up the real cause of accidents.

True _____ False _____

23. Punishment meted out by committee of investigation tends to eliminate future accidents.

True _____ False _____

24. Calling general attention of the entire working force to the poor safety record of any one department is good policy.

True _____ False _____

25. Due to his position, it is not necessary for a supervisor to wear goggles or other safety clothing which are required for those working under him.

True _____ False _____

26. When valve on oxygen tank sticks, it should be oiled so it will work freely.

True _____ False _____

27. If it is found that a wrench does not fit, it is proper to fill in with a shim.

True _____ False _____

28. In a welding department, no harm can

be done to the eyes unless one looks directly at the electric arc.

True _____ False _____

29. When an employee is found working at a hazardous occupation and is not wearing safety equipment provided by the company, he should be "fired."

True _____ False _____

30. When purchasing safety equipment, the Purchasing Department should be the controlling factor.

True _____ False _____

The Panel Discussion

Chairman Griffith introduced the members of the Discussion Panel, as follows:

C. M. Allen, Staff Supervisor of Safety, The American Rolling Mill Company, Middletown, O.

H. W. Darr, Supervisor of Safety, Bethlehem Steel Company, Johnstown, Pa.

E. J. Eberle, Foreman, Foundry Cleaning Room, Continental Roll & Steel Foundry Company, East Chicago, Ind.

John P. Eib, District Director of Safety & Plant Protection, American Steel & Wire Company, Chicago.

F. A. Miller, Superintendent, Sheet Division, Continental Steel Corporation, Kokomo, Ind.

Frank C. Schwartz, Superintendent, Open-Hearth, Ohio Works, Carnegie-Illinois Steel Corporation, Youngstown, O.

CHAIRMAN GRIFFITH: Gentlemen, this afternoon we have a program that is a little different than ordinary. It is a type we have never tried in the Metals Section. Some of these questions we may have to take home and think over for a while.

I have here alongside me a panel of six men who are going to help us in answering these questions. But I don't want to work these men too hard. I am going to depend upon many of you fellows out in our audience to help us, too. To get this thing started, I am going to ask men in the panel first, but after we do get going along, anybody can pick it up. Any question you see in the list you have may be asked, and we will try and develop an answer, and whether that answer is true or false.

Suppose, for example, we look first at question number 14. It says: "Minor injuries should be disregarded and no report made of them." Is that true, or is it false? I will ask Mr. Allen what he thinks about it.

MR. ALLEN: Mr. Chairman, that is false. It is the little things which develop into big things.

CHAIRMAN GRIFFITH: In other words, the little injuries should be sent to the first aid station and should be taken care of rather than let them develop into infections, or something else. Well, that sounds as though it might be all right, but it takes time to get these fellows into these stations all the time. There is a lot of running around involved in that. Maybe we are losing money by doing that. What do you fellows think about it now?

MEMBER: I would like to see that question divided in two: "Minor injuries should be disregarded," and "No report made of them" is another question.

CHAIRMAN GRIFFITH: Let's divide it in two. "Minor injuries should be disregarded." How many think minor injuries should be disregarded? Raise your hands. Let's get a vote.

The consensus of opinion is that minor injuries should not be disregarded.

Now let's take up the second half, and no report made of them? Does that take care of it?

E. A. ELLIS (Wheeling Steel Corporation): I don't agree with that answer. I think it is most important that reports be made of minor injuries as well as major injuries, because it is usually from minor injuries that major injuries develop.

CHAIRMAN GRIFFITH: All right, does everybody agree with Mr. Ellis?

R. SMITH: A gentleman back here wanted to know what a minor injury is.

CHAIRMAN GRIFFITH: All right, Bob, you tell us what a minor injury is.

MR. SMITH: I never saw one.

CHAIRMAN GRIFFITH: You never saw a minor injury? All right, are we satisfied with No. 14? What is the next question?

W. W. HALL (Safety Director, Pittsburgh Crucible Steel Co., and Crucible Steel Company of America, Midland, Pennsylvania): No. 22.

CHAIRMAN GRIFFITH: All right, No. 22. "The word 'careless' is used loosely in trying to cover up the real cause of accidents." Is that true or false?

MEMBERS: True.

MR. HALL: Yes, that is a short cut for trying to evade the real cause of the accident. Too many supervisors use the word "careless" as the cause of the accident, when it is really not the basic cause. It is a short cut to evading responsibility.

CHAIRMAN GRIFFITH: In other words, you don't think the supervisors use it in the proper manner.

MR. HALL: You should never use the word "carelessness."

CHAIRMAN GRIFFITH: Now, what do you think? Should the word "carelessness" be used or not? How are you going to express yourself sometimes unless you use this word "carelessness"?

MEMBER: It is only an alibi.

MEMBER: Mr. Chairman, I don't think the word careless should be disregarded. We should determine what really is the cause of a person being careless. In other words, there may be sickness, or something else involved.

MEMBER: I think you should define carelessness. I don't think there is any such animal.

CHAIRMAN GRIFFITH: All right, we are getting somewhere. Where are we getting?

MR. ALDINGER: I think that word has come into too general use instead of the word thoughtless, or indifferent. The word "careless" should never be used. Every man cares. I think thoughtlessness, or indifference would fit there better.

CHAIRMAN GRIFFITH: That is what I was trying to bring out when I said, "what word are you going to use besides careless?" I think Mr. Aldinger has hit the word on the head by using thoughtless instead of careless.

N. V. B. ZIEGLER (Director of Safety & Compensation, Aluminum Company of America, New Kensington, Pennsylvania): I can't agree with my friend. He said every man cares. I doubt that. I think there are a number who don't give a damn.

CHAIRMAN GRIFFITH: Now we are getting some place else here. Do you think

men really care, or do you think there are men in the world who don't give a damn, and don't care?

MEMBERS: Lots of them.

CHAIRMAN GRIFFITH: You have lots of them?

MEMBER: I am certain of this, that there are times in a man's life when he doesn't care very much what happens. He may be in some kind of trouble, or something like that, and he really doesn't care. I have had that happen.

CHAIRMAN GRIFFITH: What do you think of that, Mr. Ziegler?

MR. ZIEGLER: Some time ago we had a lost time injury, and after it was investigated the man admitted that something had made him angry. He couldn't get a piece of machine to work, and he said, "I just lost my temper and gave it a big yank, so much so that I injured myself. I am at fault, and I did it because I just got mad and didn't give a dang what happened." He was a good man otherwise, but that was his own testimony.

MEMBER: Mr. Chairman, you are talking about supervision when you are talking about what is carelessness. When a man tells me an accident is due to carelessness, his supervision is at a very low ebb.

CHAIRMAN GRIFFITH: All right. Is there anything more we have to say on that particular question?

MEMBER: Mr. Chairman, what word do you want to use in place of the word "carelessness"?

CHAIRMAN GRIFFITH: Thoughtlessness.

MEMBER: Parallel to Mr. Ziegler's comments, suppose a crane man is trying to make a lift. He doesn't know how heavy it is, but he gives the crane what he usually gives it to lift a load, and that won't lift it. Well, he knows that he is stressing it if he goes beyond that, but he gets a little bit of slack, and then takes a run at it. That isn't carelessness. That isn't thoughtlessness. That isn't indifference. If you are going to throw the word "carelessness" out what are you going to have?

CHAIRMAN GRIFFITH: Use the word "ignorance."

MR. LEWIS (Republic Steel): I can't get the drift of substituting thoughtlessness

for something else when in reality it is just substituting words, and not correcting carelessness.

D. W. POLK (The Aluminum Company of America): Mr. Chairman, what is the difference between what these other men are using, and carelessness? I'd like to find a definition of the difference.

CHAIRMAN GRIFFITH: Well, let's not split hairs on words. Let's try to get some facts on the thing, carelessness, thoughtlessness, indifference, or what have you. If you use that in your plant and get the problem across to the individual, all well and good. I don't care what you might use. If you get results using carelessness, thoughtlessness, or indifference, or no matter what it is, results are the things you are after, aren't they?

MR. GARRETT (Carnegie-Illinois Steel Corporation): Mr. Chairman, substitute boogy-woogy in there, and wouldn't we still have a problem? Any synonym of carelessness will still leave us at fault if we are trying to cover up the real cause of accidents.

CHAIRMAN GRIFFITH: All right, let's have another question. No. 24, somebody said: "Calling general attention of the entire working force to the poor safety record of any one department is good policy." Is that true or false?

MEMBERS: False.

CHAIRMAN GRIFFITH: I hear several who say false; any of you fellows think it is true?

MR. HARRIS: Mr. Chairman, I think it is very much so. Our job is one of education; instead of getting something out of a textbook, if we can show a department record to the rest of our plant and try and help the department out as well as educate the others by our safety experience, we are doing a real service.

MR. BRINKMAN: If you show a good record to the other department, then it is educational. But if you show a poor record, publicize the mistakes of the other department, you are not helping that department in the same degree you would if you would bring to their attention a department that is doing a little better than they are.

MEMBER: I think any accident in any department is a poor record, and the stressing of that is a means of preventing others.

It isn't a matter of degrees of goodness. The question is in terms of badness. I am in favor of that as a means of correcting further accidents.

CHAIRMAN GRIFFITH: All right. We have two sides of it.

J. F. COLLINS (Supervisor of Safety, Youngstown Sheet & Tube Company, Youngstown, Ohio): Whenever you point your finger at any individual, that person is a subject of scorn, or on the spot because everybody in the plant knows the department has a bad record. They can do things to help and rather build them up instead of pushing them down.

CHAIRMAN GRIFFITH: In other words, you believe it should be positive instead of negative.

MR. GORNELL (The Aluminum Company of America): Isn't there a tendency to have one department shown in worse shape than the other? If you hold up the record of one department as being better, won't that create a false pride, and then they will start slipping?

MR. ZIEGLER: I can't agree with my brother from the Aluminum Company. I can't see any reason why we should cover up one department if they happen to have a poorer record.

At the end of the month we make up a report of the conditions of the plant, and read it before our committee members. That will show the whole thing. We are not pointing any finger of scorn at anybody. We are just showing the facts as they exist at the end of the month. If Department No. 1 has an accident, and all the other departments are perfect, it is shown there. We might say, "Well, now, we had a perfect record except for the record of Department No. 1, and unfortunately, they had an accident. We know they are sorry about that, and so are we, but the truth still remains that they had an accident." Now, there is no finger of scorn pointed at them. I certainly would never agree with covering up Department No. 1 just because they weren't perfect.

JAMES R. BYRUM (Safety Advisor, American Rolling Mill Company, Middletown, Ohio): I don't think it is possible to cover up the record of any department in any plant. But at the same time, I wonder if it is advisable to make too much out of the fact that a certain department has a

terribly bad record. There is a certain amount of personal pride in the majority of men who work in any department. They have a departmental pride, and the fact that some men in their department have slipped naturally affects those men. There isn't any question about it at all. But I question very much whether publicizing it and holding it up as a horrible example is a just point.

MEMBER: Mr. Chairman, on some of these questions, you have neglected our major source of information. We have a board of experts up there. I would not hesitate to call upon them a little bit. I would like to hear from them.

JACOB L. RISINGER (Inland Steel Company, East Chicago, Indiana): Mr. Chairman, we have had a lot of controversy at our plant about this same question, and it seems like it boils down to this: Each department is more or less interested in itself, and when you start comparing it with other departments, you get into the old argument of the hazard ratio between this department and that department.

What we try to do is compare the record within the department month by month, year by year. In other words, it is their particular hazards you are trying to work out, and it is their problem. It is not a problem for the balance of the plant. You won't get any place by showing them up to the other departments, when they think their hazards are a lot worse than the others.

WILLIAM JORDAN (American Rolling Mill Company, Ashland, Kentucky): This No. 24 is really not a question. It is a statement; calling the general attention of the entire working force to a poor safety record of a department is poor safety policy. I dare say every one of us does that in our monthly reports, showing one department against the other. We do call attention to the poor departments as well as the good departments, so in a general way I would say the answer is true.

CHAIRMAN GRIFFITH: All right, gentlemen, is it true? Raise your hands. (Approximately 60 members raised their hands.)

Is it false? (Approximately the same number raised their hands.)

I will ask Mr. Darr his opinion on the thing?

H. W. DARR: That is a controversial problem, I know. But in our plant, and I

believe in every steel plant, you try to instill in the minds of your men that they are just one big family, all working together for one common end. Naturally, your plant is divided into different departments, and each one has a particular group of men.

If one man sees another man with a better record, he feels sorry for himself, if his record is bad. But I remember my early childhood. In our family there were eight children. If my parents held me up to ridicule before the other seven children, I was very much hurt, and became disgruntled, sometimes antagonistic toward anything good in the family.

Take that same principle into the steel plants. Suppose I pick out one department that has a poor record, for example, in our plant, the Rod and Wire Mill, and I go around and tell the other departments the Wire Mill hasn't had a loss in this year, and why don't they do the same, they would naturally have a hatred in their hearts toward the Wire Mill. I think every department should be worked and calculated and reported on its own merits, and let the other fellows be left out of it.

CHAIRMAN GRIFFITH: What is the next question?

STANLEY WARZALI (Chemical Division, American Cyanamid Company, Bound Brook, New Jersey): I would like to have Question No. 23 discussed; but I would like to edit it so that it is discussed this way: "Punishment meted out tends to eliminate future accidents, regardless by whom." I would like that discussed here.

CHAIRMAN GRIFFITH: The gentleman says he would like to have the question stated this way: "Punishment meted out tends to eliminate future accidents, regardless by whom."

MEMBER: It seems to me that question is packed with dynamite. I think that is the kind we ought to discuss here. We should find out what we mean by punishment other than lay off. Maybe that is all the punishment we can mete out. I think we should find out whether it does any good.

CHAIRMAN GRIFFITH: Mr. Eib, suppose you discuss that a little, if you don't mind.

JOHN P. EIB: Of course, everybody is entitled to his own opinion, knowing his own conditions. My own notion is that on the

last three questions we have "missed the boat" a little bit. This is just one of my ideas. I think we have failed to bring out what I might express as the cause of the cause of accidents. We are just taking a little bit here and a little bit there, and we haven't really expressed it.

The question of discipline depends upon so many things that I couldn't guess at all the conditions you might have, or even that I might have. You might say, in many cases, the injury itself was ample punishment, or ample discipline. You can't make a general statement on that.

The gentleman over here wanted the question changed. I agree with him. I am still a strong believer in supervision, and not a committee. My thought then would be to go further into the causes of accidents, publicize those, and in determining the question of discipline, it depends a lot upon circumstances, but surely supervision is the answer, and not a committee, in my opinion.

MEMBER: That still doesn't answer his question. The question is whether they tend to eliminate future accidents.

L. S. HARRIS (Continental Rolling Steel Foundry Company): If discipline is given, it should be given before the accident occurs, when the workman makes a careless move, or does a job carelessly. He should be disciplined at that time, and not after the accident occurs.

MEMBER: How do we punish the employee who has been careless?

CHAIRMAN GRIFFITH: All right, how do you punish? Why do we discipline individuals?

HOMER L. ROGERS (Sheffield Steel Corporation, Kansas City, Missouri): Do you punish the man who is injured, or the man who caused the injury?

CHAIRMAN GRIFFITH: Well, that all depends. I would say, however, whoever might be at fault should be disciplined, whether it is the injured man himself, or somebody else who might be involved in the accident, too. But I think somebody else hit the nail on the head when he said we lock the door after the horse is gone. We certainly ought to lock the door before the horse gets away from us. In other words, don't wait until we do have accidents.

But we still don't have the answer to the question. Does it eliminate future accidents

in doing this? Does punishment eliminate accidents in the future?

MR. WARSALA: Mr. Chairman, I would like to see us go a little deeper into this thing. Now, you aren't drawing a line that we ought to mete out the discipline before the accidents happen. I think if it is a matter of discipline it ought to be as much before as after, or not at all.

I don't know how many of you listened to Mr. Mitchell speak this morning. He said, "apply penalties firmly." I believe Mr. Mitchell has given much study to the subject. I believe discipline should be administered before and after an accident. If you have told the fellow, in connection with his work, to do something in order to prevent injury to himself, or to others, and if he fails to do that, and you have noticed it, you should discipline him regardless of how you do it.

V. E. SCHLOSSBERG (Inland Steel Company, East Chicago, Ind.): Mr. Chairman, the question stated now is that punishment tends to eliminate future accidents. In the United States we maintain jails in which to punish criminals. If that policy is wrong, then this thing here is false. If that policy is right, then this statement is true.

B. G. BAIRD (State of Kansas Labor Department, Topeka, Kansas): I think the whole question of true or false depends upon the individual with whom you are dealing. If the man is one of these fellows who happens to miss work on the least pretext, one or two days' lay off won't matter to him; but if he is a man who comes to work on time all the time, and happens to be violating one of the safety rules, then whatever punishment is meted out to him will do some good. So the one who is meting out the punishment will be the one responsible to judge whether the man is going to benefit from the punishment or not. That is why I think, in my humble opinion, the question can be true or false, whichever the case may be, according to the individual you are studying. It is a matter of psychology.

CHAIRMAN GRIFFITH: Well, you may get an opinion one way or the other. But I think, as this gentleman stated, we have set up certain laws which govern the operation of our country. In your steel plant you set up certain laws to govern those operations. If you are going to eliminate future accidents, you certainly can't permit

accidents to go on without doing something about them. That, I think, should be done previous to the happening of the accidents. There is where we should place our emphasis, on the training of the individuals, and try to eliminate accidents so we don't have to punish individuals to get our elimination of them.

All right, let's go to another question.

MEMBER: No. 30.

CHAIRMAN GRIFFITH: "When purchasing safety equipment, the purchasing department should be the controlling factor." True or false?

MEMBERS: False.

CHAIRMAN GRIFFITH: Well, wait a minute, you fellows. What do you think we are paying these high-priced purchasing agents for? The safety engineer gets \$150 a month, and you have a purchasing agent who gets eight or ten thousand a year. He saves the company more money. Why shouldn't he be the controlling factor?

MR. ZIEGLER: The purchasing agent is not a controlling factor in purchasing other types of equipment, is he?

CHAIRMAN GRIFFITH: Yes, indeed. Where he can get it cheapest, that is where he gets the thing.

MEMBER: Mr. Chairman, maybe we should decide whether or not the safety man should set the standards, and the purchasing man should do the purchasing. The purchasing department knows as little about safety as the safety man knows about purchasing, if you want to put it that way.

CHAIRMAN GRIFFITH: Well, this is more or less a catch problem. There is no question about it. There has to be cooperation. The safety man certainly has to cooperate with the purchasing department, and the purchasing department has to cooperate with the safety man.

The safety man, if he is a safety man at all, knows what equipment he wants, and he knows what works best in the plant, and regardless of price, I think he should be the man who should specify what he has to have. Does that concur with the thinking of everybody?

The next question.

MEMBER: No. 17.

CHAIRMAN GRIFFITH: "Employees get more safety training from group safety

meetings conducted by the foreman than they do from the foreman who holds no safety meetings and talks to his men on the job."

You had better study that a little bit. There is a little complication there which I can see.

MR. ZIEGLER: Mr. Chairman, the problem isn't properly worded. If the foreman talks to his men individually, he has a group of safety meetings, and if he talks to two or three, or four at a time, he has a group safety meeting. He is educating the individual. It doesn't matter whether he has one, two or three around the machine, or four, five or six in a group. The question isn't solved by that.

CHAIRMAN GRIFFITH: Would you consider them both group meetings, or would you consider one a personal contact, and the other a group meeting? Which way do I get the better results? Do I get better results from personal contact with the individual, or do I get better results by getting those fellows in and talking to them in a group? That is practically what this means.

MEMBER: You would get results if you talked to everyone individually.

MR. RENWICK (Russell Iron & Steel Company): I think it depends upon the operation. If it is a group operation where there are ten men working together, and they have to work in harmony, the thing to do is discuss it with the ten men. If it is a single operation, and the man is doing the wrong thing, then the thing is to have personal contact. That would bring the best results.

MEMBER: I would like to quote the old principle that two or three heads are better than one. If the same man always has the personal contact, it is only his opinion that you are to listen to, whereas if you have a meeting everyone is allowed to talk, and everyone is allowed to give his own interpretation of everything concerned. Many of the best safety ideas come from the men themselves, which means the meeting will give them the outlet for such suggestions. That is why I would prefer meetings to personal contact.

CHAIRMAN GRIFFITH: All right, let's go to the next question.

MEMBER: No. 29.

CHAIRMAN GRIFFITH: All right, let's look at 29. "When an employee is found

working at a hazardous occupation and is not wearing safety equipment provided by the company, he should be 'fired.'"

MEMBER: Mr. Chairman, I don't like that word "fired." I think we should use the word "disciplined" there.

CHAIRMAN GRIFFITH: Well, I think we understand this word "fired" a little bit better than we do the word "disciplined."

MR. JORDAN: Mr. Chairman, do I understand that you would fire a man who was found working in a hazardous occupation and not wearing safety equipment? I don't agree with that. I think it is up to us and up to the supervision to train that man, to tell him on the idea to wear that equipment for his own protection. We have a job of training to do. I certainly wouldn't fire a man if I caught him working without using the safety equipment, even though he had been told.

CHAIRMAN GRIFFITH: Here is an operating man. I am going to ask Mr. Schwartz what he would do in such a case. It is probably just a personal opinion.

FRANK C. SCHWARTZ: My feeling in the matter is this: We are all human, and if we got fired the first time we made a mistake, we wouldn't be in a job very long. I feel that a man who works in a hazardous position, and does not wear the safety clothing, or use the safety equipment which is provided, should be reprimanded, and cautioned that the next offense might mean a lay off. I certainly would not be in favor of firing that man the first time he did not use the safety equipment.

MR. SMITH (General Electric Company, Fort Wayne, Indiana): I think we have gotten almost clear away from enforcement in the factories. There was a time in the old days when if a man did anything wrong in that respect, he was canned. They didn't fool around with him. But in the past 15 years we have been trying to sell people on safety.

We are getting a little bit afraid to enforce the safety rules we make. I think we should get back to some of the old ideas. I don't say you should fire a man right off the reel. That would be inhuman. But if he persists in violating the rules, and the company spends money for safety equipment for him, I think he shouldn't be fired, of course,

but he should be laid off possibly for a few days.

CHAIRMAN GRIFFITH: All right, gentlemen. Is there anything else on that?

MR. FORGY (American Rolling Mill Company): Mr. Chairman, I think the man should be "fired." We must be persistent in doing the things that prevent accidents. That is our job, together with supervision. A man might be careless in doing a particular job, simply because he doesn't have the proper education along safety lines. He may not have the proper viewpoint as to his personal responsibility. He doesn't yet realize that he can do something about prevention, and that is our job, to get the point over to the man. It may be done in some instances in a week's time, and in other cases it may take a year, but that is our job, to be patient with the individual, and help him to realize, as we do, that accidents are avoidable. When we do that we will get results.

MR. SCHLOSSBERG: How about the man who involves not only himself in an accident, but a year from today he involves somebody else in an accident, and a year from then he has another accident? Nobody is going to do any punishing, and nobody is going to do any firing.

MEMBER: No. 25.

CHAIRMAN GRIFFITH: Let's look at No. 25. "Due to his position, it is not necessary for a supervisor to wear goggles or other safety clothing which are required for those working under him." True or false?

MEMBERS: False.

CHAIRMAN GRIFFITH: I think that is very true. All right, another question.

MEMBER: No. 19.

CHAIRMAN GRIFFITH: No. 19; "Impending lay-offs increase accidents." Do they or don't they? How many think it is true? (Practically unanimous.) Well, that is finished. Another question.

MEMBER: No. 3.

CHAIRMAN GRIFFITH: All right, gentlemen, No. 3. "When a new employee is put to work the foreman should give him instructions in accident prevention and not merely show him the operation and tell him to be careful." How many of you fellows think it is true? It is unanimous.

MEMBER: No. 8.

CHAIRMAN GRIFFITH: "The number of accidents in a plant goes up or down in relation to the reporting and correcting of unsafe practices and conditions." True or false?

MEMBERS: True.

CHAIRMAN GRIFFITH: You are satisfied it is true? All right, let's go on to another one.

MEMBER: No. 2.

CHAIRMAN GRIFFITH: No. 2: "When an employee works on an operation which necessitates the wearing of goggles, he should be allowed to pick the type of goggle which he is to use."

MEMBERS: False.

CHAIRMAN GRIFFITH: Are you satisfied with that as the answer? All right.

MEMBER: No. 6.

CHAIRMAN GRIFFITH: All right, No. 6. "A foreman is primarily responsible for safety in his department."

MEMBERS: True.

MEMBER: No. 7.

CHAIRMAN GRIFFITH: No. 7. "The posting of money losses from injuries is a good selling point for safety."

MEMBERS: True.

MR. ZIEGLER: The company's or the individual's? Whose money?

CHAIRMAN GRIFFITH: Wait a minute. Who is the loser?

MR. ZIEGLER: Are you talking about the company or the man?

CHAIRMAN GRIFFITH: The money lost by the company. Let's put it that way.

MR. ZIEGLER: That is false. If it is the company, yes.

CHAIRMAN GRIFFITH: Is that satisfactory? No one objects to that, so we will go on. What is the next one?

MEMBER: No. 5.

CHAIRMAN GRIFFITH: There seems to be quite a call for No. 5. "Extra remuneration for service with an Employee Safety Committee stimulates interest in accident prevention."

MEMBERS: False.

CHAIRMAN GRIFFITH: It doesn't stimulate? O.K., if you are satisfied with that, we will cross it off.

MEMBER: No. 1.

CHAIRMAN GRIFFITH: "When new machinery is installed, the safety engineer should have final say as to whether or not the machinery is safely guarded before it is put into production."

MEMBERS: True.

MR. ZIEGLER: False. Mr. Chairman, that is only half true. The safety director should not have the final say. But a safety director, and a committee composed of some of the safety committee members in that department, perhaps, and the foreman, and the department engineer, should make up a committee to investigate and examine that machine before it is ready to be put into operation. The report of that committee should determine whether the machine should go into operation or not. It should not be just a final definite statement of the safety director himself.

CHAIRMAN GRIFFITH: How many of you safety engineers would be willing to accept the responsibility of putting that machinery into operation if it wasn't properly guarded? (Nobody answered.)

All right, how many of you fellows think this thing is true? Read it over carefully. All right, is it true? Is it false? True wins. They say the safety engineer should have final say.

D. W. POLK (Aluminum Company of America): This is the cart before the horse, to some extent. The settlement of the safety features of the machine should come in the initial buying or building of the machine instead of at the time of putting it into production. The safety engineer and the designing engineer ought to cover that question, and when the machine is constructed it should be finished to comply with all the safety regulations.

CHAIRMAN GRIFFITH: I think we agree on that.

All right, No. 4. "Education in off-the-job accident prevention is an essential part of a plant safety program."

MEMBERS: True.

CHAIRMAN GRIFFITH: True. No discussion there. All right, what else have we?

We are going to question No. 9: "The increase in accidents during the year 1939 as compared to 1938 was principally due to the failure of equipment."

MEMBERS: False.

CHAIRMAN GRIFFITH: False. O.K.

MEMBER: No. 26.

CHAIRMAN GRIFFITH: No. 26. "When valve on oxygen tank sticks, it should be oiled so it will work freely."

MEMBERS: False.

MR. POLK: Because you have all the elements of combustion, spontaneous combustion, when you get oil or grease and oxygen together.

CHAIRMAN GRIFFITH: In other words, you get an explosion.

MR. POLK: Yes.

MEMBER: No. 12.

CHAIRMAN GRIFFITH: "Men transferred from other departments should be treated like old men and not given any particular safety instructions or training."

MEMBERS: False.

CHAIRMAN GRIFFITH: Boy, there was no question about that one, was there?

MEMBER: No. 15.

CHAIRMAN GRIFFITH: O.K. "Salt tablets or other means of providing salt should never be used in the winter time."

MEMBERS: False.

CHAIRMAN GRIFFITH: If a little salt on the outside will do what it does, certainly it should be good for something on the inside. All right, another question.

MEMBER: No. 11.

CHAIRMAN GRIFFITH: "When instructions are given on how to do the job safely, it is not necessary to follow up and make sure that the instructions are being carried out correctly."

MEMBERS: False.

CHAIRMAN GRIFFITH: I can't get anyone to talk on that one. What is the next one?

MEMBER: No. 16.

CHAIRMAN GRIFFITH: "It is not necessary for foremen to spend much time observing the actions of workmen with years of experience and good safety records."

MEMBERS: False.

CHAIRMAN GRIFFITH: I will ask Mr. Miller if he will talk on that.

F. A. MILLER: Mr. Chairman, my thought on that is that "Familiarity breeds contempt." I would say it is decidedly necessary for the foreman to observe the actions

of his men in his department, even though they are men with a good many years' experience in that department. Thoughtlessness or carelessness enters into this, and in my own department I watch the old men just as closely as I watch the new men, because they are just as apt to get careless and have an accident.

MEMBER: No. 20.

CHAIRMAN GRIFFITH: All right, let's take a look at No. 20. "The physical requirement of new men is more important than the moral or mental requirements from the standpoint of safety."

MEMBERS: False.

MEMBER: No. 10.

CHAIRMAN GRIFFITH: "One of the chief means of reducing the number of accidents is by the supervisors holding group safety meetings with their men."

MEMBERS: True.

CHAIRMAN GRIFFITH: One more question.

MEMBER: No. 18.

CHAIRMAN GRIFFITH: "Setting up a deposit charge for goggles has a tendency to keep the men from using them."

MR. HART: I would like to hear some discussion on that.

CHAIRMAN GRIFFITH: You would? Mr. Eberle, possibly you could say something on this.

F. J. EBERLE: In a lot of plants it is customary for every new man coming into a shop to have a pair of goggles, regardless of whether he uses them day in and day out or not. It is usually a rule that every man should have goggles. At some time or other his duties might take him through a department which required every man to wear goggles, and he should have them in a case like that.

I don't think a charge should be made for goggles when a man is hired, but in our plant when a man is hired he is given goggles, and when he leaves our employ he must turn those goggles in. If he is not able to do that, we deduct a small charge from his last pay check.

MR. HART: Do you find that has a tendency to keep the men from wearing them in your plant?

MR. EBERLE: Absolutely not. It is a steadfast rule that the men should wear

goggles in our department. They wear them.

MR. POLK: Mr. Chairman, there is a little thought there I don't think has been brought out. The first pair of goggles is usually given to the employee, but through some reason he may have lost them or broken them in his ordinary pursuit of work. Now, I think what the committee was after was whether or not it was necessary for this employee to pay for the next pair of goggles, or the next pair. The point is that if he had the goggles with part of the glass broken out rather than turn those goggles in and pay eighty cents for another pair, or one dollar, or whatever it may be, wouldn't he use the

inferior goggles rather than pay the money to get the safer pair?

CHAIRMAN GRIFFITH: Maybe he would.

CHAIRMAN GRIFFITH: Gentlemen, do you like this type of meeting? Hold your hands up if you do. Let's see what you think of it. (Practically unanimous raising of hands.)

Very good. I am glad you do. It is something new, something we have never tried before. We have tried to get as much information to you in this way as you would probably get in a paper.

TUESDAY LUNCHEON SESSION

October 8, 1940

Accident Prevention in the Steel Industry

By WALTER S. TOWER

President, American Iron and Steel Institute, New York City

It is most appropriate that representatives of the iron and steel industry have always taken an active part in the meetings and deliberations of the National Safety Council. It fostered and financed many of the early safety activities. Indeed, the very idea of the National Safety Council, itself, had its roots in the steel industry.

In 1912 a committee was appointed by the Association of Iron and Steel Engineers, charged with the task of "organizing and guiding a permanent body devoted to the promotion of safety to human life in industry in the United States." Out of the work of that committee the National Safety Council was born.

The job of promoting safety in the mills at the start was not an easy one. It involved substantial expenditures for mechanical safeguards in the plant and much patient and persistent educational work throughout every department. It was necessary, if the idea was to succeed, to transform deeply-grooved habits of devil-may-care attitude or actual carelessness into firmly fixed habits of care and caution.

It is obvious, but still worth stating, that the work carried on for nearly three decades has paid large dividends in terms of

human lives saved and human suffering avoided. To management belongs the credit for initiating and directing the movement, but to industry's employees must go the credit for the intelligent cooperation necessary to its success.

That success in the steel industry has been most impressive. Once employment in the steel industry was regarded as a hazardous occupation. Today it is a common saying that a steel worker is safer in the plant than in his own home.

Actually the steel industry's safety record last year ranked fourth in the list among the thirty industries covered by the reports of the National Safety Council. Only the tobacco, cement and printing industries had a better record than steel. At the beginning of the safety movement steel stood near the bottom of the list and it was only a few years ago that it stood in twelfth place in the Council's rating of freedom from accidents. That progress is a notable achievement, and a share of the credit for it belongs to the earnest and helpful efforts of the National Safety Council.

I have referred to the human benefits of the safety movement, and those benefits in the saving of life and limb, of course, are

of first importance in any consideration of the problem of safety. But the financial benefits also have been very considerable, not only to the companies but to the employees themselves.

Accidents are customarily measured in terms of lost time and in industry that means lost money both to employee and to employer. It means impaired efficiency and diminished productivity of the working force. The progress made in reducing "lost time" has been a notable contribution to industrial efficiency, higher output per man hour, and better earnings for the worker.

If safety and other factors contributing to productivity are important to the steel industry in ordinary times, they are doubly so at this critical period of world history when this country finds itself forced to enter upon a vast program of preparedness for national defense. Steel must play a vital part in the defense effort, and there must be no avoidable "lost time" in national defense.

Steel is a raw material which can be specified for defense products as freely as for articles of peace. Fortunately the same technology and the same plants which have produced the steels for modern automobiles, refrigerators and all the other familiar peace time products, are available to turn out steels to required specifications and in required quantities for guns and shells, tanks and war planes, torpedoes and battle-ships. No revamping of the industry is necessary.

To supply these essential needs as well as hundreds of additional requirements, not directly in the nature of armaments or munitions but equally vital to the national defense, steel in almost every form will be in demand.

Army and Navy cantonments must be erected, shipways built, industrial plants expanded, roadways constructed and many military articles produced. For these and similar requirements regular commercial steels in proper specifications will be largely used. In some cases special needs may require kinds of steel little known to peace time use, but these the industry is prepared to produce.

With the possible exception of electric furnace steel, the industry is confronted with no immediate problem of any important additions to plant capacity. Greater

quantities of electric furnace steel are needed to provide stainless and various other alloys for planes, tools, special armor and other products. To meet that need the industry has been increasing electric furnace steel capacity by some 700,000 tons, or 40 per cent, and before the end of the year the available supply should be ample for all needs.

In some quarters the steel industry has been the target of sharp criticism because of its policy of spending large sums for plant modernization. During the past decade, for example, the industry expended approximately \$1,500,000,000 in new facilities and improvements. But you will all agree that the position of the United States in the midst of turbulent world events today would be far less reassuring than it is if the productive facilities of the steel industry were less efficient.

Along with such betterments, brain has risen in value over brawn, and correspondingly the ground has been improved for sowing the seeds of safety ideas.

The total ingot producing capacity of the industry today is close to 83,000,000 net tons, an increase since 1920 of 22,000,000 net tons, or more than 35 per cent.

As the defense program takes shape the probable requirements of steel are becoming somewhat clearer but even now no complete or positive statement of needs beyond a few months is possible. On the basis of different assumptions, estimates of total requirements for the full defense program range from 7 per cent to 20 per cent of annual steel output. According to one calculation, based mainly on the amount of authorized expenditures for national defense over the next three or four years, steel requirements are estimated to approximate 15,000,000 tons. That amount of steel could be produced by the industry, operating at capacity, in a little over two months.

Although the Congress has authorized expenditures of nearly \$14,000,000,000 for defense purposes, most commentators agree that it seems unlikely that more than one-third of any such amount can be expended during the first 12 months. Largely that is due to the fact that it takes time to build and equip new plants, to retool existing plants and to change operations from peace time work to armament production.

Although the domestic demand for steel

for direct defense purposes is not yet large, export demand chiefly from Great Britain and to a lesser extent from South America has reached a substantial volume. Shipments to England alone are reported to be running at approximately 600,000 tons monthly. The various factors of demand have combined to lift operations above 90 per cent of capacity, with some competent predictions that output will continue at a high level. When production is being pushed deep-rooted habits of observing safety principles are doubly essential.

At the current level of operations the industry is producing ingots at the annual rate of roughly 75,000,000 tons, so that it is still theoretically possible to increase present output by about 600,000 tons monthly, with everything running at capacity.

Because the industry's plant has been kept in excellent condition, it probably is better prepared to maintain operations at capacity for a longer period of time than ever before. On a few occasions in the industry's experience, capacity operations have been held without interruption for varying periods. The most notable of these instances was during the first World War in 1917 when operations were at 100 per cent of capacity for seven months.

In view of these facts there seems to be no present prospect of any lack of capacity for making sufficient supplies of steel to meet all requirements, for national defense, as well as for export and regular commercial needs.

Another factor of great importance in the industry's ability to meet the rising demand for steel is that of available and efficient working forces. A survey recently made by the American Iron and Steel Institute indicates that there is not now any shortage of skilled or unskilled workers in the iron and steel industry. Moreover, it is generally felt in the industry that even though the rate of operations does rise somewhat higher, no such shortage will develop.

The demand for workers has steadily increased over recent months and further expansion of numbers on the payrolls is probable. In August the number of employees in the steel industry was 560,000.

The ability of the steel companies to find the trained men with which to expand their

forces on the scale of recent months is due primarily to two long range policies.

One has been the policy of maintaining their organizations in dull times to the fullest extent possible through work sharing. Skilled and semi-skilled workers have been retained on the payroll instead of being cut adrift, and the effects of patient education in ways of safety have not been lost.

The other policy is that of conducting apprentice training programs. In addition to the regular apprentice training many companies are meeting the current situation by inaugurating programs of intensive training on the job.

Under this plan known as "learner training" promising young men are selected in the locality of the plant or from among those already on the payroll and given intensive training in special operations or on particular jobs when additional skilled help is needed.

This training may continue for varying periods ranging from three weeks to three months, and the instructors are skilled mechanics especially chosen for the purpose.

Based on its calculation upon the assumption that its available sources of labor supply will not be depleted by conscription, federal regimentation of labor, or by an unprecedented boom in industry generally, the steel industry is confident of its ability to meet all probable demands with its present plant and equipment and the working forces now available.

The supply of certain raw material presents a problem which conceivably could interfere with production but certainly there is no immediate threat of any such interference. Steel producers in this country are wholly or in part dependent upon foreign sources for seven of the twelve important non-ferrous metals used in the making of various steel products. The metals in the list are chromium, cobalt, manganese, nickel, tin, tungsten and vanadium. Supplies of these metals are being watched closely by experts working with the Defense Advisory Commission. Stock piles of some of them are being acquired by government agencies to serve as possible emergency protection in the event that the flow of supplies from overseas sources is interrupted. And every precaution is being taken to make sure that essential materials for our great basic industry shall not be lacking.

In that unprecedented defense program, which is now getting under way, the steel industry is working in the closest cooperation and harmony with the Army, the Navy and the Defense Commission. Without any reservation whatever, members of the steel industry are making their productive facilities and combined technical skills available for every national defense need which they can supply.

If the defense program is to succeed, and it is a huge undertaking, it will call for the best effort and the greatest pro-

ductivity of every essential industry and of every man connected with those industries. With facilities, materials and men available the steel industry faces what may be the greatest task which it has ever been asked to perform, with complete confidence in its ability to deliver. It is keenly aware, however, of the need for no loss of man or machine power by the sapping effects of accidents. To the enduring credit of those who have carried forward the safety movement over the years, safety for the worker now stands forth as a vital element in industrial efficiency at a time of critical national need.

Presentation of National Safety Council Awards in the Metals Section Safety Contest

Outstanding facts were briefly sketched by Col. John Stilwell, President of the National Safety Council, who also presented the awards in the Council's name.

Participation in the 1939-1940 competition easily exceeded the enrollment in any previous contest. Two hundred ninety-five plants employing 451,115 people who worked 913,806,880 hours during the year participated.

The average frequency for all participants was 6.08. Steel mills had the lowest average, 4.91, and foundries had the highest rates, averaging 15.05.

Group A plants, consisting of the largest in each division, had sharply lower rates than did the smaller plants.

Frequency rates averaged 4 per cent higher than in the previous contest. Only participants in light and heavy machine-shop divisions reduced rates.

Percentage change	
Division	from 1938-1939 Contest
Light Machine Shops	- 8%
Heavy Machine Shops	- 1%
Steel Mills	+ 5%
Rolling, Finishing & Fabricating	+ 11%
Foundries	+ 22%

Injuries averaged one per 81 employees.

Thirty out of the 295 participants went through the contest period without a reportable injury.

The awards consisted of handsome bronze trophies, each in the form of an eagle in flight and the Universal Safety Em-

blem, which were given to winners of first place in the contest; and Certificates of Merit, in the form of a lettered scroll, which were given to winners of second and third place. In the lists below the winners of first place are indicated by the numeral (1), and the winners of second and third places by the numeral (2) and (3) respectively.

Division I

Group A

1. South Chicago Works, Republic Steel Corp., 3,322,260 man-hours with 4 reportable injuries.

2. Warren Works, Republic Steel Corp., 10,738,004 man-hours with 17 reportable injuries.

3. Carnegie-Illinois Steel Corp., Farrell, Pa., 4,899,717 man-hours with 10 reportable injuries.

Group B

1. E. & G. Brooke Iron Company, Birdsboro, Pa., 453,528 man-hours with no reportable injuries.

2. The Youngstown Sheet and Tube Company, South Chicago Works, 1,129,708 man-hours with 1 reportable injury.

3. The American Rolling Mill Co., Inc., Hamilton Div., New Miami, Ohio, 849,032 man-hours with 1 reportable injury.

Division II

Group A

1. Niles Works, Republic Steel Corp., 1,530,394 man-hours with no reportable injuries.

2. Youngstown Works, Truscon Steel Co., Republic Steel Corp., 3,579,865 man-hours with 1 reportable injury.

3. Aluminum Company of America, New Kensington Works, 14,330,178 man-hours with 18 reportable injuries.

Group B

1. Bethlehem Steel Co., Coatesville, Pa., 725,891 man-hours with no reportable injuries.

1. Laclede Steel Co., Madison, Ill., 611,560 man-hours with no reportable injuries.

1. Dilworth Porter Div., Republic Steel Corp., Pittsburgh, Pa., 395,504 man-hours with no reportable injuries.

1. Brooklyn Works, Steel & Tubes Div., Republic Steel Corp., 338,279 man-hours with no reportable injuries.

1. Hartford Works, Union Drawn Steel Div., Republic Steel Corp., 243,608 man-hours with no reportable injuries.

1. Pullman-Standard Car Manufacturing Co., Hammond, Ind., 239,407 man-hours with no reportable injuries.

1. Los Angeles Works, Truscon Steel Co., Republic Steel Corp., 230,500 man-hours with no reportable injuries.

1. General Cable Corp., Los Angeles, Cal., 175,806 man-hours with no reportable injuries.

1. Joseph T. Ryerson & Son, Inc., Buffalo, N. Y., 175,213 man-hours with no reportable injuries.

1. Hamilton Plant, Union Drawn Steel Div., Republic Steel Corp., 144,006 man-hours with no reportable injuries.

1. The National Radiator Company, Lebanon, Pa., 77,735 man-hours with no reportable injuries.

1. Joseph T. Ryerson & Son, Inc., Milwaukee, Wis., 75,266 man-hours with no reportable injuries.

Division III

Group A

1. Haynes Stellite Company, Kokomo, Ind., 570,173 man-hours with no reportable injuries.

1. The Perfect Circle Company, New Castle, Ind., 492,221 man-hours with no reportable injuries.

3. The Central Foundry Company, Holt, Ala., 1,721,486 man-hours with 2 reportable injuries.

Group B

1. National Cast Iron Pipe Co., Birmingham, Ala., 448,679 man-hours with no reportable injuries.

1. The American Rolling Mill Co., Inc., Central Works Foundry, Middletown, Ohio, 170,243 man-hours with no reportable injuries.

1. The American Rolling Mill Co., Inc., Sixth Ave., Foundry, Ashland, Ky., 120,875 man-hours with no reportable injuries.

Division IV

Group A

1. Whiting Corporation, Harvey, Ill., 1,605,995 man-hours with no reportable injuries.

2. Gilbert & Barker Mfg. Co., Springfield, Mass., 2,226,477 man-hours with 1 reportable injury.

3. United Shoe Machinery Corporation, Beverly, Mass., 6,117,920 man-hours with 7 reportable injuries.

Group B

1. United States Rubber Co., Shoe Hardware Div., Waterbury, Conn., 938,930 man-hours with no reportable injuries.

1. Link-Belt Co., Caldwell Moore Plant, Chicago, Ill., 434,575 man-hours with no reportable injuries.

3. The Challenge Machinery Co., Grand Haven, Mich., 239,845 man-hours with 1 reportable injury.

Division V

Group A

1. Mine Safety Appliances Co., Pittsburgh, Pa., 1,340,388 man-hours with no reportable injuries.

2. Westinghouse Electric & Manufacturing Co., Lamp Div., Bloomfield, N. J., 6,547,660 man-hours with 1 reportable injury.

3. Westinghouse Electric & Manufacturing Co., Newark Works, 3,834,096 man-hours with 2 reportable injuries.

Group B

1. Boston Gear Works, Inc., North Quincy, Mass., 1,122,182 man-hours with no reportable injuries.

1. Westinghouse Electric & Manufacturing Co., X-Ray Co., Long Island City, N. Y., 1,010,029 man-hours with no reportable injuries.

1. Dictaphone Corp., Bridgeport, Conn., 1,002,076 man-hours with no reportable injuries.

1. Pressed Steel Div., Truscon Steel Co., Republic Steel Corp., 761,680 man-hours with no reportable injuries.

1. Ilg Electric Ventilating Co., Chicago,

Ill., 552,979 man-hours with no reportable injuries.

1. The Perfect Circle Co., Tipton, Ind., 227,292 man-hours with no reportable injuries.

1. Kester Solder Co., Chicago, Ill., 191,426 man-hours with no reportable injuries.

TUESDAY AFTERNOON SESSION

October 8, 1940

The session was called to order by Lamar S. Perego, President, Sivy Steel Casting Company, Milwaukee, Wis., who presided. The meeting had been planned to discuss special "Foundry Problems," and the Chairman immediately turned the Chair over to the new presiding officer, John H. Holzbog.

Personnel Director, Chain Belt Company, Milwaukee, and Chairman of the Foundry Committee, Metals Section, National Safety Council.

Chairman Holzbog briefly discussed some outstanding foundry problems, and then introduced the regular speakers in order.

Maintaining Safety Interest in the Small Plant

By L. C. WILSON

General Manager, Reading Steel Casting Division, American Chain & Cable Co., Reading, Pa.

The job of making castings, whether as a straw-boss, assistant foreman, foreman, superintendent or manager, entails a great many details which go to make up the whole of the job. We can pick out a great many items which go to make up this whole, but in many cases one component part will be outstanding for pressure by the management. Until comparatively recently Safety was one of the things that was little thought about.

To the credit of industry, however, Safety in shops has received more and more attention with the progress of years and today takes, to my mind, as prominent a place in shop practice as do quality of product, cost of product and other items which go into the process of manufacturing castings.

Thinking this through, I believe to get the proper perspective we must substitute some word for "interest" and I believe that "safety consciousness" more definitely defines the intangible something with which we are attempting to deal. With this substitution, I am convinced that safety consciousness is as important in supervisory jobs as

are the elements of production, quality, cost and all other parts of the job of making castings; and if approached from that point of view, more definite progress can be made toward safer shops and better working conditions.

We are supposed to discuss safety in a small plant. However, this brings before me the question of how to designate a small plant. Number of men does not seem to answer the question entirely, as it may mean a small number of employees where the head of the business gives his undivided attention to all details from top to bottom. Again it may mean one with a much larger number of employees managed in identically the same manner by the chief, with little or no authority delegated to subordinates. From the point of view of Safety it may mean a plant with a large number of employees but maintaining a safety program which segregates the separate departments, thereby making each one quite comparable to a plant with a small number of employees.

The answer as to what constitutes a small

plant is left to one's own opinion; but as I see the problem, the safety programs in all three of the above instances should be handled in identically the same manner and the success of the safety program will be dependent upon the safety consciousness which is instilled in the men through the supervisory force but propelled by the head of the organization.

This brings us to the first of the ten phases of safety work which I will try to develop.

1. Who is the key man on safety in the small plant?

In what has been said as to a small plant, the key man on safety is, of course, the Chief, as only through him could any program live or flourish.

To my mind this chief, manager or head of a business should be the key man in either small or large business; and by key man I mean not what we sometimes describe as key men in industry, but the man from whom all inspiration, enthusiasm and direction originate—the head of the organization.

As I interpret safety consciousness it starts at the top and always remains top responsibility. To be sure, the burden of making safety plans and carrying them to a successful conclusion does largely, if not altogether, fall upon the shoulders of others in the organization who should be, and probably are, trained and expert in safety and who must support all others in the organization in attacking this never-ending job. Even so, the chief must be the key and make it known that he is the real key, or best results are usually lacking.

I believe this is the answer to the way and means to approach and maintain safety consciousness.

In order to get a broader opinion six different plants were asked this same question. Their answers were: employment manager, safety director, chairman of safety committee, plant manager, personnel supervisor; but all indicated that the real direction originated from the head of the plant or company, which bears out my opinion that the real key man of Safety is sitting at the top.

It is only right that this should be so, and here is where I believe a place for the word "interest" applies fully; that is, management interests, and there are two: first, moral interest; second, financial interest.

Management has a definite moral interest. When men are hired and taken into the foundry, management has a definite responsibility to send them home to their wives and families at the end of the day's work in a good physical condition and health as when the men reported for work in the morning. The neglect of machine guarding, or condition of equipment, or poor housekeeping eventually spells accidents; for accidents do not just happen but are the result of neglect or carelessness. This must be prevented by instructions to newly hired men, and these must be repeated continually by the supervisors and foremen, who must necessarily reflect the moral responsibility of the top.

The financial interest is in the hidden costs due to loss of time and production, as well as other items, which are four times the direct costs which appear on the books of the industry. Every accident costs money, whether it also causes injury or not.

Management has a large investment in men trained to do our work and cannot afford to overlook these losses, all of which may be prevented.

2. What does it cost not to maintain safety consciousness?

Not to maintain safety consciousness is difficult to represent in monetary values, but we do know that the absence of it in any organization will very quickly cause absence of workmen on account of injuries, resulting in interruption of production and operating schedules.

The cost may be further represented by the cost of breaking in other workmen, plus accident compensation and medical expense. High frequency of accidents in any shop will cause workmen to become nervous, irritated and dissatisfied and will contribute to labor difficulties.

3. How can foremen be kept on their toes?

Foremen may be kept on their toes through frequent distribution of safety literature and accident statistics, as well as assigning time in all meetings of foremen and supervisors to safety subjects. In addition, in case of a reportable accident of even a trivial nature, the assistant foreman or straw-boss on the job should be required to make a written report, stating his recommendations for the prevention of future accidents of that nature.

This form or report should be submitted

by the under-boss to his department head or superintendent, and transmitted to the works manager's office, and in turn given to the personnel department to assist in completing the formal report, which will be filed eventually under the name of the employee along with his other records. This may appear to involve some detail, but such a system has proved very effective in reducing the frequency of accidents through making the foremen more safety conscious and alert to hazards and unsafe practices that may exist in their department or section.

In case of serious accident a special committee should be appointed by the management to investigate, and upon receipt of their report the hazards should be corrected and a meeting called of all supervisors and the matter thoroughly discussed and analyzed for the benefit of other departments in order to prevent a recurrence of similar accidents.

4. How can the men in the shop be kept enthusiastic?

As previously stated, records should be kept of all injuries and recorded on the employee's personnel record. Also, as there are always some workers who prove more careless than others, by careful analysis these careless workers may be discovered very quickly. As workmen welcome a safe place to work in, it will be found that they are enthusiastic about even the slightest effort on the part of the management to better working conditions, and to show them how to do their jobs more safely. To maintain this enthusiasm, try to show, in the case of a lost-time injury, the financial loss suffered by the injured person as well as the physical suffering he sustains. By keeping their minds refreshed as to the possible financial loss in the case of an accident, as well as following through on suggestions and safety recommendations, thereby proving the management's sincerity about the subject, the workman retains his enthusiasm in regard to safety work.

It is also recommended that general rules with regard to safety be established for the individual plants. These rules should be of a general character and one should not try to cover everything in the category of safety in these rules. A card or pamphlet listing from 24 to 36 general rules should be more than sufficient, but they should be agreed upon before being printed and once they are issued, the rules should stand until conditions make it necessary to change them.

With this set of general rules it is easier for the management to apply discipline more fairly, because when a man violates a rule he expects such discipline.

5. What can your insurance company do for you in this respect?

The foundry industry has learned to use the knowledge of technical men in its organization and relies upon their advice. As we have developed men of this type, so have our insurance companies, who employ technical men trained in accident prevention methods.

It is extremely useful for many plants to utilize the technical accident prevention service of their compensation insurance carriers—examination of boilers, machinery and elevators upon which accidents are serious. Use of the technical inspection service of insurance companies is almost universal; also suggestions on the safeguarding of machinery, on setting up safe operating practices, the analysis of plant accident reports, and help in working out safety programs, attending safety meetings and giving general advice and suggestions to the safety supervisory forces.

The technical knowledge in accident investigation and analysis which the insurance safety engineer can provide is good schooling for foremen.

6. What are some devices used for maintaining safety consciousness?

(a) Exhibits of safety equipment, such as goggles, safety shoes which have saved accidents, photographs of particular accidents, as a clipper whose goggle lens shattered without eye injury.

(b) Insurance and National Safety Council posters changed frequently.

(c) Boards showing number of days without lost-time accidents at convenient locations such as main gate.

(d) In one plant green lights are shown on a board to designate no accident, and turned to red to notify all in the plant that an accident has taken place, with designation of the department suffering the accident. This helps create safety consciousness.

(e) Showing of safety films.

(f) Use of men other than foremen on safety committees, changed and rotated to give large numbers the experience. This helps to educate the workmen in safety.

methods and the reasons for them, and develops a lasting safety consciousness.

(g) Contests; a number of types such as prizes for individuals and departments. However, all such devices are only of temporary value, and contests are extremely difficult to devise that will be entirely fair, due to the wide variation of hazards in the several departments of the shops. Unless the factors can be equalized in order that departments with few hazards can compare with those with more hazards, and at the same time take into account the varying number of men, little safety consciousness can be maintained and it may seem better to save the effort.

7. *What are some of the causes of lack of safety consciousness?*

(a) Management not following through with a program once started. When employees see any let-up on the part of management and supervisors they are quick to let up themselves.

(b) Lack of safety consciousness in departments or sections of plants is caused by unfairness of so-called safety contests due to not taking into account difference in hazards, number in department, etc. Unless all factors can be equalized the safety records should not be used as comparison between departments.

(c) The old human failing in thinking that something may occur to injure someone but will not happen to himself.

(d) Poor housekeeping is a very large contributor to lack of safety consciousness, as is poor maintenance of equipment.

Each department would like to go on indefinitely without accident and if this idea can be put across it will help dispel the lack of safety consciousness.

8. *Does the small plant devote enough time to Safety?*

I cannot attempt to answer this question. It seems to me to be a question not of the amount of time consumed, but more the method of handling the problem of Safety.

Some plants expend a great deal of time and effort without the desired results, while others, with apparently little effort, achieve a good record.

However, whether the time be little or much, if accidents are occurring, or there

remain accident probabilities, the time should be found somehow to give the matter proper attention.

9. *How much can the small plant afford to spend on Safety?*

Assuming that a steel foundry can afford to spend whatever may be its own normal rate in the state in which it is located, it is my opinion that within a few years, by applying a simple common sense safety program, the foundry or plant can operate its entire safety program and bear its compensation and medical costs for the original rate. If such a plant is rated above the normal rate, which would indicate the poor experience of that plant, then it can well afford to spend more in order to bring that experience down to better than normal. Actually it is not necessary, nor is it recommended, to spend great amounts of money for a safety program. Of course, some money ought to be spent to guard dangerous operations, but with care there is no need of spending large amounts for this purpose.

One company has told me that their compensation costs in 1938 averaged \$19.77 per man, and in 1939 averaged \$23.33 per man. These amounts, it seems to me, are indicative of a basic guide for further expenditures for, if by additional moneys spent compensation expense can be reduced (and it can) the plant is a large gainer in intangible costs, plus the greater satisfaction of their employees.

The amount of money spent by a small plant must necessarily be determined by the individual plant after analyzing its own conditions thoroughly.

10. *What is the value of personal contact in keeping safety consciousness alive?*

In analyzing the accidents in a number of plants it was found that 8 per cent of the accidents were attributable to housekeeping, 10 per cent to mechanical causes, and by far the greatest percentage to handling materials. This percentage actually totalled 43 per cent of the total accidents. This large percentage of accidents from handling materials indicates the importance of management's part in reducing accidents, and I believe it is self-evident that this can only be done by personal contact if frequency and severity rates are to be reduced.

How to Build a Safety Program for the Small Foundry

By PETER E. RENTSCHLER

President, The Hamilton Foundry & Machine Co., Hamilton, Ohio

We feel that we have had a very cooperative spirit on the part of our employees towards our program, because we have run the program not on the basis of philanthropy or paternalism, but on the sound business basis of more earnings to the employees and less loss, or greater possibilities of profit to the company. Many people have used this as a basis for their safety work, but have not followed through with health work. At every opportunity we have stressed the advantages to both the employees and to the company that better health of the employees results in better attendance, with less interference to production by absentees, and better production means more earnings for the men so that they will have more money to spend for their families.

I feel that there is a definite appreciation of the employees for proper consideration by the management, and when the individual is convinced that safety and hygiene in a plant means more money in his own pocket, he, in turn, becomes the management's best assistant in the handling of himself as an individual and in working with his fellow-workmen, making a collective group effort to help himself, his job, and his fellow-workmen.

In April 1929 when we were trying to impress upon our employees certain safety requirements, we issued a leaflet of "Information For Employees" and in trying to stress the necessity for having minor injuries treated immediately, we carried a paragraph under "Cooperate With the First Aid Department" that stated "You must call at the First Aid Room to have all injuries cared for, no matter how slight. Failure to call at the First Aid Room after an injury will make you subject to discharge."

We made certain inspections that were in accordance with the requirements of the Ohio Foundry Code. In addition, we made inspections covering sandblasters' masks, sandblast mills, grinding room equipment, and fire equipment.

We had rigid requirements as to the use of goggles for chippers, grinders and welders, and the use of helmets by sandblasters, and our leaflet of information stated "Grind-

ers, chippers and welders must wear goggles. Sandblasters must wear helmets." This leaflet also referred to our requirements on the use of goggles and leggings when handling molten iron, and as far back as January 1932 we had posted special porcelain enameled signs through the shop reading "State Law—All handlers of molten iron must wear goggles and leggings." Other metal accident prevention and safety signs were posted around the shop. Non-silica partine was used in the foundry as soon as we learned of its manufacture.

We cleaned ceiling, walls and beams of the buildings at various intervals by using an air line with water spray and blowing down the walls. After the 1936 A.F.A. Detroit Foundry Show, we purchased a heavy duty, portable vacuum cleaner, and after the 1937 Milwaukee Show, an oil dust layer to improve our shop conditions. Steel grit was used in the blasting booth and rotary blast mills, and the blasters wore health-guard masks with outside protective hoods. A few ladders were equipped with safety shoes but not all. Certain guards were in use on belt driven equipment and our pattern working machines.

However, there was no organized plan to stress safety, and no safety committee was functioning, but in spite of all of this we were progressively improving our conditions. We had taken pot shots at stimulating various safety activities, and when the Hamilton Industrial Safety Council contest was started for the year 1937, we went in with 72 other Hamilton companies. Five companies were in the Foundry and Foundry Product group, and we finished fifth or last for the year.

Now, it would be well for me to bring you up to date in our health work. We had started physical examinations back in 1927 with the policy to examine men at the company's expense as often and whenever the company saw fit, and then to advise each man privately of his physical condition, telling him of any physical attention he needed and suggesting always that he consult his own family physician. We feel that the cooperation we have had from our own

men, has been because they have been grateful for these health-check-ups. We think that the only reason we have had this co-operation has been that we have continually advised our men that no matter what we found in our examinations, no one would be dropped from our employ by reason of any of the findings, unless he had a condition that was contagious or harmful to others.

The last physical examinations that we made prior to our intensive safety and hygiene efforts in September 1938, were made in December 1936, and these examinations were somewhat more rigid because of the contemplated amendment to the Ohio Workmen's Compensation Act to include silicosis as the 22nd disease to be covered under the Act, with this amendment to become effective July 31, 1937. In order to know where we stood as far as chest conditions were concerned, we proceeded to re-examine every employee—shop, clerical and office workers, supervisors and executives, and to take the first chest x-rays that had ever been made in our plant.

For some time we had been giving consideration to Wasserman blood tests for all employees. We made an arrangement with the local hospital to have an interne talk to each of the individuals sent for x-ray, explain the Wasserman blood test and give the man the test if he was willing; otherwise to pass him up, as there was to be no communion in the blood test. Of 197 men sent in for x-ray examination and blood test, only one man refused to take the test. We found 8 positive blood tests but none of these men were in an infectious stage. Each man was permitted to continue to work but with the stipulation that it was absolutely necessary that he undergo treatment and bring a certificate from the doctor or the clinic after each treatment. On re-examinations made December 1939, after a new blood test, one man was dismissed from further treatment, and in August of this year four men were dismissed from further treatment.

After we completed our examination program, there was some delay in getting the reports to the men, because we wanted the examining physician to talk with them individually and take whatever time was required to answer their questions. We found that quite a few of the men were worried about the result of these chest x-rays and the Wasserman test. We arranged a shop

meeting on company time for July 13, 1938, to again state the company's policy, and to clarify in the minds of the men tuberculosis and silicosis, and explain again the Wasserman blood test, and syphilis.

At this meeting we had the cooperation of the Ohio Industrial Commission in that the Medical Director came in and gave an excellent, practical, non-technical talk to the men on silicosis and tuberculosis. We were fortunate in having the Assistant Chief of the Bureau of Venereal Disease of the Ohio State Department of Health on hand to show several movies and to give an informal talk on venereal diseases. We also had the cooperation of our County and City Health Commissioner at this meeting who gave an outline of the social diseases program and the tuberculosis program being carried on in the city. He explained the free Clinic services on social diseases and tuberculosis that were available in the city. Informative literature was distributed.

We duplicated the shop session program the same evening by a meeting of our supervisors, office personnel and invited guests from other local industries. We felt that if we could get the outside community interested, that the community as well as our own men would know that our program was not something that we trying to do just for the company, but that we were doing something very definitely for our men that others weren't doing in this community.

We had such a friendly response from our employees to this first meeting that we decided to schedule another educational meeting on August 25, 1938, with the Chief of the Bureau of Tuberculosis of the Ohio State Department of Health as the speaker. Again with the assistance of our local Health Commissioner, a well balanced program of talks and movies was presented. We concluded that the messages could best be gotten across to the group by lectures supplemented by movies much more readily than meetings without movies.

This last program was very well received, and before long we had expressions from a number of our men that they would like to have their families hear a program on tuberculosis, so that they could avoid the occasions of contact and educate their children. We canvassed the plant to see whether there would be any response, and to our surprise we had 560 reservations for a meeting from 128 employees. When we

finally had the meeting, 711 attended.

This general interest in health led us to believe that we could advantageously interest the families in safety. It occurred to us that an opportunity to go through the foundry and see where husband, brother or sweetheart worked would be quite unusual. And then the thought occurred that we might also show a few finished products in which our castings were used. Before we knew it, we had plans for an "Open House" for employees and their families, all built around recent safety and hygiene activities.

While we were formulating these plans, we decided to embark on an organized safety campaign in conjunction with the health work we had been doing. In the meantime we had taken a Complete Industrial Membership in the National Industrial Safety Council, had consulted with the Regional Safety Engineer of the Ohio Industrial Commission and various individuals who had considerable experience with safety work. On September 13, 1938, we started our intensive safety and hygiene campaign, based on a program that the writer personally felt would be best suited for our own plant needs.

Previous experience had led us to believe that we could have more effective work if the Safety Committee were divided into two separate groups, a foreman's group and a workmen's group, so that the workmen might feel more free to discuss safety and hygiene without their supervisors being on hand and perhaps having a deterring influence on the discussions of the workmen.

The committee is a rotating committee, in that two new men are added each month to the workmen's committee and two men dropped. The foremen's committee, however, is a more permanent committee; the head of each one of the departments serves for one year. I set myself up as general chairman of the General Safety and Hygiene Committee, with Don McDaniel, vice-president of our company, as chairman of the foremen's committee, and Eldon Altman, our employment manager, who is now also titled safety director, to act as chairman of the workmen's group. At the Workmen's meeting no foreman was to be in attendance nor company representative without an invitation, unless it happened that the writer was to come in to the meeting. Throughout it all I have tried to be a very vital part of

the program, following the thought "Safety begins at the top."

The safety meetings are practical and educational to the members. We post at five different places throughout the plant very detailed minutes of the meeting, the actions taken, as well as all of the recommendations that have been acted upon, and an explanation is always given as to why recommendations are not followed. Recommendations to the safety and hygiene committee turned in by members of the organization since the last meeting, are discussed, acted upon by the workmen's committee, and those that involve policy, considerable expenditure, or are not practical as far as the workmen's committee can see, are turned over to the foremen's committee. This group makes final disposition of any recommendation. The general safety meeting is just a short meeting that I conduct based on the results of the other two meetings, at which time I announce any change of policy, or any change of rules or regulations. In an order issued at the general safety meeting, everyone knows that it is definite and final.

In 24 months, 531 safety and hygiene recommendations have been turned in by men in the shop, of which 75 were hygiene recommendations and 456 safety recommendations. To date, the recommendations that has cost the most cash outlay is one that came from several molding machine operators at various times, requesting better lighting in No. 3 Foundry. The cost was approximately \$2,000. This new lighting system was just one of "thousands" things we had in our minds for a long time but never before had anything to give us the push to make us decide to spend the money until it came to the management on numerous occasions from men working in the department.

With our accident reports we stress at the safety meetings the cost of our accidents. Each month we give the committee men the days lost and the compensation paid for each lost time accident.

In addition to keeping the men informed on current conditions, we find that they are greatly interested in the figures showing the total cost of cases that "drag" along. We show them the figures on each individual case as they accumulate, and then of course show the final cost of a case. The men themselves, have no idea what the costs of industrial injuries amount to, not only to the

company but to the individual on compensation.

At these meetings we also stress the use of unsafe tools and equipment, as we have a practice that at irregular intervals our safety director goes through the plant searching for any unsafe tools or equipment, and of course committee members or any one in the shop is instructed to bring in any unsafe equipment. These articles are then exhibited at the next safety meeting, and then posted on the board provided for this purpose as a permanent exhibit.

Members of the safety committee assist in plant inspections so they learn at first hand the health and safety conditions that are too freely discussed only in the abstract. We have inspection forms that are used in inspecting various parts of the plant and various safety appliances.

After our Open House we noticed an increase in the use of safety and health facilities. We feel we have since had less difficulty in introducing new practices and new equipment than previously. In the case of safety shoes where we had in 11 months sold 23 pairs up to the time of our Open House, or had 13 per cent users of safety shoes, we jumped up to 62 per cent in use in the five months after the Open House, and 97.2 per cent in fourteen months after the Open House. We attribute a lot of this increase in the use of safety shoes to our Open House educational show display and efforts, and the balance to accidents resulting in toe injuries.

During the holidays we scheduled a first showing of the Open House movies in our assembly room and restricted this to our employees only. 70 per cent of our employees other than foremen and supervisors were in attendance. At this same meeting we showed a safety and hygiene movie that we had made the previous month in our own plant with our own employees. We have shown this Open House movie at subsequent meetings, and had requests from time to time that it be shown again.

Another method of stimulating interest of our employees and their families in the things that we do, are the letters to the employees that are sent to their homes by first-class mail. For instance, during the summer a letter on heat exhaustion and the use of salt tablets; before the tuberculin

test a letter and a reservation slip for the test, and after the tuberculin test an analysis of the results and the relationship of each person tested to the employee; a letter on community hospitalization, as our company was the first to offer this plan to its employees; a letter on urinalysis available under our group life policy; at the start of the school year a booklet furnished by our insurance carrier "Common Diseases of Children"; a letter on our health program accompanied by an Eastman Kodak Company 36-page booklet "X-Rays and You" followed by another letter and an 11-page booklet "How To Prevent Toothache" furnished by the Medical Division, Eastman Kodak Company; a mailing, "The X-Ray Reveals," furnished by the Butler County Tuberculosis and Health Association, and an eight-page letter—summary of our year's experience in safety and hygiene work, covering lost time accidents, costs, not only in the aggregate but for individual cases involving more than \$100, our standing in the Hamilton Industrial Safety Council contest and the National Safety Council.

In January 1940 every person on the payroll, except men newly hired after September 1, 1939, was given a general re-examination, Wasserman blood test and chest x-ray. All chests were O.K. and while the number of positive Wassermans remained the same, this was because one man had been dropped from further treatment and an additional case added. These examinations, however, were more rigid than previous examinations, and there were 76 employees set up for re-examination in July 1940.

We were highly gratified at the cooperation of the men who had been advised to consult with their family physicians in January 1940, because of the 76 men that were up for re-examination in July, 40 had been dismissed by their physicians for their faulty conditions, whereas most of the balance had shown quite an improvement or were still undergoing treatment. During our vacation period, one week, from August 9th to August 19th, some of the men endeavored to improve their physical conditions—five tonsillectomies, two basal metabolism tests and two eye corrections. We feel that our health program and the group hospitalization contracts that we encouraged our employees to take, were directly responsible in all nine cases.

WEDNESDAY AFTERNOON SESSION

October 9, 1940

Safety An Operating Problem

Panel Discussion

This session program was planned as a Panel Discussion, the special subject being, "Safety An Operating Problem." General Chairman H. J. Griffith called the meeting to order, and immediately introduced as Acting Chairman Earl F. Fyler, Assistant to the Director of Industrial Relations, Carnegie-Illinois Steel Corporation, Chicago, who presented the members of the Panel, as follows:

F. A. Hagedorn, Superintendent, Coke Ovens, Interlake Iron Corporation, Chicago.

L. B. Luellen, Superintendent, No. 1 Open Hearth, Inland Steel Company, East Chicago, Ind.

George B. McKee, Master Mechanic, Republic Steel Corporation, Chicago.

J. H. Miller, Electrical Department Superintendent, Wisconsin Steel Works, International Harvester Company, Inc., South Chicago.

Donald Petersen, Superintendent, Transportation Department, Gary Works, Carnegie-Illinois Steel Corporation, Gary, Ind.

H. R. Sanow, Superintendent, General Lines Processing, Acme Steel Company, Riverdale Works, Chicago.

Frank Snyder, Superintendent of 96 Inch Plate Mill and 44 Inch Slab Mill, South Works, Carnegie-Illinois Steel Corporation, Gary, Ind.

George T. Williams, Superintendent, Blast Furnace & Coke Plant, Youngstown Sheet & Tube Company, East Chicago, Ind.

Chairman Fyler then introduced as permanent Moderator of the Meeting, W. Dean Keefer, Assistant Manager, Safety Engineering Department, Lumbermens Mutual Casualty Company, Chicago, who assumed the Chair to direct the Panel Discussion.

MODERATOR KEEFER: We are going to assume that our little crowd here on the platform are the members of the operating board, or whatever you might call it, in a

given plant in any part of the United States. Here we have a bunch of superintendents who are responsible for high grade operations. We have gotten together to discuss the accident problems in our respective departments. We told each fellow here that he must recite before us the details of a given accident in his department, and then we, the other members of the panel, are going to quiz him; we are going to ask him questions. Maybe we will have some suggestions to make to him, all with the general idea in mind of trying to do two things: First, we want to make sure that we have discovered or unearthed the definite, underlying causes of each accident; and, second, we want to try to make sure that we have planned those things that will definitely prevent recurrence of similar accidents in the future.

Finally, after each fellow gets through with his accident and we get through with our quizzing, and after we have arrived at what we think are the logical conclusions, then we are going to throw that accident open to you for discussion from the floor and you will have the privilege, if you want it, of asking questions, embarrassing or otherwise. You will have the privilege of disagreeing with any of our premises or any of our conclusions, telling how you would handle the same thing in your plant, if it is different, and so on.

All right, we are going to pretend that we are in this meeting, just nine fellows, talking over our problems. Mr. Snyder is going to be the first speaker.

Accident in Plate Mill

Mr. Snyder, you had an accident in your department the other day. In order to get at the root of this thing, we want you to tell the rest of us how that accident happened, then we are going to talk with you about it and see if you have found the

right way to prevent a similar accident. Please tell us about it.

FRANK SNYDER (Superintendent of Plate Mill and Slab Mill, Carnegie-Illinois Steel Corp., Gary, Ind. (Blackboard): This little sketch is supposed to represent a shear in a continuous plate mill. Here is the approach table. Here is the shear block and the shear. This is the stationary block, and this is movable. This is the delivery table. Here is a scrap sheet which is conveyed from the shear. Here is a space about 18 inches, walking space or working space, if found necessary. This is the safety stop used for any plates that may approach the shear. This stop is down, when a man is working in this position. Normally a plate cannot back up to this, if this center line is lower than this shear block. Remember this little sketch, and I will attempt to explain the accident.

The age of the man was sixty-four years; occupation, multiple shear helper, with five hours' experience. His total plant service was twenty-six years as a shear scrapman. He was injured in the finishing end of the continuous plate mill, sustaining contusion, 1½ inch laceration of right thumb, tenderness, beginning rigidity in left lower abdomen, fracture of pelvis and fracture through head of the metacarpus of right hand.

The injured man was engaged in removing sheared plate scrap ends, approximately ½ in. by 6 in. by 72 in. from the rear end of a plate, 650 in. by 72 in. wide by ½ in. thick at a ¾ in. by 100 in. multiple shear. He was standing in the 18 in. wide space at the south or entry side of the shear. He had completed removing two pieces of the above-mentioned small plate scrap from the rear end of the plate which had passed completely through the shear and which travels in a northerly direction, when the plate started to back slowly towards the entry side, through the shear, pinning him between the end of the plate and the first entry table roller, sending this plate back and looping up right over the roll.

The first table on the delivery side of the shear where the above plate was resting, was operated by a multiple shearman, with a pulpit on the opposite side, and within two feet of the "take." The man could practically look over the table. The man worked on the near side and the operator was on the far side.

The multiple shearman stated that he suddenly observed the plate backing through the shear, although he maintained that the controller for the delivery table was in neutral position. He immediately reversed the controller, but the plate had already struck the injured man.

The accident occurred at 3:25 a.m., with excellent illumination and good housekeeping. Investigation revealed injured man attempted to push the last piece of small plate scrap onto the scrap conveyor located on the opposite side of the shear from where he was standing. He then stepped out of the space and, for some unknown reason, stepped back into the space between the shear block and the entry table. One end of the last piece of small plate scrap did not fall onto the scrap conveyor, but remained resting on the bottom shear knife at an angle of 30 degrees to the table. That is what I have attempted to show here. This last piece remained in this position.

Further, it was brought out that the multiple shearman, in trying to dislodge this piece of small plate scrap, backed up the plate on delivery table by reversing the control without ascertaining that everyone was in the clear.

That is, briefly, the description of the accident. This plate had gone through the cropped end, was laying on the block, the man stepped in there. The last piece remained in this position. The operator, in attempting to dislodge that piece, backed the plate up. In so doing, this plate, acting as a chute, shot the plate up over there and came back and pinned the man.

Remember, the man was sixty-four years old. After twenty-five years' experience, he could not talk English; he could not understand English. He had had five hours of experience at this location.

MODERATOR KEEFER: Mr. Snyder, you are the superintendent in this department, I judge, and this man who was hurt has a foreman who is under your supervision?

MR. SNYDER: That is right.

MODERATOR KEEFER: Where were you when you heard about the accident?

MR. SNYDER: I was at home. It was three o'clock in the morning.

MODERATOR KEEFER: How soon after the accident did you hear about it?

MR. SNYDER: Within an hour.

MODERATOR KEEFER: Did you go down to the plant?

MR. SNYDER: Yes.

MODERATOR KEEFER: What did you do?

MR. SNYDER: I got the preliminary information. I did not start an immediate investigation but I got the pertinent facts of the case.

MODERATOR KEEFER: When did you start your investigation of it, then?

MR. SNYDER: That was started by the court of inquiry the next afternoon when that same crew came on duty.

Conducting the Investigation

MODERATOR KEEFER: Tell us a little about that investigation. How do you conduct it? Where do you conduct it? Who is there, and why?

MR. SNYDER: It is held by the departmental court of inquiry, our departmental safety committee.

MODERATOR KEEFER: Are you the chairman of it?

MR. SNYDER: No, the assistant superintendent is chairman of that committee. It is composed of two foremen, two workmen, and the assistant superintendent. Others are brought in to assist and advise.

MODERATOR KEEFER: Are any of the safety men there?

MR. SNYDER: The departmental safety inspector acts in an advisory capacity during that meeting; also, the mechanical man acts in an advisory capacity.

MODERATOR KEEFER: Well, you were there, too, at this particular court of inquiry?

MR. SNYDER: At that particular time I was chairman.

MODERATOR KEEFER: You were chairman; you took over the job from your assistant?

MR. SNYDER: I was the assistant at that time.

MODERATOR KEEFER: How do you go about it to get your facts? You couldn't interview the workman. He was in the hospital, I suppose.

MR. SNYDER: We did have one state-

ment from the workman, who told the safety inspector at the hospital that he didn't know the last piece we shoved in there came back. That is all the statement we had from the workman.

MODERATOR KEEFER: What was your purpose in holding this court of inquiry? What was your objective?

MR. SNYDER: The first objective was to prevent a similar accident. We try to find out all of the facts leading up to the accident and any way that similar accidents may be prevented.

MODERATOR KEEFER: When you hold this court of inquiry, do you try to find out who was at fault or who was to blame? Do you use such words in your investigation?

MR. SNYDER: We finally boil it down to who is responsible. That is one phase of the investigation.

MODERATOR KEEFER: All right, tell us a little more now about this court of inquiry. What conclusions did you arrive at? What were the causes that you determined?

MR. SNYDER: The causes of the accident were, first, violation of published and posted safety rules on the part of the multiple shearman.

MODERATOR KEEFER: What rule did he violate?

MR. SNYDER: "Do not turn on any electricity, gas, steam, air, acid or water, or set in motion any machinery without first making sure that no one is in a position to be injured."

He reversed the controller which started the plate back and finally pinned the man.

MODERATOR KEEFER: That is one definite point that you arrived at in your investigation. What did you do about it?

MR. SNYDER: In that particular case the man was found to be experienced on the mechanics of the job but not on the other duties of the job which he was being paid for, like supervisors, and the safety angle and all of those things that were taken into the rate structure.

MODERATOR KEEFER: You are talking about the multiple shearman?

MR. SNYDER: The multiple shearman.

MODERATOR KEEFER: He theoretically had charge of this whole operation?

MR. SNYDER: That is right.

MODERATOR KEEFER: He isn't a foreman?

MR. SNYDER: No.

MODERATOR KEEFER: But he had charge of two or three other men?

MR. SNYDER: Right.

MODERATOR KEEFER: All right, you found he was wrong. What did you do about it then?

MR. SNYDER: That particular man was taken off the job until the departmental supervision was assured that he knew all of the requirements of the job. It happened in this case that the man was found to be not experienced for the job.

MODERATOR KEEFER: You took him off that job temporarily until he could become more experienced in that kind of work?

MR. SNYDER: Until he proved to local supervision that he could do the job satisfactorily.

MODERATOR KEEFER: That was one cause.

(Let me explain a point here to our listeners: None of this has been rehearsed in advance at all. Mr. Snyder is answering questions in pretty rapid-fire fashion here. We are just trying to do the job the way we think it might be done in a given plant.)

All right, that was one thing you unearthed. You tell us that is one thing you did about it. Did you discover there were other causes?

MR. SNYDER: The first cause was the failure of the man to follow published and posted safety rules. The second cause was failure on the part of supervision to instruct employees as to specific methods of performing work and hazards incident thereto.

MODERATOR KEEFER: That was a failure on the part of your foreman?

MR. SNYDER: Yes.

MODERATOR KEEFER: And the foreman comes under you. Did you do anything with the foreman?

MR. SNYDER: I would first like to tell how we arrived at that conclusion. The foreman placed this man who had had thirty years of experience at handling scrap—heavy duty work—on this job under the

direction of a man who had two turns of experience on the job. That man was supposed to teach him all about this particular job. Normally everything might have run along all right, but two turns of experience on a job of that nature was not considered experience enough to be a teacher.

MODERATOR KEEFER: What did you do about it?

The Foreman Disciplined

MR. SNYDER: The foreman was disciplined.

MODERATOR KEEFER: How?

MR. SNYDER: Disciplined and instructed and explained the need of proper training of men, before placing them on jobs, and following up to observe and see whether they are doing the job as they had been told to do it.

MODERATOR KEEFER: That was your job, to exert that discipline in your foreman?

MR. SNYDER: That is right.

MODERATOR KEEFER: Did you do anything else with the foreman?

MR. SNYDER: No.

MODERATOR KEEFER: I think that brings out an important point, that discipline isn't always firing a man. Discipline isn't always laying a man off. Discipline is much more fundamental than either of those two things. Discipline, as you know, means "to lead." Anything that is done from the standpoint of real leadership can then very properly be placed under the head of discipline.

I am not going to argue with Mr. Snyder whether that was a sufficient amount of discipline or not; all I am trying to bring out is that they did discipline this foreman.

MR. SNYDER: This was entirely for training purposes, not for punishment.

MODERATOR KEEFER: You were leading and instructing.

MR. SNYDER: That is right.

MODERATOR KEEFER: All right, now you have two points, the failure of the multiple shearman and the failure of the foreman. Did you find anything else that ought to be done?

MR. SNYDER: The blame again was on the foreman for improper placement of

the men. Here was a man sixty-four years old, who could not read or write or talk English. He also had a lame shoulder. This was considered a lighter job, and that is the reason the foreman brought him up there. It was considered a lighter job although it paid more money. The foreman should not have placed that man in that location because it requires a man who is mentally alert. As you can see, it is working with moving machinery, around a shear. Even in pushing the scrap there is a certain amount of danger. He works with a plate wrench. Even then there is a certain amount of danger.

MODERATOR KEEFER: Another cause of foremanship failure.

MR. SNYDER: I would say so.

MODERATOR KEEFER: You included that in your disciplinary action you just described?

MR. SNYDER: That is right.

Safeguards Provided

MODERATOR KEEFER: Were there any other causes of that accident that you unearthed?

MR. SNYDER: The fourth cause was failure of management to provide safety devices.

MODERATOR KEEFER: How do you make that out? You didn't have any safety device on there in the first place. Did you put one on after this accident occurred?

MR. SNYDER: Yes.

MODERATOR KEEFER: What?

MR. SNYDER: Dogs were placed to prevent that plate from backing up through the shear. Normally, the block is two inches above the level of the table, but dogs are provided now, so that if the plate attempts to back up, it comes against the dog. The operator has no control over backing it up and slipping those dogs.

MODERATOR KEEFER: Is that all you found and all you did about it? I am not trying to indicate that you should have done any more. I am just asking you.

MR. SNYDER: I would like to explain the general instructions to foremen that we have in our plant. "When placing a workman on a job, do not assume that he knows anything about the job. Give him

personal attention or place him under the guidance of an experienced workman who is qualified to train him."

That is about the sum and substance of this particular accident.

MODERATOR KEEFER: Your disciplinary action you probably read all over to him again, didn't you?

MR. SNYDER: Well, there is quite a bit more to him. The foreman had thirty-three years' experience, twenty as foreman.

MODERATOR KEEFER: You probably didn't use quite as gentlemanly language as you did right now.

MR. SNYDER: I try not to use otherwise.

MODERATOR KEEFER: Fellows, what do you think about it? Has he done a pretty good job? Has he completed it? What else have you got to say about it?

L. B. LUELLEN: I would like to raise possibly a little different viewpoint, on that. I wouldn't absolve the foreman from responsibility for placing an elderly man, who was obviously unfitted, at work around a multiple shear. On the other hand, it seems to me the main spotlight should be, not on that foreman, but on the shear operator.

The evidence points out two vital things. First, that a piece of scrap which the old man had pushed through to the conveyor had caught on the knife. It is logical to believe that after he stepped in the clear, he stepped back in there to dislodge that further, in plain view of the multiple shearman. I can't quite see how the multiple shearman, inasmuch as he was only six or seven feet from the man who was making a move directly in front of him, could be moving that plate backward in order to dislodge that piece of scrap, unless he was certainly very inattentive. Although the age of the old man was a factor, and also that he couldn't speak English, and again that he hadn't been given a great deal of instruction, I still feel that the major difficulty was with the man operating the tables. I wonder if he wasn't possibly dozing and his hand pushed the controller in the wrong way?

MR. SNYDER: We can only assume that. You notice I took these in rotation. In investigating any accident, the primary cause is No. 1 and then in order as they go down. The safety device was mentioned last

because we had a partial safety device in shear knife which is two inches above the level of that table; but the primary cause was No. 1. That is one of the reasons why he was taken off. Incidentally, he has never been returned.

MODERATOR KEEFER: How long ago was this?

MR. SNYDER: About a year.

MODERATOR KEEFER: He has never been returned since then?

MR. SNYDER: Not to that job.

MODERATOR KEEFER: I would say he has been disciplined pretty well. Are the rest of you fellows satisfied?

J. H. MILLER: Was any consideration given to keeping the man out of that 18-inch space?

MR. SNYDER: That is 100 inches wide. When you take the crop end, it may only be 24 inches long and 100 inches wide. A man has to get in with the plate wrench to turn it around.

F. A. HAGEDORN: What were the circumstances surrounding the operation? I believe you said this elderly man had four hours and the shearman had three turns.

MR. SNYDER: The shearman had about three months. His duty was to instruct this man. He remained with him one hour and then went back.

MR. HAGEDORN: The question arises, was there a sudden expansion of work that required the foreman to go out and pick anybody he could to fill the job?

MR. SNYDER: On the contrary, work was running low. This man had formerly done heavy duty work, handling scrap, and had injured his shoulder outside. So that the scrap was too heavy for him and the foreman elected to put him on another job.

H. R. SANOW: Mr. Snyder, is it customary to dislodge that piece of scrap by backing up the plate?

MR. SNYDER: It is not customary to let it pile up.

MR. SANOW: When it is piled up, is it customary?

MR. SNYDER: There has been discipline issued for scrap piling up, for two reasons; from the safety angle, and from breaking down the machinery.

MR. HUTCHINSON: If that shear had

been in operation for a very long time prior to the accident, it seems strange that difficulty wasn't encountered before, and the protecting dogs placed in such a position as to prevent that.

MR. SNYDER: The main reason for that is that an operator may never back up a piece. In the second place, as I explained, this shear block is two inches above the top of those table rows. Unless there is a piece of scrap in this position to act as a chute, the piece cannot come back through the shear.

MODERATOR KEEFER: Have any of you men in the audience had an accident like that? Just raise your hands. One man has had an accident like that. Are there any other questions or any differences of opinion?

MR. EFFENBERGER: I think, regardless of who was working on that shear, it wouldn't help very much if he had a man there he couldn't explain anything to.

MR. SNYDER: They were both of the same nationality and could talk the same language. I won't mention nationalities, but they did converse during the turn.

MR. EFFENBERGER: Everything was explained to the man before he started?

MR. SNYDER: The foreman was of the same nationality, too.

F. W. KELSEY (Jones & Laughlin Steel Corp., Aliquippa, Pa.): Isn't it quite possible that a man might get caught on the forward movement? I am thinking now of the cut-out a man might have to open up before going in there.

MR. SNYDER: There is a safety gate there. Before any plate can be run this way, the man must come over and hold the lever down.

MODERATOR KEEFER: I am glad you brought that out. That is interesting to me. I didn't know that was in there.

MR. SNYDER: He can't run a plate in this direction unless he holds the lever down.

MR. SKYRME (Employers' Liability Assurance Corp., Boston): Was it just a bright idea of the operator, reversing that thing to clear the shears, or was that part of standard procedure?

MR. SNYDER: It was not a part of standard procedure. We do not know

whether it was a bright idea of his, or whether he felt it was the easiest way out. The man could have reached in here with a hook, which he has there, and released that, too.

MR. SULLIVAN: I was wondering what the foreman had to say in his own defense and, also, whether the foreman may have suggested later that the dogs be applied.

MR. SNYDER: The foreman did not. The foreman knew he was in the wrong. He had no resentment whatever.

MODERATOR KEEFER: Who did suggest these additional dogs?

MR. SNYDER: That was the court of inquiry. I forget who it was in particular.

MODERATOR KEEFER: In conclusion, let me summarize very quickly. It seems to me that Mr. Snyder and his group have done a very good job on this. They found and placed responsibility three ways, on a helper, on the management, and on the foreman, and you all practically exonerated the injured workman himself from all responsibility.

MR. SNYDER: That is right.

MODERATOR KEEFER: Mr. Sanow, you had an accident in your department. What about it?

Slitting Machine Accident

H. R. SANOW (Superintendent, General Lines Processing, Acme Steel Co., Riverdale Works, Chicago): This accident occurred on the coiler section of a multiple strand slitting machine. For the benefit of those who are not familiar with a machine of this type, I will attempt to give a description of it and the operation.

When a coil of steel is slit to several strands of lesser widths, the usual method of coiling is to have a coiling block for each strand. When a slitting machine is designed for slitting narrow widths, the coiler block is composed of a back plate, a core on which the strand is wound, and a removable front plate. So that coil can be taken off when completed.

On this particular machine the coiler units are about 3 feet in diameter, mounted on a framework on about 5-foot centers, staggered slightly to allow for strand alignment. Just ahead and somewhat above each

coiler unit is placed a flanged guide roll about 10 inches in diameter.

The slit strands from the slitter unit come to the coiler unit at eye level, running in a parallel position. When a strand reaches its coiling unit, it runs over the guide roll, down between back plate and front plate onto the core. When the coil being slit comes to the end, the whole machine is stopped. The next coil is spot welded, and the welded section is run through the machine. The machine is again stopped and the welded section is cut out with hand snips and the finished coil removed from the machine. The next coil is fastened to the coiler and the machine is started again.

The crew operating this machine consists of an operator and one or two helpers depending on the number of strands being slit. The machine is equipped with start and stop buttons at slitter unit and also at the coiling unit. The usual procedure is for the operator to start the machine at the slitter unit.

The hand tools required to operate machine are pliers and long-handled snips. Pliers are carried in a leather holder fastened to the workman's belt. The long-handled snips are usually placed across the top of one of the skids on which finished coils are placed or piled.

The injured man was one of the helpers. He is 23 years old, American born, with two years of high school education. He had two years of machine operation experience before coming to our company, and one and one-half years' experience on machines of the type on which he was injured. His previous safety record was very good.

The machine was stopped to pick up slack which has developed in one of the strands. The operator, upon restarting the machine, had observed that both helpers were in the clear but immediately after he had pushed the start button, the helper who was injured attempted to place his long-handled snips on the top of the coiler unit between the strands. To do this, it was necessary to reach between the strand and coiler, and, as he did so, his shirt sleeve was caught between the strand and coiler plates. This resulted in his arm being caught likewise, and, before the operator could stop the machine, the coiler had made two revolutions, forcing the helper to take two involuntary cartwheels. The helper sustained

a compound fracture of the radius and ulnar of the right arm, temporary disability being three months.

MODERATOR KEEFER: Mr. Sanow, I suppose you made an investigation of this accident?

MR. SANOW: Yes. When we have accidents of this type, other than minor accidents, the foreman of the department, the safety department and myself make an investigation.

MODERATOR KEEFER: You don't have a meeting like Mr. Snyder did in his plant?

Analyzing the Accident

MR. SANOW: Not exactly a meeting. We go right on the job where the accident took place. We analyze it from that point.

MODERATOR KEEFER: What did you find was wrong in this particular case? What was the cause?

MR. SANOW: Well, we believe that the main cause of this accident was force of habit. This man worked on various types of machines, all of the same nature. Some of them were much smaller than this particular machine. The customary procedure is for the operators and helpers to place their tools on top of the coiler unit, the units themselves being smaller. They use hand snips which are perhaps one foot long and weigh two pounds. A rack is provided on top of the coiler. That is the customary procedure.

In this particular machine, the work is heavy. The weight of the stock, the thickness, is greater. It requires a tougher pair of snips to do the work. So that they use a long-handled snip which weighs approximately ten pounds. The machine itself is high. As I said before, the strands travel at about eye level. We did not intend that the top of the machine be used for the keeping of the tools.

Most of this man's experience had been on the smaller machines. He had formed, as I term it, a habit pattern of keeping his tools on the top of the machine. He worked on this particular machine several weeks. In an unguarded moment, he, through force of habit, tried to put his snips on the top of the machine.

MODERATOR KEEFER: Let me ask

you, was the fellow who operated this machine the boss?

MR. SANOW: The crew boss.

MODERATOR KEEFER: How many helpers did he have?

MR. SANOW: Two helpers.

MODERATOR KEEFER: One of the helpers was injured?

MR. SANOW: Yes.

MODERATOR KEEFER: After you made your investigation, did you decide to make any mechanical improvements in this set-up?

MR. SANOW: Yes, we did. We now have put around the guide rolls, in the position where the strands travel, a guard so that if anyone else has the same habit, he will not be able to put his snips in that position.

MODERATOR KEEFER: Then you think that management had some responsibility in this accident?

MR. SANOW: We did, in not anticipating just what he might possibly do.

MODERATOR KEEFER: Did you find that the machine operator himself was in any way responsible?

MR. SANOW: No, we think the machine operator was entirely in the clear.

MODERATOR KEEFER: The uninjured worker was not responsible?

MR. SANOW: He was not responsible either. It was definitely this injured worker's habit, and the responsibility rests entirely on him.

MODERATOR KEEFER: The responsibility rests on the injured man. He was careless or thoughtless or something or other, whatever it was?

MR. SANOW: Well, I don't want to say careless or thoughtless. I think it was definitely his habit, a habit which he had formed.

MODERATOR KEEFER: Did you exonerate the foreman on that job? Was he in any way responsible?

MR. SANOW: The foreman, I believe, had done his part in instructing the man as to the operation of the machine. I don't believe that we could hold the foreman responsible in this particular accident.

MODERATOR KEEFER: You say that the man himself was partly responsible or

entirely responsible. What did you do about it?

MR. SANOW: As far as the man was concerned, he was cautioned, of course, about the unsafe practice, and all the other men in the same department were likewise cautioned.

MODERATOR KEEFER: That was part of your disciplinary action, instruction and educational activity?

MR. SANOW: I would say it was mostly education. There was no disciplinary action taken at all.

MODERATOR KEEFER: Although he was responsible, you didn't feel that the blame was sufficiently strong to justify any real form of discipline?

MR. SANOW: Considering that it was a habit, I don't think we would be right if we had disciplined him on that basis.

MODERATOR KEEFER: I won't argue that with you. Let us get back to the supervisor. You say this wasn't the first time this man had ever done that job of putting the snips up in that position?

MR. SANOW: I did not say that. I said that it was a habit which he had developed. That doesn't mean he had done this before.

MODERATOR KEEFER: Well, maybe I was misled by your use of the word "habit." What do you mean? If he had never done it before, then he wasn't following habit, was he?

MR. SANOW: Yes. Now we are going to get technical.

I heard a man say the other day that when he gets up in the morning and goes to work he puts his coat on and always puts the same arm, either the right or the left, in the sleeve first, but he doesn't know which one it is. That is habit. This man had this habit unconsciously. He put the snips where he did in this case, by habit.

MODERATOR KEEFER: Then he had done it before?

MR. SANOW: He may have, and he may not have.

MODERATOR KEEFER: Men of the Panel, do you agree with this so far: that the management had little or no responsibility, that the crew operator didn't have much responsibility, that the helper who wasn't injured had no responsibility? All the responsibility lay on the shoulders of

the man who was injured, and that the supervisor was not responsible? Do you agree with all that?

L. B. LUELLEN: Mr. Sanow brought out the fact that the man who was injured had been working, prior to his transfer to this large machine, on a smaller machine, where I assume that his habit of placing the snips on top of this area was entirely safe. That is where he formed the habit, as I understand it, of throwing the snips up there.

However, on this higher machine, it was necessary for him to place his hand in between those strips in order to get the snips in that same place.

There seems to be a definite tendency to point toward the foreman here, and I am going to defend him. The foreman would have been at fault had he seen this man do that particular act before and not had the foresight (remember, second guess is much easier than first guess) to see or sense the danger in that man's act and to provide what was later provided to prevent a recurrence. That is the thing as I see it.

MODERATOR KEEFER: Do the rest of you fellows agree with that?

FRANK SNYDER: We have to assume that the operator did not see the man do this previously. How long had he worked on that big machine?

MR. SANOW: Several weeks.

MR. SNYDER: The machine operator did not see him do this?

MR. SANOW: That is right.

MR. SNYDER: I happen to know those units. If the machine operator, who was standing where he couldn't help but see the man in almost every act, if he did not see him do that previously, you have to assume that this was the first time he laid the snips there.

MR. SANOW: That would be a fair assumption.

MR. SNYDER: In that case I do not believe that the machine operator, who is a group leader or the foreman, could be held responsible.

MODERATOR KEEFER: That is pretty logical.

In your investigation, did you find out from this injured man or anybody else where he had placed the snips before?

MR. SANOW: The usual place for that is on the load of finished material. The reason we do that is because these machine units are quite long, and the man goes from one unit to the next and cuts out the weld and carries his snips with him and lays them on the last load of material. These snips weigh ten pounds. That is the most convenient place to put them.

MODERATOR KEEFER: Are you all satisfied? What does the audience think about it?

MEMBER: Was there a roll of unfinished material lying there at the time this accident happened? Did he have a place to put his snips?

MR. SANOW: There is always a skid-load of material at the machine.

MR. ROGERS (Pittsburgh, Pa.): The statement was made that the man must carry his snips from one part of the job to the other, and at the last operation, he leaves the snips there. Is that true?

MR. SANOW: Yes.

MR. ROGERS: Well, how many points of operation are there?

MR. SANOW: It will vary. It may be three or six, depending on the number of strands that are being slit. The coiler units are side by side, so that they have a coiler unit on five-foot centers.

MR. ROGERS: My point is this: a statement is made that the man carries a pair of pliers and a shield is provided and a carrier on the man's person for these pliers. If we bear in mind the rules on handling tools, we must take into consideration that we use the proper tool for the job, which I assume the company supplied the man, and then we must use the tool properly. Evidently he had the proper tool.

So, in my opinion, it boils down to the fact that the tool wasn't put away properly. That is the thing we must remember in handling tools. My suggestion is that at these different stages of operation along the line, why can't you put up a proper rack for the snips, the same as the guard the man carries on his person for the small pliers?

MR. SANOW: You mean to have a pair of snips at each coiler unit?

MR. ROGERS: Well, the one snip; he could put it on a portable rack.

MODERATOR KEEFER: Do you do it that way in your plant?

MR. ROGERS: No. This is only an opinion formed here.

MR. SANOW: I think the answer to that is, the man cuts out the welds. He cuts out the weld on the first coiler, moves down to the next one, and he carries the snips in his hand. He doesn't put it on a rack. He would have to move the rack. He cuts out the next one and moves down, and so on, until he gets to the last one and cuts it out, and then lays the snips down. If he had a rack or portable unit of some kind it would mean one more thing around the machine. They have, of course, their proper working space, but it would be one more thing to move around.

We have felt that the skid load of material, where they place the snips, has been as convenient as possible when they handled that type of snip. If the coiler unit was strictly a one-station affair, a rack or holder for the snips would work out very nicely. But since they have to step or move by stations, it is convenient that they carry the snips along with them as they go.

MODERATOR KEEFER: Does anybody else have a suggestion to offer?

MR. SANOW: We have considered using an alligator type of power snip. They are a little dangerous and, frankly, we are a little afraid of them.

MODERATOR KEEFER: Has anyone in the audience been confronted with a problem like this and solved it in a different way? Are you satisfied with the investigation that Mr. Sanow told us about? Are you satisfied with his conclusions that all the responsibility in this case rests on the shoulders of the injured man?

I guess they are all satisfied.

Mr. Petersen, you had an accident. Will you please tell us about it?

Stumble Costs Two Fingers

DONALD PETERSEN (Superintendent, Transportation Department, Gary Works, Carnegie-Illinois Steel Corp.): The accident which I will describe is a very simple one. The man who was injured was 24 years old. He had worked in the plant for a year and a half as a stillman in the coke plant.

While carrying a pail of ammonia liquor,

he stumbled over an iron bar which he himself had left extending partially across the walkway. As he fell forward, he knocked off the guard which covered some gears on a pump machine, and his fingers went into the gears and he lost the ends of two fingers, which were crushed in the gears.

The causes of the accident obviously were unsafe housekeeping, the bar extending in to the passageway, and a guard which was not securely fastened.

Because of the importance of unsafe housekeeping as a cause of accidents, I would like to hear some discussion on what this audience and the members of this panel are doing to promote good housekeeping.

This accident did not happen under my supervision.

MODERATOR KEEFER: This was in another department?

MR. PETERSEN: Yes.

MODERATOR KEEFER: How do you know the injured man himself left the bar extending out in the aisle?

MR. PETERSEN: It was his admission later that, in using the bar some ten or fifteen minutes earlier, he had laid it in the passageway so that a portion of the bar was in the road of travel.

MODERATOR KEEFER: Was there a suitable place for that bar?

MR. PETERSEN: Yes. There was a rack on the wall, adjacent to where he left it; you might say almost as convenient as where he left it, except for the act of putting it up instead of laying it down.

MODERATOR KEEFER: He put it down on the floor?

MR. PETERSEN: Yes. He may have dropped it.

MODERATOR KEEFER: How long had the bar been in that position?

MR. PETERSEN: Ten or fifteen minutes.

MODERATOR KEEFER: Since there was a good place for the storage of that bar, you therefore exonerated management? Management was not responsible?

MR. PETERSEN: No, I wouldn't say that. It is difficult to determine whether management condones poor housekeeping to any degree. If they had been in the habit of having a guard securely placed, providing holding facilities, racks, and so forth, that

would be a minor part of the problem. The education of the man to use them is the major portion.

If they had condoned his habit of laying it in the easiest spot when he was through, then I would say management had part of the responsibility. Of course, in the case of the cover to the gears, that was rusted, in bad condition, and entirely unsatisfactory.

MODERATOR KEEFER: Was that the responsibility of the supervisor?

MR. PETERSEN: It was the responsibility of the supervisor to have caught this case because it was so obvious.

MODERATOR KEEFER: What did you do about it?

Results of Investigation

MR. PETERSEN: We investigated and determined the causes. It led to the set up of inspection of all guards.

MODERATOR KEEFER: Inspection by supervisor?

MR. PETERSEN: By maintenance and by supervision. I would say probably the best result was the reinstallation of job training to insure, in the cycle of work, the return of tools to the proper place.

MODERATOR KEEFER: Did you do anything with the man who got hurt? Was he responsible?

MR. PETERSEN: He was responsible for his carelessness in leaving the bar there, which he admitted.

I believe in the matter of discipline, it was felt that his lost time and the discomfort he went through was sufficient; he had a labor position and there was nothing in the line of discipline there which would put him on a job more suitable to his ability.

MODERATOR KEEFER: I suppose the supervisor talked to him, though, when he came back? He went into this educational program you are talking about?

MR. PETERSEN: Yes.

MODERATOR KEEFER: Then the two big things you did were to work out some plan or some scheme for careful inspection and some educational plan that would prevent a think like this occurring again.

MR. PETERSEN: That is right. Our program in approaching the problem of good housekeeping is one of inspection by the

supervision in the districts in which they work, and inspection in the higher bracket of management of plants as a whole, and periodic inspection which leads to reports and checking of supervision, and job training to teach the men to do the job right.

MODERATOR KEEFER: Did the safety men enter into this at all?

MR. PETERSEN: I wouldn't say they did.

MODERATOR KEEFER: Do they make inspections?

MR. PETERSEN: Yes, they are a portion of this committee that makes inspections.

MODERATOR KEEFER: There is a safety man on the committee that makes the inspection?

MR. PETERSEN: That is right.

MODERATOR KEEFER: They failed to catch the thing on their previous inspection? They failed to catch this rusty guard?

MR. PETERSEN: Well, the guard portion of it is separate from this inspection for good housekeeping. There are two major points to that accident. In relation to good housekeeping, this inspection I speak of is the answer. Speaking of the guard, that is maintenance and supervisory responsibility to have checked that. This guard was rusted, and its poor condition was obvious. It was also loose.

MODERATOR KEEFER: Are you men satisfied?

GEORGE T. WILLIAMS: Who has the responsibility of reporting a faulty guard to the operating department, the operating foreman or their own mechanical inspector?

MR. PETERSEN: The operating foreman has the responsibility of notifying the maintenance department to perform the work necessary to make the equipment safe.

MR. WILLIAMS: In the general housekeeping of the department, would a bar out of place on the floor be obviously out of place, or were there enough other things out of place so it wouldn't be noticed?

MR. PETERSEN: It would be noticed by all men. It could hardly be otherwise, because it was in the passageway.

MR. WILLIAMS: The plant otherwise is clean?

MR. PETERSEN: Yes.

MODERATOR KEEFER: I have asked Mr. McKee if he will tell us about the housekeeping program that they have instituted in his plant.

A Housekeeping Program

GEORGE B. MCKEE (Master Mechanic, Republic Steel Corp., Chicago): We have instigated in our plants a program whereby a superintendent of one department makes an inspection of another department. These schedules of inspections occur once a month. Finding something, such as was described here, would be a demerit.

There is what we call a clean-up order filled out in duplicate. Both of these copies are sent to the safety department where records are compiled. At the end of the month the statistics are gathered, and they are rated in percentages. The department winning or having the highest rating is awarded a plaque. I might say this plaque is a yearly affair. There are twelve places on it where the name of the department can be inscribed or engraved. There is quite a little ceremony about the awarding of this plaque.

For the men, we have a prize drawing of several pieces of stainless steel which they can use as kitchenware. This drawing is held, and the superintendent of the department winning the plaque the previous month awards it to the department winning it the present month. We have found that it has done a lot of good.

I think our safety record can bear that out.

MODERATOR KEEFER: Are there any questions you want to ask either of Mr. Petersen or Mr. McKee? Are you satisfied with Mr. Petersen's conclusion that there was a partial supervisory failure there, and more failure on the part of the injured man himself, and that these two things led to further education of supervisors and further education of workers? Are you satisfied?

MR. NOLAN: I don't think so. I think they were lacking in the safety committee. Why shouldn't they have caught the guard? They did afterwards. Why not before?

MR. PETERSEN: I said in housekeeping it wasn't the responsibility of management, if they had condoned not using a

rack. I say in the case of the guard it is entirely the responsibility of management.

MODERATOR KEEFER: Management, or the supervisor?

MR. PETERSEN: The supervisor, yes. That was part of his work in this place, to inspect such obvious things as this guard.

MODERATOR KEEFER: How often does the committee make inspections?

MR. PETERSEN: The committee makes inspections about once every ten days. The supervisor makes an inspection as a normal portion of his routine work. In addition, the safety man makes an inspection every day.

MODERATOR KEEFER: There were three or four fall-downs there on inspection, apparently.

MR. NOLAN: Did they find any more guards in similar condition after they inspected later?

MR. PETERSEN: I believe they did find a couple of other guards that were in need of changing, not that they were rusted, but guards that should have been tightened or repaired.

MODERATOR KEEFER: You agree with this man?

MR. NOLAN: I think it is obvious they are lacking on inspection.

MEMBER: Was the ammonia in a non-breakable container?

MR. PETERSEN: Just in a pail.

MEMBER: Did it spill over?

MR. PETERSEN: I imagine it did.

MEMBER: Were there any harmful effects from it?

MR. PETERSEN: None at all.

MEMBER: Did the nature of the work where the guard was installed cause the breaking down of the metal on the guard?

MR. PETERSEN: It was heavily rusted. The conditions in the department contributed to that.

EDWARD SCHMIDT: I can put the blame on the man who makes the daily inspection on that.

MODERATOR KEEFER: The daily inspection, as I understand, is made by the foreman, and a ten-day inspection is made by a committee.

MR. SCHMIDT: He should have reported it to the maintenance department. That guard should have been fixed.

MR. PETERSEN: I am of the same opinion. The foreman is part of the management, and management has the rap for that guard. I don't see how they could avoid it.

MODERATOR KEEFER: Thank you, Mr. Petersen.

Mr. Williams has an interesting accident to tell us about.

A Coupling Accident

GEORGE T. WILLIAMS (Superintendent, Blast Furnace and Coke Plant, Youngstown Sheet & Tube Co., East Chicago, Ind.): The accident that I will describe involves a man 41 years of age. He is somewhat of a new man. He has had experience on this job for about six weeks a year prior to the accident, and again seven weeks immediately before the accident.

His occupation is that of unloader on a blast furnace high-line, or trestle. Locomotives are prevented from coming onto the high-line, when men are working, by a safety gate which is swung across the track.

When a locomotive must come onto the high-line, it is the duty of the unloader to open the gate and to close the gate again when the locomotive has left. Switchmen are not permitted to open or close the safety gate. Thus, we are certain that the car unloader knows when the locomotive is working on the high-line and when it is gone.

On the day of the accident there were four cars on the high-line, of which three were empties to be removed, and the one on the end was a load of coke. None of the cars was coupled together. The locomotive arrived to do its work. The safety gate was opened by the unloader, and the unloader asked the conductor of the crew to couple the third car to the fourth car and pull it forward a little so that he could get hold of it with a car puller to spot it onto the proper bin when he was ready.

The conductor said he would make this coupling as requested. The conductor then took his position at the junction of the first and second cars and faced the locomotive. He signaled for the coupling, which was made. The conductor then walked to a position between the second and third car and again faced the locomotive, with his back to the fourth car. He signaled for the coupling of the second and third car, and, as he made that coupling, he heard a cry and shouts of

other men, and found that the injured man had caught his hand in the coupling of the third and fourth car. The injured man had tried to help the conductor to do the conductor's job, and he had put his hand in to open the car knuckle on the fourth car just as the conductor coupled the second and third cars. He lost his hand above the wrist.

MODERATOR KEEFER: That is an interesting case. Mr. Williams. Did the conductor do his job in the best and safest way?

MR. WILLIAMS: The investigation showed that he gave clear hand signals to his engineer.

MODERATOR KEEFER: He did his job just exactly as he should have done it?

MR. WILLIAMS: Yes.

MODERATOR KEEFER: Had the injured man been carefully instructed concerning the danger of his job?

MR. WILLIAMS: This plant uses a printed form called "Unsafe Practice Report." When a foreman gives a man a verbal instruction, he makes a note of the fact that he did instruct the man and, in many cases, they ask the man to sign that report, to acknowledge that he was instructed. There is such a written report signed by the man, which is dated six weeks before the accident, to the effect that whenever the engine is on that high-line he must stay clear of the cars and away from it.

MODERATOR KEEFER: In other words, the foreman had caught him doing this thing before?

MR. WILLIAMS: He had told him not to do it, but without catching him.

MODERATOR KEEFER: He had not been caught in this unsafe practice?

MR. WILLIAMS: No.

MODERATOR KEEFER: Had he ever been caught in any unsafe practices on which you have record?

MR. WILLIAMS: There was a general foreman of the plant who saw him working beneath a car one day in a way he thought unsafe, and he took the time to show him how to work safely on the doors of the car and made a note of it.

MODERATOR KEEFER: You didn't, after the thing was all over, institute any mechanical improvement in any way, did you?

MR. WILLIAMS: Nothing has been done.

MODERATOR KEEFER: You exonerate the management itself pretty well. You exonerate from responsibility, the supervisor. You throw most of the responsibility onto the man who was hurt. Am I right?

MR. WILLIAMS: That is correct.

MODERATOR KEEFER: What did you do with him?

MR. WILLIAMS: He is back there with a mechanical hand, doing what he can, janitor work and such things as he can do.

MODERATOR KEEFER: He was disciplined automatically as a result of his accident.

MR. WILLIAMS: He is disciplined from now on.

MODERATOR KEEFER: For the rest of his life.

MR. WILLIAMS: Yes, for the rest of his life.

MODERATOR KEEFER: I suppose the man's foreman had a talk with him, too?

MR. WILLIAMS: They talked to the man about safe practices. There were two other instances in group safety meetings, which this man had attended, where the foreman used as his subject the dangers of the high-line.

MODERATOR KEEFER: That seems to be pretty clear. Is there anything else you want to add, anything else you did, or should have done, or could have done?

MR. WILLIAMS: There is nothing we can think of that would prevent a man from asking a conductor to make a coupling for him and then go and make it himself. We couldn't think of a possible thing. Nobody has been disciplined except the man; but the foreman wants to discipline himself. He says, "There must have been something that I might have done to prevent that accident. I tell the men that they must watch these places, and still they get hurt. I feel a personal responsibility for the man who got hurt."

MODERATOR KEEFER: He is a pretty decent foreman, I should say.

MR. WILLIAMS: He asked me what I was going to do about it.

MODERATOR KEEFER: What did you tell him?

MR. WILLIAMS: I said, "You sit in safety meetings with your men; you hold them regularly; you do a good job of it. You are a good foreman, but you are a poor preacher. When you are preaching, how do you know they are listening?"

He said, "That is what I would like to know. How do I know when a man I talk to knows what I said or instructed him to do?"

MODERATOR KEEFER: Do you fellows want to ask Mr. McKee a question?

"Selling" Safety

MR. SNYDER: I would like to bring out one thing that may or may not help to prevent accidents. I have found that a fairly effective way to sell to workmen the practice of reporting and correcting unsafe practices, is to put it up to them in this way: "Gentlemen, this plant will run if we are all in the hospital. It will keep right on going. But if you are injured, your family and you lose the income that you might have made. You might receive a little compensation, but it will not compensate for the fact that you are going to lose your earning power." This man may be a skilled workman. If he loses his hand he is going to have to go back to laboring work. Selling it in that way, I do not know whether it has a real effect or not except that in our own department we do have a higher percentage of unsafe practices reported by workmen than any other Department in South Works. I wanted to bring that out because in this accident the man lost his hand. He lost his earning power.

W. W. HALL (Crucible Steel Co. of America, Midland, Pa.): The unloader was evidently a laborer with some knowledge of railroading. He realized that one knuckle should have been open. The conductor was a railroad man. Before he gave the signal to make the coupling, shouldn't he have seen that one knuckle, at least, was open, so the coupling would have been effectively made?

MR. WILLIAMS: There are four cars. The conductor is standing between the second and third. The accident happens between the third and fourth, behind him. The conductor was making his couplings one at a time. He would have gotten to that one in turn.

MR. HALL: Shouldn't he have walked

behind and seen the knuckles were open, before he gave the signal to the engineer?

MR. WILLIAMS: He was not trying to couple the four cars with one move of the engine. He was taking them one at a time, and as he came to each junction of the car he saw that that knuckle was in position.

MR. NOLAN: How many men were on that crew?

MR. WILLIAMS: Engineer, fireman and two switchmen.

MR. NOLAN: Two switchmen and a conductor?

MR. WILLIAMS: A conductor and one switchman.

MEMBER: Where was the switchman when the conductor was doing all the work?

MR. WILLIAMS: On the fore end of the engine.

MODERATOR KEEFER: That is where he should have been.

MR. CAMPBELL (Youngstown Sheet & Tube Co.): Why wasn't he back where the coupling was being made?

MR. WILLIAMS: The conductor was making the coupling.

MR. CAMPBELL: What was the other man doing?

MR. WILLIAMS: Nothing.

MR. CAMPBELL: I am a transportation man. We have two men at the junction of the car. When there are couplings to make, the brakeman and conductor are back there helping to do the work, and if we need them, they go to the front end.

MR. WILLIAMS: I knew a fellow who is going to hear that rule.

MEMBER: I would like to ask if you consider the act of the unloader, in assisting or attempting to help, a definite violation of a known safety rule, or was it just poor judgment?

MR. WILLIAMS: It was a definite violation of an instruction to him which was, "when the engine is on the high-line, he shall stay away from cars."

MEMBER: That brings up the question, was that man observed previously in his general work to be a type that would violate safety rules, that had been caught doing similar things along that line previously?

MR. WILLIAMS: He had not been caught. No high-line foreman had even seen

any other man attempt that, and no man would ever admit he had ever attempted it.

MR. McKEE: You mentioned that they were pulling this up so a car puller could reach it. I assume the car puller cable was too short.

MR. WILLIAMS: Too short.

MR. McKEE: Does this happen regularly?

MR. WILLIAMS: That is a regular thing. The extra cars are set on the back end of the high-line, and these fellows pull the last car down.

MEMBER: Was it possible for the locomotive engineer to see that the man was in a hazardous position?

MR. WILLIAMS: That was brought out in the investigation, that they were on the same side, and it would have been possible, but the engineer did not see the man, and you have to give him the benefit of the doubt that his attention is concentrated on the conductor who is giving him signals.

MR. PETERSEN: I believe you said the crew consisted of a fireman, engineer and one switchman. That is not a full crew. The man from Youngstown employs a five-man crew.

MR. BARR (American Rolling Mills Company): We have a set-up that possibly might help in taking care of a situation of that kind. We take the responsibility for getting men in the clear when our railroad engines are working, but we have made it very definite that we do not take any responsibility away from our transportation department. They must satisfy themselves that everyone is in the clear when they go in to make a coupling.

MR. LUELLEN: Before any switching crew can make a movement, do I understand that they have to go up and down looking under the cars, over the cars, in the cars and every place else?

MR. BARR: They have to satisfy themselves there is nobody around those cars when they go into a department to make a switch.

J. M. TRANSUE (Superintendent, Plant Protection, Philco Radio Corp., Philadelphia): I railroaded for fourteen years. You spoke about the switchmen being at the front end of the engine. As I understand this, that would be the proper place for this

man. There is a coupling to be made at the engine. There is the possibility of having to pass a signal. If the conductor were doing the work of a switchman, because of the two-man crew, it would be only natural to go and make the first coupling, the second, third and, progressively, the fourth.

An engineer, in looking after his train crew, observes any man or any member of the train crew working around cars, and if they go in between cars, it is the job of a man going between the cars to make certain the engineer sees him so that he is protected. Therefore, the engineer could hardly be expected to be looking for a third man if he has two men in full view. It could hardly be the responsibility of the conductor to go back to the fourth car to see that the coupling was open there. Suppose there were forty cars and forty couplings.

H. A. W. KERWIN: I would assume that this man had been in the habit of being a good fellow to the conductor. That is the way it looks to me. I don't think it would be the first time he tried to do that.

MR. WILLIAMS: That is always a question as to whether it was the first time. But his own statement later was that he had never done it before.

MODERATOR KEEFER: Nobody had ever caught him?

MR. WILLIAMS: Nobody had ever caught him.

MEMBER: There is one point that hasn't been brought out. If this was on a straight track and they had the latest type of coupling which has been in use for several years, there would be no necessity for even an experienced railroad trainman to go in and make the coupling, open the knuckle.

Supervisor Responsibility

MEMBER: I believe the discussion seems to be getting away from what the speaker was seeking to find. I think the thing he is trying to arrive at is whether or not the supervisor might be held responsible in any way for this accident, in something he overlooked.

MR. WILLIAMS: You are right about that. I didn't bring this up as a problem in railroading. I believe railroaders generally operate under strict rules, and they operate safely in regard to railroading. The point

of all this is that the foreman is asking me, "What can I do now with the man I have definitely instructed as to dangers? What do I do to make sure he heard what I said?"

MEMBER: In conducting safety meetings, your foreman will throw out the material to the men, but I wonder if he goes back a week or so after the message has been given, with a questionnaire, seeking to find out how much of what he gave them has been learned and how much they are carrying along with them. That might be the answer.

MR. WILLIAMS: That is a good suggestion, back-checking to see whether or not the information stuck when he gave it to the men. They do this: If there is a doubt in their minds, sometimes they will ask the men, "What did I just tell you?"

MR. SHERILL (Pittsburgh Plate): We have a condition that unfortunately is very congested. Two tracks run between two buildings, and men are constantly going over these tracks. Men are loading and unloading the cars during the day. If we had cars shifted around such as in this case, we would be hurting somebody every day.

In our case we have a conductor that is responsible to go clear around the cars and look between them and see that there are no men loading the cars. He is entirely responsible. I don't see why, in a case like this, the conductor can't be made entirely responsible to see that men are in the clear.

MODERATOR KEEFER: Do you fellows think the conductor was in any way responsible? Raise your hands. There are about fifteen hands up. The rest of you apparently disagree on that. You think the conductor was not in any way responsible.

MEMBER: Is there a possibility that that man might have been illiterate and did not understand what he signed? Isn't the answer probably in how are you going to prevent a similar case happening with some other illiterate employee?

MR. WILLIAMS: The man was not illiterate. He understood English.

MR. MILLER: Perhaps that foreman had the feeling that possibly the signing of the slip had gotten to be a mechanical motion, and the matter of getting over to the man that he should stay out from between the cars wasn't really put across.

MR. SANOW: I believe Mr. Williams has a first rate idea of how to put an idea across.

Visual Education

MR. WILLIAMS: I did talk to these fellows on the idea that, if what you say and what they hear doesn't register, maybe we can do something with what they see. So we took an eight millimeter movie camera, and we made a film that takes about four to five minutes to run. The subject we chose was the handling of a ladder, in which two men came onto the scene to use the ladder. They did about a dozen wrong things with the ladder, and then came back with the ladder and repeated it, doing the operation correctly. I took that to the foremen's meetings, and also to the men's meetings with their foremen, showed it to them and said, "Does this help you fellows? Does it help put a better idea into the safety meeting if the men see something?"

We showed the picture for four or five minutes. Then the men discussed among themselves what they had seen which was right and what they had seen that was wrong. We showed the picture again in four or five minutes, and then in twenty minutes we had a safety meeting. A lot of fellows thought it was a help to them to put over one idea at a time.

The film cost \$2.25. I don't see why there shouldn't be a thousand films on a thousand similar subjects. With them you can break up the monotony of foremen preaching to men in safety meetings.

MODERATOR KEEFER: Who made these films for you, Mr. Williams?

MR. WILLIAMS: A boy in the chemical laboratory and a couple of pipe-fitters.

MODERATOR KEEFER: Did the safety engineers take any pictures?

MR. WILLIAMS: They haven't yet.

MODERATOR KEEFER: You are trying to get them to do it?

MR. WILLIAMS: I think it is their job I am no scenario writer; I am a blast furnace man.

MODERATOR KEEFER: I have been trying to get somebody to take a crack at the safety engineers here. We are throwing an awful lot of responsibility on injured workers, on supervisors and some on man-

agement. Nobody has credited very much about the failure of the safety department to do anything. You sort of touched on it here.

MEMBER: Do you think a safety engineer is never wrong?

MODERATOR KEEFER: We haven't found him very much wrong this afternoon. Maybe some of the other men will have a little more to say about safety engineers.

MEMBER: Isn't there a mechanical remedy of some type on that high-line? Have you got room for a catwalk?

MR. WILLIAMS: There is a catwalk on both sides of the high-line.

MEMBER: Wouldn't it be possible to keep the unloaders on the outside of that? Could you have a force between your track and the catwalk to make your unloaders stay away from it?

MR. WILLIAMS: He has to get at the cars to open the doors.

MEMBER: Yes, but he doesn't have to get at them when they are switching.

MR. WILLIAMS: He is definitely told that he has to stay away from them.

MEMBER: Couldn't you get a penalty that would be severe enough to make him stay away from there?

MR. WILLIAMS: He gets the penalty.

MEMBER: You haven't any barrier between the cars and the outside of your track, have you?

MR. WILLIAMS: No, I don't believe you can get a barrier like that.

MODERATOR KEEFER: Have you anything like that in your plant?

MEMBER: No, we haven't.

MR. NOELAN: Do you feel that that crew has let down men?

MODERATOR KEEFER: How many feel there were enough men in the crew for this job? (Majority) Do you agree with that?

MR. WILLIAMS: I agree that four men are enough for the high-line.

MEMBER: I suggest that everybody but the railroad crew leave the high-line.

MODERATOR KEEFER: These fellows are after an interesting point here. They are trying to get management to do something before they place the blame on injured workers. But there are some cases where we

have got to agree that management just can't go very much further in safeguarding these jobs. To me it appears that this is one of them.

We apparently agree that the injured man was mostly responsible, but that there is a responsibility also resting on the shoulders of the supervisor. Apparently the majority feel that that responsibility is divided, maybe not fifty-fifty but at least divided.

I think we will have to go on to our next accident. Mr. Hagedorn of the Interlake Iron Corporation, Chicago.

Accident on Coal Bridge

F. A. HAGEDORN: The accident which I desire to place before this panel occurred on a coal bridge. This bridge has a span of 238 feet and the height of the trolley above the ground is approximately 60 feet. The trolley has a speed of 150 feet per minute. Immediately below this trolley is a lorry car which moves back and forth the full length of the bridge and which receives coal from the bucket on the trolley. The lorry car transfers this charge of coal to one end of the bridge where it is unloaded onto a belt conveyor.

The man who was injured was 24 years old, American born, white, single, had one and one-half years of high school education. He had been in the employ of the company one year and four months, and had been on this particular job as a bridge oiler for five months.

The accident occurred at 8:15 in the morning, approximately an hour after the man had gone to work. The foreman in charge of the dock operation went up on the coal bridge to make a shift in operators so as to allow the regular operator to attend a meeting on welfare work.

This regular operator was replaced by a relief operator who was fully as experienced as the regular operator. The foreman then instructed the man running the lorry car and the injured man that they were to grease the sheaves on the lorry car, and as soon as this was completed the operation of conveying coal was to proceed.

The foreman then walked north a few feet and stopped where the trolley was located, to inspect the gears on the hoisting machine of the trolley. While the foreman was

standing at this point, looking at the trolley, the operator moved the trolley south in order to get it in position where he wanted to dig coal. Shortly after the trolley started to move, the foreman heard a scream and, not knowing what had happened, hurried to the cage of the trolley in order to stop the operator. The noise of the trolley machinery and the fact that the operator was in a cab underneath the trolley made it impossible for the trolley operator to have heard or seen the injured man.

After the trolley was stopped, the injured man was found on top of the machinery, his body lying over the housing of the machinery and caught between the housing and one of the cross spans of the bridge.

Investigation at the time brought out the fact that the injured man had no grease buckets or oil cans with him. The scream was the first indication that anyone had of his being on the trolley. He had been specifically instructed by the foreman to grease some sheaves on the lorry car which was at the other end of the bridge, and no one knows why the injured man got up on the trolley.

It is an operating rule on the dock that no one must oil or work on the trolley without the full knowledge of the trolley operator, since there is not man clearance between the trolley housing and the cross members of the bridge immediately above.

Questioning of all operators brought out the fact that this rule was fully understood among them, and no one could give any reason why the injured man should have been on the trolley.

This bridge has been in operation about twenty years and no accident of that kind has ever occurred. There never has been known a case where a man got up on top to work or oil, without first notifying his operator. The question is one that we have never been able to solve. No one has ever given us a satisfactory answer as to why he went up there.

MODERATOR KEEFER: If that clearance had been greater, the accident couldn't have occurred. Was there any necessity for those cross members being that low?

MR. HAGEDORN: In the original design it could have been made larger, perhaps, but there is nothing we can do now without wrecking the bridge.

MODERATOR: Doesn't that bring out an interesting point that, although the thing is twenty years old, we still come back to the idea that somebody, when designing that bridge in the beginning, didn't take safety into consideration? Was that point given consideration in your plant? I don't suppose the designer was even working for your company when this accident occurred. You certainly couldn't go back at him and discipline him, I suppose.

MR. HAGEDORN: No one in our company designed it. It was built by a bridge company.

MODERATOR KEEFER: Are they being built in that way now?

MR. HAGEDORN: Every bridge that I have seen is different. They are not built exactly this type.

MODERATOR KEEFER: The ones being built now, do they have that very short clearance?

MR. HAGEDORN: No, I would say most of them have plenty of clearance now.

MODERATOR KEEFER: The designers have learned their lesson, either from similar experiences or they have gotten some sense?

MR. HAGEDORN: Yes.

MODERATOR KEEFER: Do you fellows want to say anything about it?

MR. McKEE: Was it this man's duty to oil this particular crane or trolley?

MR. HAGEDORN: Yes, that was one of his jobs.

MODERATOR KEEFER: Was there any investigation of his home conditions? Was he a pretty good man? Was he married?

MR. HAGEDORN: No, he was a single man. So far as we know, his home conditions were excellent. He wasn't in any kind of trouble financially or at home.

MODERATOR KEEFER: He just did something crazy that you couldn't account for in any way, shape or form?

MR. HAGEDORN: Yes.

MODERATOR KEEFER: He had no financial worries?

MR. HAGEDORN: Not that we know of.

MODERATOR KEEFER: Did he have any girl friends?

MR. HAGEDORN: I don't know.

MR. SNYDER: How long did he work as an oiler on that particular job?

MR. HAGEDORN: Five months.

MR. SNYDER: Sufficient time so he should have known better?

MR. HAGEDORN: Oh, yes. He oiled that every day, every shift.

MR. MILLER: What arrangement does he make when he goes up to oil it ordinarily?

MR. HAGEDORN: He notifies the trolley operator that he is going to oil, and that is the rule on the dock.

MR. MILLER: How does the trolley operator know when he finishes oiling?

MR. HAGEDORN: He comes down and tells him he is through.

MR. MILLER: I would like to tell about what we do in our plant that is a little further than word of mouth. We furnish every man with a safety sign, as it is called, and he carries this sign. If he is going to oil any machinery, he opens a switch that has a hasp on it, and he locks up that switch with this sign with his name on it. We have had to put teeth in that, of course, to make the men use it. If a man is caught working on a piece of machinery without his safety sign on that machinery, he is given a day off for the first offense. We have had pretty good results with that. In other words, we try to keep the man out of a place where he will get hurt, and have some definite means of letting the operator know he is up there doing his work.

MR. HAGEDORN: We have that rule also on most of our machinery, but in this case there are only two men involved in it. We feel that two men can certainly be trusted with each other.

MODERATOR KEEFER: Let me ask this question of the audience. Probably you have conditions somewhat similar to that. Raise your hands if you answer this "yes." Would you, in conditions like this, require the installation of a safety lock by the man who goes up? (A large number raised their hands.)

MR. HAGEDORN: I would like to ask the question, if the man wouldn't tell his operator he was going to oil the bridge, would he put a safety lock anywhere?

MR. SHERILL: Yes.

MR. HAGEDORN: I doubt it.

MR. KERWIN: I would like to again assume it is possible he may have told the trolley operator and, in a lapse of memory, while the man went up above, he could have started that thing.

MR. HAGEDORN: The injured man did not get anywhere near the trolley from the time he was instructed until this move took place. There was no possibility of his having told the operator.

G. I. SMITH (American Car & Foundry Co., St. Louis, Mo.): Years ago we had an accident nearly identical to this. We had those trusses, as you have, that will not clear a man. After we had that accident we put cut-out switches on all our cranes and put a lock on them. Every man who has anything to do with going on top of the cranes is given a key to lock the safety switch. We school them. If a new man is put to oiling or repairing, we take particular pains to instruct him about locking the switch.

MR. SCHMIDT: I found these conditions in 1917 over in the Buffalo Plant of the Lackawanna Steel Company. They have had that method there. If the oiler went up on that crane, he had a lock, and there was a red light in that cage. If the operator was not in the cage, when he came back, he knew there was somebody on top of that crane doing some kind of work. When this man came down, he pulled the red light switch, pulled his lock out.

MR. SHERILL: In our plant we do very much the same thing, except each individual man has his own padlock with him. There is no danger of mixing keys. It is his own responsibility.

MEMBER: Was there a chance the foreman could have seen where the man was?

MR. HAGEDORN: No, the trolley is about 40 or 50 feet long, and some of the drums stand that high. It is about 20 feet high. It is quite a large trolley. You can lose half a dozen men up there very easily.

MEMBER: Could the foreman inspect the crane without the switch being locked out or the operator knowing he was up there inspecting?

MR. HAGEDORN: He was standing alongside looking at the gears.

MEMBER: And the operator didn't know that?

MR. HAGEDORN: No.

MEMBER: That is a very bad practice.

MR. HAGEDORN: I don't think so. You can stand on the sidewalk and watch automobiles go by.

MEMBER: What did you do about the foreman? He was on the crane.

MR. HAGEDORN: He was on the walkway alongside of it.

MEMBER: The walkway is connected to the crane, isn't it?

MR. HAGEDORN: It is not connected with the movable part of it. It is the stationary part of the bridge.

MEMBER: This bridge doesn't move?

MR. HAGEDORN: This trolley moves along a track, and there is a walkway on each side.

MEMBER: The bridge doesn't move back and forth?

MR. HAGEDORN: Yes, the whole bridge moves up and down.

MEMBER: He was on the crane?

MR. HAGEDORN: Yes.

MR. PETERSEN: The walkway was put there so the foreman might go up there without getting into any danger.

MR. HAGEDORN: Yes.

MODERATOR KEEFER: How many think the foreman was in a dangerous position unjustifiably? (Majority.)

MEMBER: We are like this gentleman. We learned the hard way. We killed one man and cut the legs off another one before we learned to lock the crane while there was anybody up there.

MODERATOR KEEFER: Fellows, as a result of our discussion of this accident, in my opinion, the management has to bear the biggest share of responsibility on two counts: the low clearance—I think that is a lousy situation. Even though we might excuse them by saying that it was a twenty-year-old installation, nevertheless if there had been greater clearance, this accident wouldn't have occurred. Maybe the cost would be almost prohibitive, but nevertheless that rotten clearance is there. The management has to take that count.

The other count is on this failure to provide safety locks. There is a supervisory failure there. Also, certainly there is a failure on the part of the injured man himself, some responsibility on his part, although I am inclined to relieve him of an awful lot

of his responsibility, because I am inclined to think he was given a lousy example by the foreman who was up there. Does that seem logical? Do you agree heartily with that? (Applause.)

The hour is getting awfully late, and I am going to adjourn this meeting. But, first there are one or two things that, it seems to me from our session here this afternoon, we can conclude about safety work in general.

First, it is necessary to investigate every accident and investigate from top to bottom. They are not investigated simply to determine who was at fault in the thing. Accidents are investigated to determine responsibility, which is a little different from fault, to determine what you are going to do to prevent recurrence—that is, both what you are going to do and who is going to do it. Is it going to be the supervisor or a worker or a superintendent or the chief engineer or the purchasing agent or master mechanic? That is part of the investigation job, and, certainly, responsibility can be divided about four ways: Management, supervisors, injured workers and fellow workers.

There is one other thing I think we get out of this. Many operating men approach the problem of accident prevention from an entirely different angle. If they can show that the man was injured because of his own carelessness, that is, if there was any element of carelessness, they think they have finished their job. They think they have alibied themselves completely out of all responsibility, and have thrown all the responsibility on the poor sucker who got hurt.

Any supervisor who says he is not responsible for an accident that has been due to carelessness is simply using the boomerang kind of argument that comes right back on himself, because he is admitting that he was either a poor job trainer, or a poor supervisor, or a poor disciplinarian, because those are the three ways to eliminate carelessness. I think we have condemned supervisors and foremen here pretty heavily. Probably we could have condemned them a little more heavily. But I wish we had gone a little further on a couple of these accidents and condemned the safety engineers. That is where I think we fell down on our job this afternoon. I am one of them. I would take some of the blame if I were in some of the plants where these accidents happened.

THURSDAY AFTERNOON SESSION

October 10, 1940

Ask the Employee

By T. O. ARMSTRONG

Supervisor, Industrial Relations, Westinghouse Electric & Manufacturing Company, Springfield, Mass.

In trying to formulate a policy for safety or any other factor in employee relationships, it seems that our first step is to understand what the people who are to be affected by such policy think and feel about the problem.

A mere statement which says in effect that we are interested in safety, safe working conditions, safe practices means nothing to the individual employee if he has a feeling within him that we are not sincere in what we say. In other words, what we say with words may mean one thing which is discounted when our actions indicate otherwise.

We all agree that employee cooperation is essential to the administration of policy or procedure; and I mean all those within an organization that are employees, workers, shop or office, salary paid or hourly paid, supervision as well as those supervised.

Anyone dealing with the problem today also knows that employees must be sold before they will become a part of the program, and they are sold through the medium of words on the one hand, and actions on the other.

I believe that the average employee will feel reasonable about a policy which states that we want to protect him against accident, and I believe that the average worker will feel more strongly about it when our actions demonstrate to him that we mean what we say.

Thus latter fundamental was a part of our thinking when we approached the idea of asking the employee:

Were we willing to let them have a part in the safety program?

Would they, if such an opportunity presented itself, voice their opinion?

Would our safety program stand such an inquiry?

Would the employee feel that he was committing himself if he answered the question presented?

Would we be willing to "go along with" and do something about the suggestions or criticism that might be offered?

Were they tired of the very word "safety"? Westinghouse, at its East Springfield Works, found the answer to these and many other such questions. The safety program has withstood the inquiry of the employees because the employees take an active part in setting up the safety policy for each year.

"Safety Inventories" were started in the year 1937 with what is known as the "Clean Sweep for Safety" Campaign when we merely asked the employee to report to his own departmental safety man any unsafe conditions which he found around his work place.

In 1938, we went a step further and our questions were designed particularly to the equipment used by him and his suggestion or thoughts concerning its use safely.

The 1939 inventory questions were designed to create an interest and develop a desire in the employee to inventory his own experience in the matter of lost time due to personal reasons.

Our 1940 inventory is one that gives the employee an opportunity to tell us what makes a safe worker from his own personal work experience.

Inasmuch as the 1940 inventory has not been tabulated, the following analysis is on the basis of the inventory taken in 1939 with some reference to 1938 on certain questions not asked in 1939.

It is also well to note that the inventory does not replace any of the other safety work that is constantly going on throughout the year.

Immediately and upon "return to work" after the plant's regular inventory of materials and stock, cards are distributed to each employee from sweeper to manager, hourly paid and salary paid, requesting each

individual to "take stock" of his own work situation with respect to safety.

Two thousand four hundred and seven workers polled. Ninety-nine per cent of them made a return. The questions asked were answered as follows:

Questions Asked

Do you operate a machine?—Yes, 821.
Is it properly guarded?—Yes, 808; No, 13.

If not, what are your recommendations? Two suggested an improvement in guards. Eleven suggested additional guards.

In asking this question, we were interested in how the employee felt about it—believing that if he had an opportunity to express himself freely, he would be likely to co-operate in its use safely, and would appreciate the part equipment played in alleviating suffering and mishap.

In the thirteen No's the safety committee had an immediate job to do.

Where is the nearest fire alarm box?
Where is the nearest stretcher?

The real intent of these questions was to draw the attention of the employee to the location of each. We recommend these questions periodically to keep everyone posted.

These questions were interesting and were the cause of considerable commotion throughout the plant—everyone asking the other fellow where the fire-alarm box or the stretcher was located. It clearly indicated to us how little we know about the things around us which are commonplace; but which are necessary when needed.

What personal safety equipment do you use?

Too often equipment; such as, aprons, gloves, tweezers, etc. is issued out of stock without any thought on the employee's part that it is issued for his safety. This question was designed to call his attention to the extent to which we safeguarded his welfare.

Tabulation of this question presented the following facts regarding materials purchased for the employees' protection.

Aprons	105
Gloves	537 pairs
Goggles	426 pairs
Machinist Glasses	49
Respirators	22
Welding Masks	24

Leggings	18 pairs
Tweezers	66 pairs

What additional safety equipment do you require?

47 suggestions were received, compared with 111 suggestions the previous year.

Do you wear safety shoes at work? If not, why?

335 said Yes—an increase of 120 over the previous year. 255, however, gave definite reasons why they did not want to wear them. These answers ranged from a mere statement of "I don't like them" to "They're not comfortable"—"Hurt my feet"—"Pinch my toes." Others stated: "Tender feet"—"Wear arch supports"—etc.

Do you wear low or Cuban heels at work?

This question was to point out that the wearing of Cuban heels was hazardous. 198 stated they wore low heels; while 14 said they wore Cuban heels. 383 women were asked—the others probably felt that it was "none of our business."

When working do you wear finger rings, arm bracelets, long sleeves?

Such practice on operations of rotating machinery is particularly hazardous. Some of the most serious accidents recorded in some firms result on punch presses, lathes, drill presses, etc.

Are there any physical ill effects from your work?

1,550 said No—while 84 said Yes—giving their reasons as: fumes, vapors, drafts, etc. Each complaint was investigated and corrected even to the extent of calling in a chemist to analyze the jobs where fumes and vapors were the causes of complaint.

Do you believe that the safety rules should be enforced?

2,000 employees said emphatically—Yes.

This would indicate that the average worker is still rather sensible about the welfare of himself and those around him. He will not stand for any tomfoolery about safety, and he will not hesitate to state so if given the opportunity.

How about those who said No? What is their opinion? These workers were interviewed and in all cases their experiences with other plants had not been one of a self-

ing program, but one of an enforcing program. They stated that anyone who disregarded the rules of safety should be fired, but too often they had seen the wrong person fired.

Are the safety rules for your benefit or the company's?

This question seemed necessary in view of all the odd thinking that seems to be going on. What would the employee have to say about it?

The following tabulation indicates that most employees felt that the safety rules benefited both the worker and the Company.

For Your Benefit	1,800
For the Company's Benefit	300
For the Benefit of Both	2,000
<i>Have you completed a course in first aid?</i>	
<i>When?</i>	<i>With whom?</i>

In 1938, we asked the same question and found that 243 employees had completed First Aid courses at some time or another over a period of 20 years—gaining such experience with the Boy Scouts, Army or Navy, Red Cross, in colleges, former employers, schools, etc.

Six hundred and sixty employees stated their desire to attend classes in First Aid and such classes were formed immediately. Due to limitations in the number of instructors, 145 were enrolled, meeting each week for a period of ten weeks and finally receiving their diplomas at the Annual Meeting of the Local Red Cross Chapter.

Would you be interested in attending First Aid classes again this year?

Six hundred and forty-eight new ones applied, and all of those who had completed courses last year applied for the advanced course.

Thirty applicants were office girls, 24 were engineers from the engineering department, and 31 were departmental supervisors and foremen.

Would you be interested in a class in home and highway safety?

Five hundred and eleven said they would be. Among this group were 20 female employees and 35 foremen.

During the past year and particularly in the summer months salt tablets were distributed extensively throughout the plant, and in order to find out the extent of their use the following question was asked?

Did you use salt tablets this summer?

750 said *Yes*. The comments with regard to their use were tabulated in the following manner for guidance of the safety committee:

Favorable comment: Very good, 107; Good, 71; O. K., 69; Helpful, 44; Very Helpful, 29; Beneficial, 12; They Helped, 9; Very effective, 9; Satisfactory, 9; Believed they helped, 10, and Slows up perspiration, 9.

Unfavorable comment: Tablets not readily available, 13; Upset my stomach, 5; Make me sick, 13; Does not agree with me, 4; Do not care for them, 4; Doctor ordered no salt, 3, and Didn't notice any difference, 22.

How much time did you lose this year because of sickness? Home accidents? Automobile accidents? Other?

Here was an opportunity for each employee to take stock of his own situation with respect to this question.

Of 335 cases reported as having lost time due to reasons ranging from the common cold, to infection operations, home accidents, automobile accidents and recreation, 2,850 days were lost.

While on the other hand, of the five cases of lost time within the plant, only 145 days were lost.

1 Industrial Accident for every 6 Outside Accidents.

1 Industrial Accident for every 61 Cases of Sickness.

1 Industrial Accident for every 67 Other Cases of Lost Time.

1 Day Lost for every 2.2 cases of outside accidents.

1 Day Lost for every 19 cases of sickness.

1 Day Lost for every 21 due to other causes.

What is the feeling of the average employee with regard to physical examinations? Do they want them? Would they avail themselves of them if they had an opportunity?

To determine the answer to these questions the following was asked.

When were you last examined by a doctor?

Our tabulation indicated that for the most part the entrance examination when applying for work was the only one that the greatest

percentage of the workers had availed themselves of.

Do you want a physical examination?

Only 10 per cent indicated any desire for one, which seems to indicate that the average worker is not inclined to physical examinations periodically—at least within the plant where he works.

Have you any additional recommendations for the advancement of safety and health among our employees?

250 suggestions and recommendations received in spite of the fine record of safety, and work of the safety committee:

Better ventilation, exhausts for equipment, storm doors, lighting, eliminate drafts, sanitary drinking equipment, toilet facilities, better health and safety publicity, and more of it, a health and safety forum, enforce safety rules more rigidly in some departments.

We are very much sold on the "Inventory Idea"—as a basis for planning our next

year's program—as a measure of the kind of a job we have and are doing.

In the past, we thought we were doing a good job; our records proved that we were. Yet, we found after our first inventory that there is always room for improvement. The inventory idea will not allow you to slip.

We were gratified to know that in the main, the employees not only were enthusiastic about presenting their point of view, but they wanted to be a part of the safety program, and wanted it enforced—if necessary.

Three factors seem to be important in building up an attitude toward a real Safety Program.

1. Every one must believe that you are sincere in your Safety Policy.

2. Every person must have opportunity to express his feelings about the policy.

3. His expression must be considered and something done about it.

"Safety Kinks in Preventing Accidents"

The final feature of this program was a presentation of numerous motion pictures, by T. R. Smith, Safety Supervisor, Youngstown District, Republic Steel Corporation, Youngstown, O., showing "Safety Kinks in Preventing Accidents." The pictures in-

cluded devices in the Coke Plant, Blast Furnace, Open Hearth Furnace, Blooming Mill, Bessemer Converting Mill, Slag Yard, Scarfing operations, Chipping, and Miscellaneous operations.

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MONDAY AFTERNOON SESSION

October 7, 1940

The session was called to order by General Chairman Angus D. Campbell, Safety Engineer, McIntyre Porcupine Mines, Ltd., Schumacher, Ontario, Canada, who presided.

In his opening remarks the Chairman sketched activities of the Section and Standing Committees during the past year, and then introduced the first speaker.

A Course of Training Foremen for Safety Work

By F. E. BEDALE

Assistant to General Manager, in Charge of Safety, Consolidated Coal Co. Inc., Fairmont, W. Va.

Before one can even start the education of the foreman a great deal of ground work must be done—a price must be paid for safety.

A safety program must be decided upon and unless the executive officials realize that such a program is merely a sound and profitable operating program and are willing to cooperate and stand behind such a program, the desired results cannot be obtained.

A department of safety should be organized with a director or chief reporting directly to someone of the higher executive officials. This department should have sufficient mine inspectors, ventilation inspectors and other field men to properly cover the various operations of the company. There must be an office force sufficient to study and properly assemble the information turned in by the field force.

The first work of the safety department is to study the past record of the company. This study should cover the various accident causes. The official foreman organization should be studied; many of these men will, or should be excellent material for the program that is to be carried out. The study of the foremen on the job is a difficult one and must not be hurried, it may take a year or more. You must have a report of the conditions found under each foreman, meet them personally and find out whether they are popular with their men; whether they are able to have orders carried out, or whether they are considered "easy marks." The health, habits and thousand and one little things that go to make up personality should be ascertained for each foreman.

Arrangements must be made to have a report covering each and every accident that occurs and a method of classifying these injuries. This process, carefully carried out will automatically determine where and how injuries are occurring. A method of permanently classifying your foremen should be made. This is done by keeping a record of each individual foreman, charging to his ac-

count each personal injury occurring under his jurisdiction. The causes of these accidents will probably disclose just where each foreman needs training and education. This preliminary work will determine, to a large extent, just how the foremen on the job will fit into the new company policy.

Whether new foremen are employed or whether the old ones are retained, the maximum benefits cannot be realized unless careful consideration is given to fundamental qualifications. Intelligence and a magnetic personality, in addition to experience, must be weighed carefully. A well rounded high school education is desirable, its equivalent should be required. Each foreman underground should hold a first grade mine foreman's certificate, a first aid certificate and a mine rescue certificate. Ambition and a sense of loyalty to the company and its operating policy are essential qualities if the educational effort is to bear favorable results.

As the work progresses the first step toward the education of the foremen is the preparation of a set of safety standards and operating rules. This involves an enormous amount of study and work. The safety standards and operating rules must cover all phases of operation underground and on the surface. They should be gone over by the entire executive staff, criticized, corrected and revised; then sent in preliminary form to the superintendents, foremen and others for criticism and suggestions, until finally you have what is really a text book for your operations.

By the time the safety standards and operating rules are prepared you will have completed your preliminary study of the foremen and laid the ground work of making them receptive to a safety education. You have impressed upon them that safety is pure operation with care and common sense, that safety and good mining are synonymous and that safety and mining efficiency are usually found together.

The next fundamental step is to place a complete set of the operating rules in the

hands of each foreman and to arrange for classes so that each man will become thoroughly familiar with them. Classes should be established at each mine, preferably conducted by a member of the safety department. The study will be along the line of safety and the proper application of the standards; together with the inevitable discussions and the reasons for each item of the safety standards and operating rules. After completing the course of study a written examination should be given and only those men who are able to pass with a satisfactory grade should be retained as foremen. (Men failing to pass the examination are usually given a re-examination after 60 days, but failure to pass the re-examination automatically eliminates them for a supervisory position.) When new foremen are employed they must pass a satisfactory examination on the standards and rules and this stipulation is understood at the time of employment.

The school on standards and operating rules is only the beginning of the education of the foremen. Most mine officials, until educated to better ideas, consider safety only as a by-product. Care must be taken to impress the foremen that there is nothing mysterious or objectionable to safety in coal mines and that all requirements laid down are the result of the study of facts.

The education of employees must always be accomplished through the foremen and all foremen must be taught the proper method of imparting their knowledge. This is a very important part of foreman training. The hardest task of the safety department is to keep the official organization in line with the program. This let-down is sometimes due to the pressure brought on the foreman for cost or coal, but in many cases it is because of indifference to the welfare of his men or a lack of determination to accomplish his work thoroughly.

The attitude and loyalty of the employees toward safety and the company is almost wholly derived from the attitude and loyalty of the foremen, and one foreman in the official organization, who may be out of line, can tear down the structure of safety and ruin a record that has taken years of labor to build to a desirable result.

Far more accidents in coal mines are caused by unsafe practices than by unsafe or substandard conditions. Unsafe condi-

tions can usually be corrected with reasonable effort and within reasonable time. The elimination of unsafe practices is an endless job of supervision and education on the part of the foremen. Consequently the final success of the entire program depends on the ability of the foremen to enforce the standard requirements and to secure the respect and cooperation of the men under them. This is the most essential part of the foreman's education—the personal equation in each foreman may have weaknesses to be corrected. The foreman must be taught, not only how to educate his men, but how and when to apply disciplinary measures.

In order to know each foreman's ability, where he is falling short, there must be some plan of checking his accomplishments and failures. A merit rating system should be established giving each foreman a classification based on inspection records. This foreman classification should show the number of men working under him, the number and kind of substandard conditions or violations of rules found on the section, and the general condition of the section.

Based on this information there is established a ratio of the number of substandard conditions and violations to the number of men under his supervision. The defects enumerated against each foreman over the period of a year will show his weaknesses and these conditions can then be brought to the attention of the mine organization. Weaknesses in the work of the various foremen must be corrected and this important phase of the education is an operating department function and usually the responsibility of the mine superintendent.

To further discover and eliminate the weakness of the individual foreman, all lost time accidents should be classified as to responsibility. Usually this is done each month by mine officials in conjunction with the safety department. The classification should be on the primary cause, tabulated against the foremen and placed in one of the following classes:

- 1—Substandard Conditions.
- 2—Violations of Rules.
- 3—Lack of or Poor Supervision.
- 4—Carelessness.
- 5—Unavoidable.
- 6—Doubtful as to Compensability.

Obviously this information is of no value unless full information is available. The

first four classes come within the direction and responsibility of the various foremen. Substandard conditions, known to exist previous to the accident, must be poor supervision. Violation of rules denotes lack of discipline; carelessness denotes poor supervision and lack of effort on the part of the foreman in educating his men. If full information surrounding the accident is available, and honestly used, each classification has considerable value for accident prevention purposes.

There is also considerable educational value to the foreman and officials making these classifications. When such a system is first started carelessness is a favorite place to assign the cause of an accident. Carelessness is an expression cherished by many operating officials when accidents are increasing and the record going bad. Of course, from a supervisory standpoint this is an alibi accepted by the majority of sympathetic foremen. Many minor and some serious accidents are attributed to carelessness of the employee, but in mines where carelessness prevails, the cause is due to insufficient and poor quality of supervision.

Then, too, the carelessness is not always on the part of the injured employee; it may be, and often is on the part of the foreman. In due course of time the foreman learns to prefer that accidents to his men be placed under some other classification than carelessness, realizing that it reflects seriously on his ability. This responsibility classification not only helps educate the supervisory man, but indicates also his ability as a supervisor, as an education in the right and wrong methods, and is another measuring stick as to his interest in his job and the welfare of the men under him.

Another point in the foreman's education is to have him express his ideas, opinions and corrections relative to the safety standards and operating rules. Foremen's meetings should be held frequently at each mine or group of mines, during which problems relating to accidents, investigations, mine inspector's reports, discipline and general supervision should be thoroughly discussed. These meetings should be conducted by a member of the safety department, but the discussions and various problems should be raised by the foremen. Such meetings should operate as a clearing house for ideas and all questions raised should be thoroughly

discussed, opinions and ideas all recorded and followed up. Definite programs of discussions can be prepared and papers should be required from selected foremen, dealing with subjects in connection with their work. These papers should be short and concise, covering subjects essential to a good accident record.

Every foreman should be an inspector, and one very effective method of education is to require the various foremen to inspect and make a record of the substandard conditions and bad practices coming under their jurisdiction. This should always be done when accompanied by the mine inspector in order that nothing is overlooked. This system trains each foreman, not only in standard requirements, but also aids him in correcting bad practices among the employees. If this system is established it should be extended and foremen exchanged for others for inspection purposes. Finally it should be extended to include other mines of the company. Such procedure stimulates the interest of the foremen and gives a sense of added responsibility which most foremen appreciate.

Further effective education of foremen in accident prevention can be given by encouraging inspection trips to the mines of other companies, to the experimental mine of the United States Bureau of Mines and to mining institute meetings, and to the use of mine extension courses of the various colleges.

As education and advertisement is much more effective through the eye than through the ear, a visual system of education should be established. Moving pictures, illustrated lectures to foremen, showing the right and wrong way of accomplishing the work should not be overlooked.

Anything that stimulates interest among foremen advances education. A competitive spirit in safety must be established and maintained between foremen in the same mine, also between mines and in large companies between divisions. Monthly progress as to safety results must be kept before the employees. Many different methods of stimulating the competitive spirit can be effective. A card system, displayed on the bulletin boards, and classifying departments is effective; the cards are classified as "A," "B," "C" or "D" and designate the extent of substandard conditions and bad practices

found by the mine inspector. In companies operating several mines rotating "Honor Flags" or plaques can be awarded for the best monthly record. Miniature race tracks, barometers, clocks indicating the safety

progress, all will promote interest. Such special features are effective for a comparatively short time and should be changed when interest begins to lag. Executive interest in the competitive spirit is always the greatest stimulant.

What Do We Actually Know About Roof Testing?

By JOHN E. JONES

Safety Engineer, Old Ben Coal Corporation, West Frankfort, Ill.

In many phases of mining progress is pronounced in knowledge with respect to efficiency and safety including the loosening and loading of coal and ores, timbering, transportation, power, hoisting, machinery and preparation of the product.

There is, however, an omission in mining progress that is difficult to understand. We still guess about the looseness or solidness of the roof and sides. Our guessing has been bad. In the fifty-seven year period of anthracite and bituminous coal mining in the United States, 1880-1936, 87,052 fatalities occurred in underground coal mining. 53.4 per cent of these (46,476) were from falls of roof and sides. In the same period 15.2 per cent or 13,189 lives were lost from mine explosives. This and other data in the nation and for Illinois coal mines are shown in the accompanying tables.

It is generally recognized that falls cause the majority of injuries. It is puzzling why there is such absence in mining tests, mining instruction courses and mining apprenticeship of the recognition and correction of this outstanding type of hazard. From time immemorial the criticism has been, "He should have set a prop." Proper timbering is unquestionably the correct answer. It is fair to estimate, however, that the majority of the 46,476 fatalities from falls in the coal mines of this nation during the 57-year period resulted from incorrect judgment as to the solidness of the rock or coal. They sounded and guessed it was safe. Many simply looked and guessed it was safe. Occasionally there have been some who did not even look.

There has not been aroused an interest in the study of roof and side inspection comparable with gas, electrical, mechanical and other departments of underground safety

procedure. For correction of this neglect there is need:—

First, of a more thorough understanding by all underground workers of the inspection means at hand, that it is more than a simple tapping procedure, that more frequent inspections must be made, and that a fundamental knowledge of the science of sounding should be understood.

Second, there is need of scientific study to find, if possible, a more definite means of measuring the looseness and the solidness of roof and sides. The scientific progress of the last half century has frequently approached possible solution of this problem. Much has been done in the finding of flaws in metals, in alarms from vault burglary, and various accomplishments in the measurement and analysis of sound waves. There is possibility of accomplishment from scientific research of a more certain means of roof and side inspection.

That which is most prevalently known about roof testing is that if the roof sounds drummy it is loose and might fall, and if it sounds solid it is safe. Injuries from working under the known loose roof occur from the acknowledged risks that are taken. Occasionally injuries occur while in the act of correcting known loose roof and sides.

Facts which are not widely understood are:—

- (1) The many variations of sounds other than those that sound drummy.
- (2) It is difficult to recognize a sound that is not quite solid without comparison with a solid sound.
- (3) The reasons for the various sounds.
- (4) That an angled roof break does not reflect sound as does a break at right angle to the direction of sounding.
- (5) A vertical break will not reflect sound showing there is a cavity.

Bituminous and Anthracite Mines

UNITED STATES	Falls of Roof, Sides or Gob	Explosions	Haulage	Electricity	Explosives	Other Causes	Total Underground	In Shafts	On Surface Including Stripping	Grand Total Including 114 Stripping Fats. Since 1930
1880-1936	46,476	13,189	14,324	2,485	5,956	4,622	87,052	2,596	6,633	96,395
Avg. per Year	815	231	251	43	104	81	1,527			
Percentage of Underground Fatalities	53.4	15.2	16.5	2.8	6.8	5.0	100.0			
ILLINOIS	Falls of Roof and Sides	Explosions	Haulage	Electricity	Explosives	Other Causes	Total Underground	In Shafts	On Surface	Grand Total
1892 to 1938, inc.	3,383	586	1,203	154	645	602	6,573	347	253	7,173
Avg. per Year	59	10	21	3	11	11	115	6	4	126
Percentage of Underground Fatalities	51.4	8.9	18.3	2.3	10	8.1	100.0			

(6) A rough or staggered break will not reflect sound as does a smooth break.

(7) A break even sufficient for the rock to fall will not sound drummy if there is no space at the break.

(8) That a thud sound is frequently indication of greater hazard than a drummy sound.

(9) The importance of thud sounds and their recognition in relation to solid sounds.

(10) The loose rock, if not cracked, would sound solid if slung in midair.

(11) It is not the loose rock that gives the loose sound; it is the relationship of the loose rock to the parent rock.

(12) The relationship or position of a loose rock can be of such nature as to not indicate hazard upon sounding.

(13) The most perfect drum sound is from cavity condition having a complete enclosure. Where enclosure is not complete

because of broken rock the drum sound is lessened.

(14) Damping of sound is frequently caused by fracture which may result in a deceptive sound approaching that of a secure rock.

(15) A fallen uncracked rock on the floor can sound solid.

(16) Fallen rocks on the floor can be sounded and found to give varying solid to loose sounds similar to those on the roof. Certainly all those on the floor are loose.

(17) Improvement in sense of hearing is necessary and can be developed in practice of sounding fallen rocks and coal.

(18) The importance of material that is used for sounding.

(19) That two sound vibrations are started, one in the rock and the other in the tool.

(20) The sound from the tool, such as the

ringing of a pick, often predominates and a thud roof sound is not recognized.

(21) Sounding with a shovel is practically of no value. The rock must be thin and very drummy to sound louder than the ring of the shovel.

(22) Sounding with the knuckles is of no value.

(23) An iron bar or miner's sledge are the best sounding tools.

The travel of sound in rock and coal is well understood by miners. In the approach of passages before connecting there is often a tapping on the solid coal face from each working face by the workers to estimate by sound the distance yet to be driven when the distance is short. When such sounding is done a solid piece on the coal face is chosen to do the tapping. Usually the sound cannot be heard a long distance. As a boy listens on the rail or the Indian listened on the ground, sound can be heard farther by listening on the coal. Blasting can be heard at much greater distances than hammer blows on the coal.

Geophone

A sufficiently sensitive device can detect sound waves at much greater distances than the human ear. Such a device, the geophone, has been made for detecting the tapping of miners in event of their impossibility of escape and tapping is done by them in effort towards communication with rescuers. Miners so imprisoned can organize a tapping system in the hope that listening is being done by means of the geophone on the surface, the coal rib or rail in another part of the mine or the coal rib of an adjacent coal mine. With geophonic success not only is it possible to hear the tapping but it is possible to locate the direction of the source of the sound. Unfortunately, practical development is not completed. Sufficient technical development has been made to prove the theory is true and possibility of practical success.

Lamination Factors

Soundings with the geophone are across the laminations when listening is on the surface and along the laminations when listening is on the coal seam. Sounding of coal in line with the partings is entirely different in tones and velocity than sounding at right angles; such as sounding roof coal. The differences may be shown upon sounding a prop or bar crosswise and lengthwise. Ve-

locity of sound waves along the grain of elm wood is 13,517 and across the grain is 4,658 ft. per second.

There is added difficulty in ascertaining breaks (other than those a few inches from the sounded surface) in the coal seam and in sounding rock roof edgewise as compared with flatwise. The action is somewhat similar to tapping a steel rail edgewise to find a flaw instead of crosswise.

Wrong Analyses Factor

It is my firm opinion that falls accidents usually occur from a wrong analyses of the true conditions, the majority of these wrong analyses resulting from improper, inadequate and non-understanding of sounding.

In apparently solid sounding drawslate, for instance, the sound is nearly always a thud sound approaching a solid tone. Even though no cavity exists there is sufficient absorption of the sound waves in the drawslate parting to dampen tone resulting in a thud sound. Insufficient comparison with truly solid sounding is done to develop correct knowledge of the thud sound, the most treacherous rock and coal sound in coal mining.

Sounding Tools

The sound from impact of two bodies may be from the vibration of both. In striking an anvil with a steel hammer the sound waves from both the anvil and hammer will be heard. In using a lead hammer only the sound waves from the anvil can probably be heard without very close attention.

In sounding of rock and coal the minimum of vibration from the sounding tool is desired. A baseball bat, a billiard cue and a copper rod are good in this respect. They would, however, be special equipment for the miner. He usually has a steel bar, a shovel, a pick and a 3- to 4-lb. hammer. The choice of these is the bar or the hammer. General use of a hammer for sounding throughout the length and breadth of coal mining plus proper vocational instruction upon the principles of structures, sound and testing would materially lessen falls accidents. Instruction at the mines and in study courses by laboratory means of sound variations and their causes would be of additional value.

There is possibility of improved sounding tool or sounding instrument development of sufficient simplicity and greater accuracy

than our present means in the measurement of a loose rock. Its greatest value would be its possible use by all who sound the rock and coal. If not sufficiently practical for general use it would be of value in better development of sound sense.

Other Than Sounding Inspection

In effort towards determination of the condition of roof, the miner in his analysis uses other means in addition to sounding. When sufficiently loose and not too big a physical vibration may be felt with the other hand when sounding. When a vibration is felt there is no question as to the very loose condition of the roof rock. Rock or coal, especially coal, on the rib or face can with considerable certainty be tested in this manner. In such vertical position it can be very loose yet remain in position because of vertical support, there being no other holding support.

Excessive roof weight is shown by the crushing of pillars and timbers. Prior and during such crushing is the usual chipping noise and breaking off of face and pillar particles. A soft bottom will heave. Evidence is first shown in the weakest structure.

The presence of vertical roof breaks may upon close search be found. Sounding will not give evidence of these vertical breaks. Search for chips is also important. The fresh chipped surface edge from weight of a very big rock is evidence of a bad hazard that cannot, because of the rock's bigness, be found by sounding. Occasionally such chipped edge can be followed from fresh shale chips that have fallen to the floor. In occasional locations the conditions are peculiar in that a moisture line appears along the line that soon will break.

Instruction with respect to safety and efficiency in mines is given in all mining efforts except sounding. These include gas, ventilation, haulage, drainage, timbering and many others. Sounding is accepted as so simple in procedure and understanding as to require no study or instruction; simply advice and instruction that the roof be sounded.

Need of Improved Technique

Proper technique is understood by very few and much good can be accomplished from proper standardized instruction given as in gas, ventilation, electricity and first aid.

The usual falls fatalities are one by one and do not arouse public condemnation as explosions from which hazard fatalities per

accident occasionally approach 100 and even go beyond that figure. In the bituminous mines of the United States during the 33 years of mine operation ending January 1, 1939, there were 27,080 fatalities from falls of roof and face and 8,048 from local and major explosions; 77 per cent from falls and 23 per cent from explosions. My contention is not that too much interest is given the explosion hazard but it certainly is that the falls hazard problem has not been given its proportionate attention and study.

Safety Culture

There has not been bred into us in the three centuries of coal mining a safety culture to balance the falls hazard. The American Indian was adept at looking and listening to see and hear with amazing sensitivity the possibility of food or enemies. His ability to sense footprints in the leaves, hear the rustle of a branch and to walk silently impressed us in our school histories. Unquestionably there was training from babyhood through the play of boyhood and an important part in the discussion at family and community gatherings. All individuals lived in their industry from birth to the end, success of each largely depending upon development of his senses and correct interpretation.

It is difficult to conceive of an industry in which the family life is so divorced from the industrial physical activity as coal mining. There are no toys or play in copy of the father's work. There are toy soldiers, guns, wheelbarrows, wagons, tractors, building blocks, tool chests, airplanes, chemistry sets and what-not, but certainly no roof sounding. The boy approaching maturity upon getting his first job in the mine enters into a new environment. The type of industry compels absence of sense development in those most important impressionable years.

To listen or to look and not understand that which is heard or seen is similar to attendance at a baseball game without knowledge of the game. Sufficient interest in attention and questioning will soon result in knowledge of the game. The technique of baseball is well established in the majority of those who attend. A similar efficiency of technique with respect to the hazards of falls in mining is essential for safer workmanship and safer management.

The trend of thought is that our practical knowledge is in direct proportion to our number of years of work in the mines. This

Age at Time of Accident and Number of Fatalities in Illinois Coal Mines from Falls of Rock and Falls of Coal

Fiscal Year 1924 and Calendar Years 1925, 1926, 1927 and 1928
Annual Coal Reports—Illinois

Age	Rock	Coal	Age	Rock	Coal	Age	Rock	Coal
17	2	2	35	4	3	35	2	1
18	1	1	36	3	4	54	7	2
19	2	1	37	3	4	55	6	4
20	4	4	38	4	1	56	8	2
21	1	1	39	11	2	57	6	2
22	3	2	40	9	4	58	3	4
23	2	5	41	2	1	59	..	2
24	3	..	42	5	3	60	5	3
25	1	3	43	8	6	61	3	..
26	4	2	44	8	2	62	3	1
27	4	2	45	5	6	63	1	..
28	4	3	46	9	2	64	..	2
29	4	..	47	2	2	65	2	1
30	2	4	48	1	5	66	..	1
31	2	1	49	4	3	67	1	1
32	5	3	50	14	4	68	1	2
33	2	1	51	7	..	69	2	..
34	4	5	52	9	1	74	1	..
Fatalities	50	40		108	53		51	28

Fatalities from Rock Falls for 5 years.....209
 Fatalities from Coal Falls for 5 years.....121
 Age not given.....1

TOTAL 331

Average age of 209 men killed by rock falls was.....43.55 years
 Average age of 121 men killed by coal falls was.....41.22 years
 Average age of 330 men killed by falls was.....42.69 years
 Rock falls are roof and brow falls. Coal falls are face, rib and roof falls.

is equally as applicable to mine workers as to any other class of folks. Many of us absorb the maximum of all we know on safe workmanship within the first year's experience on a job. Those of us approaching half a century of work in the mines without a serious injury naturally think it is due to our knowledge from the many years of practical experience. From my study of this particular experience factor I am convinced that this years-of-experience factor per individual is of less importance than his ability factor. It is true there are many of us who have experienced many years in the mines without serious injury. The reason is possibly our safety ability and perhaps the good breaks that have been ours. Statistics tend

to show that the number of years of experience is of little, if any, value with injuries from rock and coal falls at the working faces.

Falls-Age; Fatality Data

The most recent Illinois mine data available upon ages is from the annual coal reports from 1924 to 1928 inclusive. Fortunately for statistical data that five years is a fair representation of normal employment conditions. Sons of miners were normally employed and labor turnover as to ages similar to previous years; somewhat different to present abnormal conditions with respect to age per individual. We now hang on to

our jobs more tenaciously irrespective of how old we are. Youth at present has not been employed in our mines as in the past and split time is a factor that upsets statistical data. A better study could be made if we knew the age of each employee during that five year period. The data given, however, is such that conclusions of unquestionable character can be deduced.

From those five annual coal reports the following table is made. It is a tabulation of all the fatalities from rock and coal falls occurring in the coal mines of the state in those five years showing the number of rock fall and the number of coal fall accidents per age of injured at time of accident.

In the first 18-year column, from 17 to 35 years of age, there were 90 fatalities. Some of these were haulage men, the cause of accident being runaway or derailment.

In the second 18-year column, from 35 to 53 years of age, there were 162 fatalities.

In the third column, from 53 to 74 years of age, there were 79 fatalities for the same number of years.

These columns speak for themselves in that length of experience apparently is not a factor in the reduction of falls accidents. The average age of 330 men who lost their lives by falls during those five years is 42.7 years. Unquestionably they had an average of over 20 years of experience in the mines.

From the foregoing it is evident that we as individual mine workers do not, irrespective of how many years we have worked in the mines, learn dangerous rock sufficiently well to affect the records or else we develop indifference to the danger at about the same rate that we grow in knowledge of the hazard.

Systematic Timbering

There are occasional mines that have made remarkable progress in the lessening

of all accidents, including falls accidents. The basis of their success is they don't trust the roof to be good, assume it is all bad and timber it, good or bad. Systematic timbering is adopted designed to safeguard the worst conditions. Safety posts are set in proximity to the working face usually ahead of the car and certain prescribed distances only are permitted to exist between timber, rib or face supports. This is the most efficient and safest plan so far tried. Its success has been proven and demonstrated by many companies.

With this system there is a definite and interlocking supervision to ascertain first that material is at hand; if not, the working place is not worked. Second, that timbering is completed as per the system adopted and third, that the worker has his safety post or posts properly set or cleaning to set them. In addition is the assumption the worker and the supervisor know the technique of sounding roof, ribs and face. This is an essential part in the safety program of systematic timbering.

Need of Scientific Study

Irrespective, however, of how well timbering is done the need to correctly test roof and sides remains. We have not approached our best endeavor with the safety means we have at hand. We have not given proportionate scientific attention this fatality rate suggests when compared with the explosion hazard. We certainly have not attempted application of recent sound and vibratory applications to our problem that have been scientifically successful in other industries in improved efficiency and safety. There is unquestionably room for much improvement in our present technique and probably scientific application of roof inspection that can substantially improve over our present method of estimating the looseness or solidness of a rock.

Ventilation and Dust Control in Ontario Mines

The closing feature of this first session was the showing of a large number of motion pictures illustrating "Ventilation and Dust Control at Ontario Mines," by C. Gib-

son, Ventilation Engineer, Ontario Mining Association, Toronto, Ontario, Canada. The pictures covered many phases of both accident prevention and health procedures.

TUESDAY AFTERNOON SESSION

October 8, 1940

The Necessity of Active Participation of Management in Safety Work

By H. C. HENRIE

General Superintendent, Copper Queen Branch, Mines Division,
Phelps Dodge Corporation, Bisbee, Ariz.

Phelps Dodge Corporation may be considered one of the pioneers in industrial safety work. In 1913 when safety work was inaugurated at one of its mining properties industrial accident prevention work was in its infancy and it was difficult to convince either employer or employee that accidents could be prevented.

During the early years of our safety efforts the system of administering the work consisted of appointing a safety inspector whose duties were to see that no accident occurred in the mine or in the plant. Later a separate safety department was created and a safety engineer was placed in charge of all accident prevention work. In these early years several systems of administering the work and many methods designed to stimulate interest and promote safety education were tried with varying degrees of success. Progress made, however, was not satisfactory due to the tendency of the supervisory staff to regard accident prevention work as the safety engineer's job instead of a job for the entire organization.

During the year 1924 there were 2,829 accidents at the various coal and metal mining properties of the corporation with a resulting frequency rate of 1.11 accidents per thousand man shifts worked, or at the rate of one accident for every 7,200 man shifts worked. In the nine succeeding years the accident frequency rate decreased steadily, only 13 accidents occurring in the year 1933 with a frequency rate of 0.039 accidents per thousand man shifts worked. This represented a decrease of 96.5 per cent from the 1924 experience. However, during the latter year mining operations were conducted on a greatly reduced basis, and the personnel consisted largely of long-service employees, so the principal value of the foregoing figure is to indicate what can be

accomplished with an experienced, safety-conscious organization.

Since 1933 the expansion of operations has resulted in the employment of a large number of men, many of whom had no previous experience in mining. This condition necessitated a more intensive training and educational program.

During 1939 at all metal and coal mining branches of the corporation, 195 accidents occurred with a resultant frequency rate of 0.05 accidents per thousand shifts, or at the rate of one accident for every 160,000 man hours worked, a decrease of 95.5 per cent below the 1924 rate. The accident severity rate during the same year was 2.21 per cent.

Plan of Organization

The present system of administering safety work, which was adopted in 1925, was designed to correct certain weaknesses in our former procedure. As our experience had very definitely indicated that the responsibility for effective accident prevention work rested primarily on the executive officer and management of the company, it was felt that if this group would devote a reasonable amount of time to safety work, the accident record of the corporation could be improved. To accomplish this objective a committee, known as the Corporation Safety Committee, was established.

This committee, consisting of the vice-president of the corporation, the general manager, and the managers of the various subsidiary companies, is responsible for the administration of the accident prevention program. Meetings are held approximately every four months, and are arranged so that the committee visits each of the different branches or subsidiary companies in rotation. At these meetings the accident record of the various branches is reviewed, the ac-

cident record of the corporation analyzed, and methods for improving practice and new innovations studied. During these visits a meeting is held with the branch safety organization, and inspection of local operations is made.

This committee has been successful in developing a definite and uniform safety policy. Methods and practices at the various branches have been standardized to a very large degree. The active participation of the management group has been in a large measure responsible for the excellent progress made in reducing the accident rate of the Corporation and in creating what we believe to be a safety-conscious organization.

At each branch or subsidiary company there was established what is known as the General Safety Committee. This committee, consisting of the manager, who acts as chairman, and the superintendents and department heads, is responsible for the proper administration of accident prevention work at the branch. Through this committee, matters of policy, methods, and procedure developed by the corporation committee are carried directly to the departmental operating heads. Meetings with the manager presiding are held at least once a month at which time the branch accident record is reviewed, accidents analyzed and classified, methods for improvement discussed, and specific hazards and existing practices studied. Recommendations submitted by the departmental safety committees, many of which involve the expenditure of money, are discussed and passed upon.

In each major department of the branch, such as the mine, mill, smelting and mechanical departments, there were established departmental safety committees which consist of the superintendent, who acts as chairman, and the supervisory staff of the department. Each departmental committee is responsible for the accident prevention work in its department.

The departmental safety committees are the key committees of accident prevention work and are the mediums through which it is made a routine part of the operating duties of the supervisory staff. These committees meet at least once a month, at which time all accidents occurring in the department are analyzed and classified, and methods developed to prevent repetitions of similar accidents. Methods for improving existing

practice and elimination of possible hazards are studied.

In each operating unit of the department, such as a shop or mine division, a workmen's safety committee carries the accident prevention program directly to the day's pay employees, thus securing their interest and cooperation. This committee consists of the foreman, as chairman, bosses, and workmen representing the day's pay employees of the unit. It investigates, analyzes, and classifies accidents occurring within its department.

The workmen's committees have been a prolific source of suggestions and recommendations relating to the improvement of practice and the elimination of accident hazards. Committeemen representing the workmen serve for a three-month period, and through a system of rotation an ever-increasing number of workmen are brought into direct contact with the safety program, which is an important educational measure.

The plant safety engineer acts as secretary for all plant safety meetings, compiles accident reports and statistics, and, in conjunction with the departmental safety committees, investigates all accidents. In general, the Safety Department has full charge of first-aid and mine-rescue training and acts as a service department for the entire plant.

We are convinced that the committee system of administering accident prevention work is basically sound, and, when properly directed, results in making safety work an essential part of the operating duties of the supervisory staff. It also results in securing the cooperation of officials, managers, superintendents, foremen, bosses, and workmen in the safety program.

Methods of Procedure

We have found that complete and accurate information covering the accident experience of the various plants and operations is fundamental to effective procedure. A detailed written report is required on every accident, irrespective of how slight the resulting injury may have been. Employees failing to report an accident promptly to their boss are subject to discharge.

To obtain this information the safety inspector investigates every accident, and he may call on members of the safety committee of the department concerned for assistance and on any other persons having knowledge pertaining to the accident. After

viewing the scene of the accident and securing all available information pertaining to it, the investigating committee classifies the accident as to cause, and places the responsibility on the proper parties. A full report on the accident is then written by the Safety Inspector.

All accidents are thoroughly discussed and analyzed by the departmental safety committee in order to ascertain just how the accident occurred, the circumstances contributing to it, and the parties responsible. By analysis of an accident we mean a study of the particular work being performed, a survey of the equipment used, the method of preparing for the work, the personnel involved, and all the contributing causes which it is possible to obtain. The findings and recommendations of the departmental safety committees are reviewed by the General Safety Committee of the company.

The information secured through this system of analysis invariably indicates the remedy by which a similar type of accident may be avoided. This remedy may be additional mechanical safeguarding the elimination of unsafe tools or equipment, or in other directions that constitute an engineering problem. Again it may indicate unsafe practice, the need of more complete instruction as to safe methods of doing the work, closer supervision, laxity in enforcement of safety rules, or the need of disciplinary action.

After reaching a certain point in the reduction of accidents, further progress is largely dependent upon the ability of the safety organization to recognize unsafe practices and to correct them before an accident occurs. The analysis of no lost time accidents presents a fertile field in which to uncover unsafe practices. The difference between a no-lost-time and a fatal accident is often very slight.

In analyzing accidents, we have observed numerous cases where an employee, through lack of knowledge or instruction, was doing his work in the wrong manner. As a consequence, it was necessary to make job studies of the more common operations where it seemed that practice could be improved. Committees composed of superintendent, foreman, and bosses studied the movements connected with a certain job or operation and agreed on what they considered to be the most efficient and safest method of perform-

ing the work, after which the workmen were instructed to follow this method.

The required use of protective clothing has resulted in marked decreases in certain types of injuries. In 1925 it was ascertained that eye, foot, and head injuries were the contributing causes of 28 per cent of the disabling accidents during the year. To correct this condition, the use of goggles was made compulsory on certain jobs; safety hats are compulsory for all underground employees; and safety shoes for both underground and surface work. During recent years these types of injuries have been practically eliminated. The wearing of woolen underclothing by certain groups of employees engaged in smelting operations was insisted upon as protection from splashes of molten metal, sparks, and hot calcined material. After several employees were saved from a serious or fatal injury due to these articles of protective apparel, little difficulty was experienced in enforcing their use. Accidents due to burns decreased from 69 in 1925 to 5 in 1939.

In 1925 in metal mining operations there were 222 accidents resulting from falls of ground. During 1939 there were 18 such accidents. This decrease was accomplished largely by the use of duraluminum bars, which, being about one-third the weight of steel, permitted the use of longer bars and lessened the fatigue of the operation; better illumination, including electric lights in stopes, which permitted more thorough inspection of the backs; the use of sufficient timber; teaching men where to stand and how to bar down safely; and insistence by bosses that working places be thoroughly barred down.

In operations connected with underground haulage, 146 accidents occurred in 1925 and 4 in 1939. In this operation, improvements in the design of ventilation doors will undoubtedly prevent many serious and fatal accidents.

Considerable attention and effort has been devoted to the problem of safety education. Of the many methods tried, the most effective results have been obtained through direct contact between the safety inspector or boss and small groups or individuals. The employment of relatively large numbers of inexperienced men, which often takes place in a short period of time, necessitates additional efforts.

Talks to new men are given by the safety inspector. As many of these men are entirely inexperienced, a great deal of patience and explanation are necessary, and many elementary details must be covered, such as how to light and handle a carbide or electric cap lamp. At lunch time talks on safe practice and safety rules are given to relatively small groups. Employees are also examined as to their knowledge of the safety rules, and in certain occupations, such as motorman, on their proficiency and knowledge of their duties.

Discipline is a necessary adjunct to safety work. Regardless of whether the employee is a foreman, boss or workman, if, after instruction, he fails to show proper interest or cooperation, it is necessary to take disciplinary action.

Maintaining Interest

Safety competitions whereby the various subsidiary companies compete for safety trophies have been powerful factors in maintaining interest. Six different branches or subsidiary companies compete for safety

trophies which are awarded to the branch having the best frequency record and the best severity record. Under the standard method of compiling accident statistics, a lost-time accident is defined as an accident where the employee does not return to his job the shift immediately following the accident. No safety bonuses are paid either to supervisory staff or workmen.

The safety program of the corporation contains nothing new in practice or methods. We have not resorted to safety rallies, the emotional or revival-meeting type of appeal, in an effort to stimulate interest, and accident prevention work is handled in the same routine manner as are other operating problems.

We feel that the present plan of safety organization has been largely responsible for the reduction in our accident rate during the past sixteen years, since this system of administering the work, by bringing the entire organization into direct contact with the accident prevention program, has resulted in creating a safety-conscious organization.

What Should an Anthracite Mine Safety Inspector Look For?

By C. A. PETERSON

Safety Inspector, The Hudson Coal Company, Scranton, Pa.

"You only see what you look for" is a time worn adage. The hazards encountered in mining are so numerous and varied that unless they are systematically tabulated and frequently reviewed by safety inspectors and foremen many of them will slip into the background of our consciousness until they are suddenly and sadly brought to our attention by a fatal or serious injury.

A case with which I am personally familiar is that of my own employer. We have experienced the benefits of keeping constantly before safety inspectors and foremen what to look for in the line of injury hazards. We have done it by various means:

First: by providing a printed list of 210 more common hazards to be read over as a reminder by inspectors and foremen from time to time.

Second: by issuing a monthly letter briefly describing each fatal or serious injury which occurred on our property during the preceding month.

Third: by bulletins based on our current injury experience, issued at frequent intervals by our Safety Key Men's Organization, which is composed of officials who have achieved outstanding safety records. These bulletins are required to be read and explained by each of our sectional foremen to the employees under his jurisdiction.

In discussing what a safety inspector should look for I think it may be well to classify the subject matter into a few main headings: 1. Physical Hazards; 2. Unsafe Practices; 3. Mental Attitudes and Habits Inimical to Safety; 4. Methods of Supervisors and Inspectors which are Inimical to Safety.

You will note that I do not limit seeing to mean what is seen by the eye, but include also the mental and institutional searching which we must employ if we expect to effectively understand and influence others. Correction of physical hazards is of course

fundamental to any safety program, but that alone is not enough. Physical hazards and unsafe practices are merely the visible results of wrong mental attitudes and habits, and of wrong supervisory and training methods. In order to prevent a recurrence of physical hazards we must, therefore, look for and correct the faulty supervisory and training procedures.

The detection of physical hazards and unsafe practices represents the urgent and inescapable short-term problem of the safety inspector. The long-term problem is that of discovering and correcting unsafe mental attitudes and unsafe habits.

Disaster Hazards

With regard to physical hazards, I believe that the safety inspector should give special attention to hazards of potential disaster magnitude, i.e., hazards which may cause the loss of several lives at one time. Fortunately, disasters have been on the decrease but therein lies their greatest danger in that we may be lulled into a false sense of security regarding them.

Hazards of this type are large unsupported open areas in pillar mining which might cause sudden extensive squeezes or falls, neglected timber replacements in crushed ground, accumulations of methane due to geological structure, faulty mining methods or neglect of ventilation, bodies of water standing at elevations higher than the active workings, travel of groups of men on slopes or planes, improper handling of explosives, mine fire hazards, and inadequate second openings.

Falls of Roof

In looking for hazards of less than disaster magnitude the safety inspector can well be guided by the statistics of mine accident experience. Roof falls cause, roughly, one-half of all fatalities. It would be well if the inspector devoted something more than half of his time and effort to roof hazards for there is no type of accident which is more often inexcusable or which can more readily be prevented. A number of sectional foremen have supervised mining over long periods of time in sections where the roof was very bad and yet have had few roof fall accidents. This proves that such accidents can be largely eliminated.

Investigations of roof fall injuries lead

inevitably to the same conclusion. Safety inspections furnish evidence of a general tendency to neglect thorough and systematic examination of roof, and even more universal neglect of ribs and face. It is therefore evident that the most profitable place to expend accident prevention effort is in the prevention of roof falls.

Roof fall hazards in the northern anthracite field are extremely varied. There are the usual hazards from slips and saddles, from overhangs, from a thin weak stratum directly over the vein of coal, and from neglect of props and timbering. They are common to both chamber and pillar mining.

Much of the mining now being done consists of skipping pillars in crushed or caved ground. As a pillar is skipped a very definite danger zone is created along the original rib line of the pillar because there the roof has been weakened by exposure to air and moisture and by fracture. In such mining almost all roof fall accidents occur along the original rib line of the pillar and the safety inspector should therefore note if this zone receives special support and special attention when testing roof.

High veins, i.e., 9 ft. to 16 ft. and more, also have an extremely serious roof hazard on account of the height which makes inspection, trimming and timbering and propping more difficult. The number of roof fall injuries in high working places is entirely out of proportion to the tonnage obtained from them. The safety inspector should observe if the necessary effort is made to inspect, trim and secure the roof, and if necessary facilities in the way of planks and horses are provided.

Change in roof conditions as a working place advances is an important factor in many of our roof fall injuries. The safety inspector should note if, when conditions change, the miner changes his timbering and mining practice to meet the changed conditions.

Strata Between Veins

In some cases in the northern anthracite field we have as many as fifteen different veins of coal being worked at one time at a single colliery. Safety requires that the pillar robbing face in any given veins be kept a sufficient distance in advance of the robbing face in the underlying vein. The

safety inspector must familiarize himself with the nature and thickness of the rock strata separating the veins of coal in order to correctly evaluate the roof conditions found at the working faces.

Mining on a heavy pitch is frequently associated with injuries from falls of roof and coal, as well as injuries from falls of person. In such places we must make sure that roof, ribs and face are thoroughly trimmed; that props are stood close to the face and in such a manner as not to be dislodged by falling material; that sufficient loose coal is kept close enough to the face to permit the miner to have a secure footing and be in a safe position when trimming down loose material, and also when doing his other work; that manway steps are of sufficient strength and not too far apart; that top of manway is protected from falling material; that proper safeguards are used to prevent men from falling into chutes; and on extreme pitches that two manways are provided, one on either side of the place.

Transportation

Transportation continues to maintain its place as the second most serious source of injuries. Defective rolling stock, defective tracks, poor clearance, and neglect of sensible and well known safety rules are the common hazards we must look for and correct in order to effect a reduction in this type of accident.

Mechanical loading has largely eliminated the hazards from the handling of cars on heavy grades in chambers but the spotting of cars at conveyor discharge points on the gangway has taken its place as a prolific cause of transportation accidents. Fortunately, the spotting of cars on the comparatively gentle grades generally found on gangways does not require much skill or agility, regardless of whether the cars are spotted manually with the aid of snubs or mechanically by means of a car spotter (hoist).

The hazards which cause such accidents are—inadequate clearance and dirty track at car loading point, insufficient blocking of loaded and empty cars; use of improvised snubs which needlessly expose fingers to the danger of being pinched; starting to load car too close to the end and thus causing it to tip while being loaded; and hazards associated with car spotter hoists, such as

worn rope, unsafe mechanical conditions, and operating switch in wrong location (does not permit operator to remain a safe distance away from moving cars when using switch.) In the occasional cases where heavy grades are found on the gangway at the conveyor's discharge point, it is necessary to make sure that the man spotting cars is capable of doing the work safely or that a mechanical car spotter is provided which will permit the work to be done safely.

Methane

Ignition of methane has been largely eliminated as an accident cause by the use of electric cap lamps. However, the feeling of safety inspired by electric cap lamps may in some cases lead to neglect of brattice, flame safety lamps, doors, and ventilation generally. The safety inspector must be on the lookout for evidence of such neglect.

Blasting

Blasting has been made safer by the widespread use of electric detonators and igniters. Nevertheless, ignorance and carelessness continue to cause injuries even when electric blasting is used. The more important things to look for are—condition of blasting battery, especially the last date on which it was tested by the mine electrician; condition of firing line (noting whether joints are tightly twisted and staggered, also noting presence of short pieces of wire which should be discarded); location of firing station, whether blasting battery is kept under lock and key at all times except when actually in use, and whether ends of firing line are kept twisted together to short circuit them.

When there is no opportunity to observe a miner's blasting practices he should be questioned about them, the inquiries being directed toward determining his method of stretching firing line, whether signal lines are removed from face and all electric power is cut off before beginning to charge holes, method of handling misfires, and method of giving warning to others. The latter is especially important with regard to working places approaching each other or about to tap through into an opening.

Unsafe Practices

Unsafe practices are naturally much more difficult for a safety inspector to discover than are physical hazards, yet they are the

cause of so many injuries that they merit particular attention. Unsafe practices are connected with every step in the mining process—blasting, loading, timbering, transportation, etc., and they are so numerous that it is not feasible to attempt any kind of enumeration of them here.

One general rule the safety inspector may adopt for detection of unsafe practices—and that is, to closely observe every act of each man with whom he comes in contact, particularly noting what a man is doing at the moment when the inspector first sees him.

Although many unsafe practices are difficult to detect, there is one that is almost impossible for the safety inspector to overlook, and that is, failure of an employee to wear suitable protective clothing. It is an easy matter to note whether skulguards, goggles, respirators, gloves, knee pads (in low places) and hard toe shoes are being worn. It is important too to note their condition. We frequently hear of injuries prevented by wearing hard hats, but it should also be remembered that there have been cases of injury due to wearing broken hats which failed to give protection.

Mechanical Mining

The increase in mechanical mining in recent years has brought with it many new problems in safety. Although, in general, mechanical mining has inherent possibilities of greater safety than the methods which it superseded, such increased safety will not come about without a great deal of vigilance on the part of those charged with the safety operations.

Some of the most important hazards which the safety inspector must look for in mechanical mining are—insufficient clearance around machine installations, inadequate guarding of moving parts, defective or inadequate signaling apparatus, pulleys and jacks not securely anchored, apparatus not maintained in safe mechanical condition, worn ropes on undercutters and other equipment, failure to place guard on undercutter chain when not in motion, delay in standing props or timber in order to facilitate loading with certain types of apparatus, improper fusing, insulation, grounding and splicing on electrical installations, and the handling of heavy or cumbersome parts in an unsafe manner when installing or removing equipment.

There are a couple of miscellaneous items that also should be mentioned. On travelingsways the safety inspector should look for slippery or icy places, obstacles over which a man might trip or which he might bump into, and roof and timber hazards.

In working places approaching bodies of water, the safety inspector should note whether the State Mine Law with regard to width of place and bortholes drilled in advance and on the flanks is being complied with.

The safety inspector should also look for physical hazards which reflect oversight or neglect on the part of the sectional foreman, such as crosscuts not started at specified legal distance, and roof and rib conditions at other places than the immediate working face.

Mental Attitudes

Employees may be classified according to their mental attitude toward safety, as follows:

1. Unaware of the real magnitude and seriousness of the hazards of their work.
2. Hostile to safety suggestions from others.
3. Tolerant safety rules and admitting their merit, but not willing to change old habits.
4. Willing but not able. After years of exposure to the safety message, that is the condition of many a workman today. These men offer the greatest opportunity for immediate improvement in our safety record. They are willing to work safely but not able because habits are hard to change.

Sporadic hell-raising has its useful function in safety work as well as elsewhere, but it is a poor way of aiding a man to build up a safe habit. That can be done only by friendly but firm and frequent admonition at the right moment.

The safety inspector should try to discover which of the four mental attitudes an employee has, because from that we can determine how to handle him. If it is No. 1—Unaware of Hazards—he requires teaching. If it is No. 2—Hostile to Safety—he requires teaching and a firm hand; perhaps punitive discipline followed by friendly teaching if he seems to respond to the safety

idea—by discharge, if he does not. If it is No. 3—he needs teaching and perhaps exemplary discipline. If it is No. 4—he may need some discipline, but more than likely he needs a talk on habit formation followed by frequent check-ups and reminders before discipline is resorted to.

The safety inspector cannot of course interview every workman he meets to determine his mental attitude toward safety. He should, however, keep his eyes open to discover employees who seem to need attention along the lines I have just mentioned, that may be perhaps as few as one or two a day. The object of such effort is not so much the direct good it may accomplish as it is to focus the sectional foreman's attention upon such matters.

New Employees

Now how shall the safety inspector discover what employees need special attention? He should look especially for young men and new employees. New employees are generally conspicuous by their lack of familiarity with the company's safety rules and practices. A little judicious questioning as to previous place of employment and safety practices followed there will generally reveal his mental attitude toward safety.

Young workers should have special attention. The safety inspector should look for ways of showing the young worker that he has a genuine interest in his safety. This can be done by discussing with him in a friendly way recent injuries to young workers or some particular hazard which he must guard against in his present occupation.

Not many years ago one of the great obstacles to material safety improvement was the type of foreman who felt that both duty and responsibility were fully discharged if he could say when an employee was injured, "I told him not to do that but he went ahead and did it anyhow." Fortunately, years of safety education and refusal by management to accept such excuses has largely eliminated or reformed this type of foreman. The fault most frequently found in sectional foremen today is best described by the expression—"willing but not able." Not able because he is in the clutches of old unsystematic habits, and either the pressure of his daily work or

plain inertia prevents him from getting rid of them.

The Sectional Foreman

In general, the individual sectional foreman today has a better safety record than in the past, but there is still a wide discrepancy between the safety records of the best and the poorest, and this discrepancy may be attributed largely to three wrong habits of supervision which can readily be discovered by the safety inspector.

(1) Distraction by matters other than safety. Other matters are, of course, equally as essential as safety, but it is simply good business and good psychology for a sectional foreman to devote the first part of his visit to a working place to a thorough and relentless search for injury hazards, to make his last words before leaving the place an admonition concerning safety and to take up other matters in the intermediate part of his visit.

(2) Does not place enough emphasis on safety training of his men. Safety training should be a constant process. Even such a simple device as the habit on the part of the sectional foreman of asking a miner how he expects to do the balance of his day's work is helpful. In answering the question the miner naturally thinks of safe ways to do his work and the chances of safe work being done are much better than if the question were not asked.

(3) Compromising on discipline. This is the most serious wrong habit of all. When mercy or the desire for production, as the case may be, seasons justice, the stew often becomes all seasoning and no justice.

Correction of the foregoing habits is of course largely up to the sectional foreman's immediate superiors. However, if the safety inspector is observant of such faults, the sectional foreman quickly becomes aware of the fact with good effect.

The Safety Inspector

Finally, the safety inspector should now and then take inventory of himself; try to discern his own faults and failures and overcome them. He should ask himself—am I becoming merely a routine recorder and reporter of physical hazards? Do I study the men I meet and look for opportunities to leave a worth while safety thought with as many as possible of them?

When I look for safe ways of doing things, do I also ask myself if my way is efficient and acceptable to the workman? Do I study the sectional foreman and his record to determine what personal quality of his is preventing him from having a better safety record? Do I keep my awareness of all hazards and unsafe practices at a high pitch by frequently reviewing them? Do I try to sense whether my safety work is being accepted by the sectional foreman and his men? Do I try to acquaint the sectional foreman with all that he may expect the safety inspector to look for?

Effects of Change

Keeping posted on what to look for is of primary importance to any inspector, and to none more so than the mine safety inspector. All the factors which affect safety have been changing during the past few years and are continuing to change. Predominant physical conditions have changed from higher to lower veins, from open to more and more caved and crushed ground. Hand mining has given way to mechanical methods, and the original mechanical methods have been and continue to be displaced by more efficient mechanical methods.

Even our human factor is changing significantly as foreign born are displaced by native born. The man who started to work as soon as he was big enough to carry a dinner pail is being displaced in many cases by a high school graduate, and men who were old in the industry and whose work

habits have been formed before they were subjected to rigorous safety training are being displaced by young men who hear safety preached to them from the first day they enter the mines.

The result is a changing picture in which new hazards and practices are arising and emphasis on old ones is constantly changing. If safety is not to lag behind other phases of our progress, the safety inspector must know not only what to look for today but also what to look for in the changed situation of tomorrow.

Finally, I would like to address a few remarks particularly to the higher executive—whoever he may be—who is the safety inspector's superior officer. It is axiomatic that the workman will be found paying attention to whatever his foreman pays attention to. It is equally axiomatic that the foreman will be found paying attention to the things which the safety inspector pays attention to.

From whom then does the safety inspector take his cue? From the general manager, vice-president, or other executive, whatever his title may be. Moral: Furnish your safety inspectors with the right cues if you want your wishes to be carried out by the workman who handles our physical product.

Incidentally you may wonder why a safety inspector should have the temerity to offer that last bit of advice: so I will tell you—that is the way my boss does it and it works.

What Should a Mine Safety Inspector Look for?

By JOHN L. BOARDMAN

Chairman, Bureau of Safety, Anaconda Copper Mining Co., Butte, Mont.

Safety inspectors frequently develop pet aversions. I once knew an inspector whose pet aversion was caches of blasting caps and dynamite. The miners and bosses kept him so busy snooping about the gobs and old timber in search for powder caches that he failed to see many of the more important hazards.

Again, there might be a vast difference between visualizing and seeing. For example, a drift turned off at right angle from a main haulage crosscut. The track grade was quite

steep. The inspector saw to it that the motorman had orders to always keep his motor on the down grade end of his trains, and that the car loaders were instructed to block the cars securely. He saw the danger of a possible runaway, but someone had excavated ground and built a powder magazine in the crosscut exactly opposite the track frog of this drift. The inspector also saw that but he did not visualize the consequences which might follow a runaway train. One day the motorman was very

busy, he pushed the empties up the grade and blocked them, uncoupled his motor and went elsewhere to work while the loader dropped the empties down grade one by one and filled them from the chutes. He blocked the car wheels, but a passing miner accidentally kicked the block from in front of the wheels. The train ran away and piled up when it struck the frog. It shot across the crosscut into the powder magazine. The old powder monkey was inside opening cases of dynamite. It nearly scared him to death as he could not get out until the wreck was cleaned up.

This inspector learned that his job requires something more than merely seeing. It requires that one look ahead to visualize the whole dependent train which may follow a simple accident. He learned that, "What can happen will happen," and this should be one of the inspector's axioms. It may take a long time, but if a dangerous condition exists time is the only factor one must wait for.

As a usual thing the safety inspector has a rule book which specifies how things should be done, but unless he understands and is able to connect things mentally in a logical order, which will enable him to go far beyond the specifications of the rule book, he may overlook important hazards.

Mining is an ever changing scene. It is difficult to set up a list of things which a mine safety inspector should look for or see. The inspector must constitute himself an animated question mark, take nothing for granted and follow each item through until he knows that it is as it was intended to be.

In *Hoisting and Haulage* we first encounter the signal system. Is it dependable? Is there an auxiliary system? Are contractors i.e., pull bobs, conveniently located and in good order? Is a standard signal code used and complied with by all? Is there a definite regulation requiring that the signal system be tested after a period of idleness and before it is used in hoisting or lowering men?

Cages: How frequently are ropes and cages inspected and is there a regular crew or a particular person responsible for this inspection? Are king bolts, safety dogs, cage bounets, guide shoes, rope thimbles, and clamps in good condition? Is there compliance with the rule requiring that cage doors be closed and latched when one or more persons are on the cage? Are rules regarding

keeping drums clutched in when handling men complied with? Are rules regarding carrying men and materials on the same deck complied with? Are cage doors closed and latched before hoist signal is given? Are men allowed to get on to the cage while smoking or carrying prohibited material such as powder?

Shafts: Is the shaft regularly inspected? Are shaft doors provided at the various levels and are station sheets near the shaft kept clean and in good condition? Is the auxiliary signal system available to men on the cage at all points in the shaft? Are skip chute doors, either hand or power operated, kept in good condition to insure complete closure? Is there a proper shaft gate or bar at each level where shaft doors are not used? Is there a safe platform and proper guard rails at skip loading stations? Is the shaft properly lighted at stations upon which tight doors are used?

Are dump holes on stations properly guarded? Are safety belts and ropes provided and used by persons who must go down into ore pockets? Are stations kept in a neat and orderly condition and provisions made for free access to the shaft, the call bell, circuit breakers and fire extinguishers? Are proper provisions made to prevent runaway cars or locomotives running into the shaft?

Haulage: Are the locomotives in good condition, good brakes, sanders, couplings, circuit breakers, and are cabs neat and orderly? Are mine cars and trucks in good repair? What is the condition of the tracks, switches, ties, ditches, etc? Are there grades so steep as to prevent quick stopping of a train? Is there proper clearance between cars and motors and timber, chutes, pipelines, electric cables, fans and rock? Is there a signal system on levels where more than one motor is used to inform motormen that a track or section is being occupied by another motor? Are ventilation doors provided with peep holes to permit pedestrians seeing the approach of a motor or train from the other side of the door, and are doors provided with reflector signs to apprise motormen whether the door is open or closed?

Are doors located at points where there are steep grades or near noisy machinery? Are chutes properly located and provided with loading seats or benches? Are tracks under chutes kept clear and free of derailling hazards? Is there a method of warning

pedestrians of the approach of a train? Are provisions made for blocking cars on grades?

Mining: Are the back, breast and sides of all working places free of loose rock hazards? Is timber used where conditions indicate that it should be used? Are timber sets properly placed with butt blocks, back blocks and lagging properly used? Are manways offset a sufficient distance from the track? Are timber hoists so located as to protect the operator? Are chutes sufficiently braced and tight on the manway side? Are ladders in manways safe and are landings provided at proper intervals? Are air and water lines properly supported in the manway and clear of the ladder way?

Are manways free of loose rock, tools or timber? Are stope floors safe and free of stumbling hazards? Is timber in stopes and raises and drifts kept sufficiently close to the face? Are there any backs being carried so high that they cannot be safely reached with a pinch bar? Are safety stulls and back stringers being used where required? Is filling kept close enough to the working floor? Are grizzlies properly placed on chutes and are guard rails placed around all openings which might constitute a falling hazard?

Are the miners using safety belts and life lines when lining chutes? Are scraper hoists properly located and cables and blocks in safe condition? Are the tools, particularly pinch bars, adequate and in good condition? Are the temperatures and humidity too high and are the miners taking full advantage of ventilation facilities provided?

Is there a two way exit from the working place except in development work such as drifts, crosscuts and raises? Are manways large enough to permit use of a mine stretcher? In approaching to hole into other workings are proper precautions taken to warn men working therein at blasting, or if approaching old working which might contain water or bad air, are proper precautions taken?

Handling Material: In caging long material is it being properly lashed on the cage? Is material such as timber, pipe, rails, etc., which is stored along the drifts and crosscuts properly piled and clear of passing cars and motors? Are timber crates provided and used in handling shorter timber on the cages? Is salvaged timber, lagging, planks, etc. properly trimmed of projecting

nails? And is old timber properly disposed of or allowed to accumulate on stations and levels? Are timber hoists properly spragged down and safely located?

Are sharp tools such as axes, saws, picks and bars properly handled on cages? Are broken powder boxes, sawdust packing and wrapping paper promptly disposed of or allowed to accumulate about powder magazines? Are motormen permitted to push trucks of long material ahead of the motor?

Electric Power and Compressed Air: Are all circuit breakers, both automatic and manually operated in workable condition and are they readily accessible at all times? Are all electric cables, switches, motors, transformers, charging panels, etc., properly grounded? Are electric cables and wires properly insulated and supported upon insulators? Is breaking or moving timber or ground producing an undue strain upon electrical conductors or crushing or abrading them? Are ventilation fan motors properly located with reference to fire hazards? Are electric blasting switches kept locked and a key in the possession only of the man who makes the connection? Are electrical conductors run through gobs or other inaccessible places and are control switches for slusher hoists and fan motors readily accessible?

Are compressed air lines and water lines properly supported and clear of motors and cars? Are air receivers properly located so that drainage from them does not constitute a fire or slipping hazard? Are air line valves allowed to project into passageways so that they constitute a bumping hazard or might be damaged by passing traffic?

Explosives: When blasting powder and caps are delivered to the mine are they promptly disposed of? Is hoisting permitted in one compartment of the shaft while powder is being lowered in another compartment of the same shaft? Are properly constructed special powder cars in use? Are powder and fuse magazines properly located with reference to the shaft and haulage track, timbered sections and other hazards? And are they provided with identifying signs? Are electric blasting wires in good condition and properly insulated?

Fire Hazards: Are there at least two escape ways from each producing level and are they properly marked by exit signs? Are there any ventilation doors or brattices across designated escape ways which are not

provided with manholes or will difficult to open? Are there a tions of old timber, wood chips ing, or other debris which might taneously or which might in ar ner constitute a fire hazard?

Are fire extinguishers of th provided and are they properly charged and regularly inspected electrical conductors and made possible shorting due to abra from transportation, etc? Are supplies properly located with fire hazards? Are fire hoses provided with proper wrenches nozzles fit? Are surface built fire hazards? Are any building that a fire in them might ca enter the mine air intake and : any provisions whereby such is closed?

There are many other thing the men who work in the min receive the inspector's attentio observe closely the actions of encountered. If a man couple cars while they are in motion serves a miner using undue vi ing holes or working under lo doing any one of the thousand which miners in common wi of us are wont to do, he sho ration of the occurrence and, d his own status, perhaps warn the spot, or if he is delega thority, take disciplinary mea

Although this is an inade know that after the inspector observed all of them he will only 10 to 20 per cent of the dent causes.

We might here call attentio mental difference between : inspector and a mine safet mine safety inspector is per by the state or by the comp ries the employees compen: It is his duty to inspect th according to a definite set o When he has made his insp his company or to the State is finished.

The safety engineer em operator, must go much fu:

What a Mine Safety Inspector Should Look for in Bituminous Coal Mines

By JOHN L. LINDLEY

General Safety Inspector, Koppers Coal Company, Montgomery, W. Va.

Mine safety inspectors as persons may be classed in one of two general groups. One mine inspector may expend his efforts toward the prevention of mine disasters. I mean multiple fatalities. Another mine inspector may make his primary consideration the prevention of individual accidents. Here the mine safety inspector must make a decision as to what job of work his employment demands.

Designing a safety program is frequently the first job of a mine safety inspector. Hence, he should design a program in which he is qualified to participate to the fullest extent. This calls for self-analysis. Call it engineering, if you will, but it is engineering that is not affected in any way by the lack of or the possession of a college degree. A mine safety inspector can be greatly assisted in his work by the analytical reasoning that is the real product of a college training in engineering, but this same faculty can be developed by industrious and ambitious men who have not availed themselves of such training.

An important view in self-analysis is the ability to make other people feel that they have done, on their own initiative, the job you want them to do. If the safety inspector is too ready to assume that a good safety record is solely the result of his own effort, he is liable to lose the co-operation of those who made the record possible.

The First Consideration

The first problem, if we may call it that, of a mine safety inspector is to recognize what his individual problem is. After several years of experience in accident prevention work, I have come to the conclusion that each mine presents a separate and somewhat different situation in the job of preventing accidents. Any safety program that is designed to meet the situation at one mine cannot be equally effective, in its entirety, in any other mine—even though they may be adjacent properties in the same coal seam. The statement is based on the fact that two men think and act exactly the same and that no one actually knows what natural

conditions will develop until the coal is extracted and the natural condition is disclosed. Hence, as a mine safety inspector moves from one coal mine to another he must, in a measure, recognize a new problem.

Management and Labor

In my opinion, strained relations between management and labor have been indirectly responsible for a considerable portion of the lost-time and fatal accidents that have occurred in the industry during the past ten years.

The very nature of a mine safety inspector's routine work places him in a position to learn more about this subject than any other individual employed by the management or by the various governmental agencies. Whether employed by the company or state, his is the opportunity of personal contact with the individuals who constitute the two groups.

Through tactful approach and diplomatic contact he may be able to determine the cause for the collective mental disturbance to which labor groups are subject. Such mental disturbances are frequently a result of misunderstanding of company or governmental policy. They may be caused by individual representatives of management who may have been tactless or unreasonable in their interpretation or representation of company or governmental policy. One such person can upset the morale of an entire organization, and it is definitely one of the intangible items for which a mine safety inspector should look.

Company Policy

The policy of a mining company or governmental agency is always one of the abstract problems of the safety inspector because his is, frequently, the job of mediator between men and foremen in those controversies that arise when a written or unwritten point of company policy is capable of two interpretations. Hence, he should exhaust every available source to learn the policy of his company or agency in regard to the safety program.

The mine safety inspector, whether employed by a company or governmental agency, may not agree that the policies of the organization are correct. He may even feel that application of existing policy is detrimental to the success of the safety program; however, such political deficiencies should never be discussed except in the presence of his superior in authority. The mine safety inspector should see that he does not criticize, destructively, the policy of the organization he represents. If he does, he succeeds only in undermining the ground on which he stands.

Official Requirements

The inspector should know the legal requirements of all state agencies that pertain to mine safety, and be able to interpret the statutes or departmental rulings. Frequently, the legal phraseology used in writing law is confusing to the layman. But the inspector should be able to express them in language that is easily understood. The natural or physical conditions of an individual mine may affect, to a considerable extent, the meaning of a section of mining law, or its application. A thorough knowledge of the mining laws and their practical application will better equip the inspector to look for and find these exceptions.

The staff of the United States Bureau of Mines has been gathering information from investigative, experimental and theoretical sources for years, and it is yours for the asking. At least some of these outstanding recommendations will have an application in your mine or group of mines. Although each mine represents an individual problem in accident prevention, the mine safety inspector may obtain a plentitude of informative material from the publications of the bureau as well as some valuable assistance from its personnel.

The Type Accident

The next thing a mine safety inspector must do is to determine the cause for the type of accidents that are occurring at one mine. At this juncture each mine has to become a separate problem. The various procedures of work should be given as much engineering thought and planning as the layout and projection of the mine. When an error in procedure is found to be the cause for a certain type accident, then this procedure should be corrected. In most instances the correction of the procedure to

prevent a type accident will be accompanied by a higher degree of efficiency in that phase of production.

To change one of the many procedures of mining is an extremely difficult thing to accomplish because the change must break down some old established work habits of men and create new habits to take their place. Hence, any change in procedure to remove an existent hazard must be simple of design, easily understood, and definitely shown to be more efficient and easier of accomplishment than the procedure that is being replaced. If the new procedure does not have these qualifications it will usually fail in its purpose of reducing the type accident the inspector or safety engineer is trying to eliminate.

Although disciplinary force may be used in an effort to establish a changed procedure that lacks the qualifications mentioned, it can never be a permanent improvement because old work habits are more easily understood or more efficient or perhaps require less manual effort, and as a consequence will "wear out" the new procedure whenever disciplinary enforcement is relaxed.

Change In Procedure

If the same rule of procedure is persistently violated, the rule should be closely scrutinized to determine whether or not it is correct. Perhaps the rule of procedure may lack one of the essential qualifications. If after thorough study it is found to be deficient in design, too complicated to be easily understood by workmen, or too great a hindrance to efficiency—then some change must be made to overcome its ineffectiveness.

For example, the following quotations are from a safety rule that is one of a group applied by my company: "All employees must remain in a sheltered place at least 100 feet away from where the shot is being fired"; and "not more than one shot shall be fired at a time."

In ordinary hand loading into mine cars where the coal is shot by individual miners, compliance with the above parts of a rule was the natural procedure to follow. However, the advent of conveyor mining in thin seams of coal where four to six men work at one coal face, changed the effectiveness of this safety rule in one important phase. Compliance became a hindrance to efficiency in production and added a definite hazard to

the process of shooting or blasting down a cut of coal. If not more than one shot were fired at a time and six shots had to be fired to blast the cut of coal, then five men would be idle while one man crawled on his hands and knees a distance of 1,200 feet. In addition to the loss of time, a man was returning to an unknown roof condition at the face, in an atmosphere so filled with smoke and fumes, that aside from the health hazard, he exposed himself to falls of roof and rolls of face coal on each return to the face. This procedure would necessarily be duplicated from one to four times in a working shift.

The question of how this safety rule can be enforced without being a handicap to both men and management was finally answered by a process of multiple shooting with the shots connected in series. The six shots in a cut of coal are then discharged at one time by a ten-shot blasting battery. While the series connection does not eliminate the possibility of a "misfire," it is much less likely to occur than in a parallel connection. This change in the procedure really made the process of blasting a cut of coal safer and more efficient from a standpoint of explosives cost as well as productive time. An incidental improvement was coarser coal and better results from face preparation as to quantity of impurities.

Enforcement — Penalties

When the program of corrupted procedures and standardization is established as such, then disciplinary action of the proper

kind must govern those who are deficient in compliance. If the penalty of suspension or discharge is used as a medium of enforcement it must originate from the foreman who is in direct charge of the man who has violated a rule. It must be administered fairly, and only after all doubt has been removed that the violator is solely responsible. The penalty, to be effective as a corrective measure, should be applied immediately after the sole responsibility of the violator is established.

Too often, penalties are imposed as a result of a safety inspector's findings. This procedure can have only one result—namely, that compliance with rules will never be good while the inspector is absent. The real test of good discipline and enforcement is the answer to the question, "What does the man do when I am not looking down his shirt collar?"

Items of Inspection

My company has set up a general program for accident prevention. We feel that this general program has enough flexibility to meet and cope with practically all our problems—but, even so, we frequently find it necessary to make allowances and restrictions apply at one of the plants that may or may not apply at others. This company has been using an Inspector's Inside Rating Sheet and an Inspector's Outside Rating Sheet for the past eight years. During this period these two lists of items of inspection have been changed several times to meet changing physical conditions and mining procedures.

WEDNESDAY AFTERNOON SESSION

October 9, 1940

Safety Accomplishments During the Past 25 Years by an Old Timer

By A. A. BAWDEN

Range Safety Inspector, Pickands, Mather & Co., Ironwood, Mich.

My mining experience covers about 51 years and is mostly confined to the iron mines of the Gogebic Range. This district is located in the northwestern corner of Michigan and about the north western cor-

ner of Wisconsin. These mines are now nearly all down to 3,000 ft. depth. I can make the picture more vivid by going back about 25 years prior to the beginning of safety work.

In thinking over the conduct of the men in those days and the condition of the mines it gives one cause to wonder how we got by with as few fatalities as we did.

Guards of any description were unknown. Shaft, winze and stope openings were wide open at surface and at every underground station; railings or guards at these openings or on elevated places either on surface or underground or on machinery were undreamed of.

The men generally were a hard boiled bunch. This made it mandatory that every one should establish his right to belong by taking every hairbrained risk he could think of. Such stunts as jumping on and off passing skips was common practice; also drilling into and digging out missed holes with steel drills or iron scrapers.

In handling explosives, which in those days were much more sensitive than they are today, no arrangement was made by the employer to thaw dynamite; this was left up to the miner. I worked many shifts with three sticks of dynamite in each boot leg and at times with several sticks also inside my shirt. I have done and have seen others do the stunt of placing several short pieces of candle under a shovel full of dynamite sticks and squat there turning those sticks over on practically red hot metal to soften them enough to use. The man known to use any other means than his teeth to crimp caps on his fuse was ridiculed as a sissy, and no miner left the mine after blasting without groping his way back into the face to see how she tore.

First aid, as we know it today, was unknown. Doctors were few and far between and injured men received little sympathy from their fellows. In cases of fatalities, however, some respect was shown and all work would cease until after the funeral; generally the hat would be passed to raise funds to give the dear departed proper burial.

It seems pathetic now to note how the attitude of workmen has changed on this score of personal injuries. With the coming of compensation acts our men today will accept no responsibility for any of their acts. No matter how flagrantly silly may be the act that causes an injury the Company must bear all of the responsibility morally as well as legally. Our Company insured their risk about 1902 but the record is not clear that any inspections or recommendations

were made by the insurance carrier. Conditions seemed to run along about the same until 1910 when our people made a serious move to get the situation under control.

In launching their program our people drew up forms for formal reporting of injuries, safety committees were appointed and these committees made detailed inspections and reports covering only the physical condition of these properties.

Books of rules intending to outline and enforce human behavior to some extent were published in several languages in 1911; the first issue contained 214 rules. This book was revised in 1917 and condensed to 186 rules rearranged departmentally.

Many of those rules became obsolete and when the printed supply of books became exhausted we got along for several years without any and finally found ourselves with no authoritative rules to be enforced. So a new rule book was issued for our Gogebic District in 1937, containing 56 rules.

The drastic reduction in the number of rules was not because we had any fewer hazards to contend with but largely because many of the earlier rules covered employer behavior which by this time was taken to be a matter of course and a routine part of the operations.

The Safety Committee plan of procedure was maintained for a couple of years, then a safety supervisor of some experience was employed in the home office and he in due time organized our present Safety Department.

This organization for the mines of our Company consisted of one man known as the Range Safety Inspector on each Range. There were three of these inspectors, located one each, in Michigan, Wisconsin and Minnesota.

In starting me out our General Superintendent said, "Well, Gus, there's a job and that's the title; what the duties of the job are you know as much about as I do; let's see what you can make of it."

We worked a six day week with an 8 hour day underground and a 10 hour day for surface wage earners. The salaried workers did the best they could; in my case half of my work was so located that I put in 14½ hours three days a week and 10 hours a day the other three days for slightly over six years. Then came the automobile as working equipment and life was easier.

Our original safety committees, as well as ourselves, were pioneering in every sense of the word. That pioneering was made difficult because the demand for results came from the home office and was looked at by most local executives as an unnecessary frill that would be short lived. And for some time it was right down their alley to have occasion to report an injury that might occur when men were installing guards or if in any way a guard or safety device could be shown to be involved.

With the organization of the "Department of Safety, Welfare and Insurance" came systematic procedure, very slowly to be sure, but in time standards were set up. These standards covered requirements for guarding machinery wherever located; installation of ladders; maintenance of exits; procedure in storing, distributing and handling of explosives; and all other items that could be thought up at the time. The standards adopted in 1918 were considered by the operators as very drastic, but today it is safe to say that we do not have a supervisor who would not voluntarily go much farther than those original standards required.

In 1913 our Gogebie District, normally employing about 1,100 men, employed one safety worker, working alone against the odds of tradition and prejudice. First Aid training was just beginning with him and the Mine Rescue equipment consisted of three Draeger one hour breathing apparatus.

Today the personnel of this department consists of five full time workers backed by the active support of all of the official family. We carry on regular training in First Aid and Mine Rescue work, have had 100 per cent First Aid training by the Bureau of Mines at all of our mines, have frequently had extra Mine Rescue training by the Bureau, and have had several sessions of advanced Mine Rescue training for members of the supervisory force. One of our First Aid teams entered the International First Aid contest in Kansas City in 1929 and came away with third place Nationally and first place for our state of Michigan.

Our Mine Rescue equipment has grown from three one-hour machines to twenty two-hour machines, twenty self rescuers, twenty-five all service gas masks, several sets of carbon monoxide detectors, several inhalators, stench injector alarms at all mines, and carbon monoxide alarms on all

air compressors. Permanent fire doors are installed at strategic points in our mines, usually set in concrete frames, and shown on our mine maps. Our man cages wherever located are equipped with safety catches and our hoists are all equipped with automatic control devices, preventing over speeding or over winding.

In checking back on our history I find that our first safety meeting was held on March 26, 1913. At that meeting the new safety inspector introduced the subject of eye protection and was instructed to try to obtain usable goggles. The record of a meeting held two months later shows that we were experimenting with non-fogging preparations. Our first goggle was a wire screen affair made in the shape of an eye cup and was of no use except possibly for dust; a blow of any consequence would surely have knocked the eye out because of the shape of the goggle and its close fit around the eyes.

Our goggle program has grown remarkably since the introduction of the spectacle type goggle and we are now on what we call 100 per cent use of goggles both on surface and underground. We have some exceptions to the mandatory rule that every man must wear his goggles throughout the shift, but in those cases the workman must have the approval of his foreman and the foreman takes the responsibility.

Our mandatory placing of goggles on all men during all working hours grew out of an injury in which a mechanic lost an eye in 1937. This mechanic had been in the employ over 20 years, always in the mechanical department, still did not see the need for using protection on that particular job. So it was decided that the only way to get reasonable protection was to insist on the use of goggles on all jobs just as much of the time as it was humanly possible to wear them.

A survey of the progress made by this program was based on our experience in the ten-year period prior to the enforced use of goggles. During that period our average annual cost of compensation for lost eyes was \$2,314.03. Our survey was made after 2½ years' intensive use of goggles and we find that after spending \$1,834.32 per year for goggles and adding the cost of compensation payments and specialist's services for two eye injuries, we have a net cash saving of \$342.11 per year plus the saving of two eyes.

We had two eye injuries that required specialist's treatment; one of these was compensable for 21 days, the other lost no time; and at this writing, after three years, we have had no others.

I feel also that it is fair to take considerably more credit for the program than I have shown because for the ten year period compensation for lost eyes was the only item used, we did not bother to check up medical or compensation cost on eye injuries or medical cost on the lost eye cases, or which there were eight.

Our next venture in protective devices was in head protection, about 1918. In the Lake Superior copper mines they had used a hard hat similar to those in use in the tin mines of England. It was made of resin and fiber, and the hats came in three sizes only and were all round in shape; they required heating and shaping to the head before they could be worn in comfort. We obtained six of them, but never had occasion to order any more as they did not take well with the men. This hat when cold was quite hard, that being its only protective feature; it had no inner harness, such as the present day hat, and depended for cushion only on padding if the hat size were large enough.

On this matter of introducing new ideas in devices men have to wear, such as hats and goggles, the trying out of samples by a few men was never a success. Ridicule by those not supplied, made the wearers self conscious and embarrassed and we did not get satisfactory results. But where we took the same items and put them on everybody at the same time there was no trouble, and the good qualities of the item soon won favor for them.

All of our underground men today and a few surface jobs are equipped with protective hats; these as well as our goggles are furnished by the employer without cost to the employee.

Modern Safety Methods

Today in our underground operations centrally located magazines are maintained with a man in charge; this man is responsible for the maintenance of the supply in different grades and for the accounting of where it is used. Powder only is stored in this magazine which, where possible, is cut into a rock wall, the dimensions varying with the demand of the mine. These rooms are electrically lighted with wires in conduit, the

light bulbs being placed in a vapor proof globe usually with a metal guard, the light switch being outside of the room. They are also heated electrically where heating is needed. The only tools allowed in the magazine are a wooden mallet and wooden wedges and a bar of some non-sparking metal for opening cases. Heavy rubberized canvas sacks are provided the miners for transporting their powder from the magazine to their working places.

A separate magazine is maintained for the storage of fuse and detonators. Here the one man in charge of explosives cuts the fuse to required lengths and places the detonators on it, using what is known as the California cap crimper in the operation. Where electrical blasting is done this man generally makes up the primers with the necessary routine of timing in the electric detonators as required, this generally only for rock work. Ore miners usually make up their own primers in the working place, using a non-sparking metal punch for making the hole in the dynamite to receive the cap. Capped fuses and electrical primers are transported by the men from the magazine to their working places in felt lined galvanized iron containers of different sizes as required by the operation. Clay tamping or stemming is in general use, this is made up in the size and form of the dynamite sticks by the powderman and is paper covered. Wooden charging sticks are always used. The powder bags, fuse cans, powder punches and charging sticks are all furnished by the employer without cost to the employee even though he may be a contract worker.

From the earliest days of our district it has been the custom for the employer to provide a change house in which the workers could change from street to work clothing, as a complete change of clothing is necessary.

In the early days of our development these were crude affairs indeed, consisting only of the cheapest type of log or frame structure with a mere pretense to furnish wash water, this provided sometimes in a common trough. When one had any type of individual wash utensil he furnished it himself and was looked upon as a dandy putting on airs and assuming a superiority over the common herd. We now have quite modern facilities in our change houses; the buildings are usually of brick and are equipped with modern toilets, individual

metal lockers and ample shower bath equipment. Disinfectants are liberally used and foot baths for protection against athlete's foot are maintained.

In addition to goggles and hats already mentioned our men are required to wear safety shoes and boots on surface and underground. These they are required to pay for themselves, but in some cases they may be purchased through the employer at wholesale prices, the employer standing the cost of shipment only.

Shin guards are furnished all timber framers and men using adzes; these guards are being used underground by men working caves and stopes where leg injuries may occur. The guards are supplied by the employer.

All miners in rock work are required to wear respirators and several types of filter respirators are in use on different classes of jobs, these also being furnished gratis by the employer and bearing the Bureau of Mines approval.

At the beginning of our safety program underground sanitation was a problem that we wrestled with for some time. In those days we were using a crude paraffin for our underground illumination. This came to us in wooden barrels about the size of a 50 gal. barrel. Our first attempt at an underground toilet was by using one half of one of these barrels enclosed in a wooden box to form a one-holer and large enough to embody a compartment to contain lime as a disinfectant. We next tried the same sort of a scheme with carbide cans, but we got nowhere but in trouble on that attempt, too.

Then when we were about ready to give up hope on that problem we attended one of these mining section meetings in which a paper was read that described an allegedly successful solution to the vexing problem. This was described in some detail which we thought we had grasped and we went home so enthused that we prevailed on the operators to try it out. This trial involved sinking a hole in rock and lining it with concrete and putting in a concrete partition from the bottom up for a given distance. I was told that the cost of the job was about \$800 and the results certainly were worth that amount more than our previous attempts. Our more modern change houses with their toilet facilities have seemed to solve this problem for us very nicely.

On the subject of underground lighting,

we are now using individual miner's electric cap lamps, and in addition our mine openings are all wired and lighted by electric current of 110 volts. For many years in this scheme of underground lighting the current was taken from the haulage trolley wires at 250 volts. With the increased use of electric tugger machines we have now installed separate wiring systems throughout our mines, and they are so thoroughly illuminated that it is safe to say that men acquainted with the mines could travel from surface to the most remote working place without auxiliary light in about 90 per cent of our openings.

Also considerable use is made of flood lighting in large stope openings and some times in rock drifting.

Our moving of ore from the working face to the loading chutes has progressed from loading into wheel barrows with hand shovels, through a period of using buggies or small tram cars to slusher operation. Each of these cycles has presented its peculiar hazards which have been slowly fought down. In our present slusher operations we place a heavy screen guard in front of the machine operator to prevent him being struck by a possible back lash of a breaking cable.

In our drilling operations we are now using the comparatively new "Jack Bit" which requires the transporting of the bits only to the shops for sharpening. This device saves the transporting of drill steel repeatedly with its attendant hazard of injuries from several handlings of hundreds of tons of that material.

On our drilling machines operated by compressed air we place safety chains at hose and machine connections to prevent injuries by a hose thrashing around under high pressure in case the connection should part.

Our mines are now air conditioned by controlled air circulation, dust allaying is general practice, controlled by regular sampling of airways and working places. All openings are guarded or covered as closely as air circulation will permit. Immaculate housekeeping is being striven for and attained.

Safety meetings of foremen are generally held monthly and frequent short meetings of the working force are intended, but we have not gotten these down to as nice a routine as the foremen's meetings.

We have tried several safety incentive plans and at present have two of these in

effect, both based on cash payments for good records.

Posters of the National Safety Council are used regularly and have been ever since the introduction of the service. We have at times had a foremanship service, and a pictorial bulletin service and at present we are using two commercial bulletin services in addition to the National Council service. Frequently home made bulletins are used to advertise items of local interest and these we often illustrate with photographs, our Department being equipped with a camera for that purpose. We also get out a monthly bulletin to foremen which is mailed to their homes.

Having given you this picture of general conditions, the accomplishments can be shown by stating that in fifteen years of participation in the National Safety competition my Company's division of the Gogebic-Marquette district consisting of the four underground and two open pit mines has won the Sentinels of Safety twice, once in the underground division and once in the open pit.

For 1939 the severity rate for our underground mines was .81 and for our open pits .10, combined rate .72. For the first six months of this year our severity rates are underground .37, pits 0, combined .34.

Advantages That Have Been Gained Due to the Invention and Use of Methane Detectors

By J. H. ZORN

Safety Engineer, Union Colliers Co., Oakmont, Pa.

Methane, commonly called "fire damp" or simply "gas" by the average miner, is found in all coal mines and in some metal and other mines. Its safe removal is a problem of modern production methods. Methane is flammable, colorless, odorless and tasteless. Its flammability and explosiveness when mixed with air in proper proportions is the chief characteristic that is of concern to mining men.

In concentrations less than 5 per cent which is the lower explosive limit, methane will burn, but there is not enough to support propagation. When the source of ignition is removed, there is no further burning of the gas. However, concentrations between 5 per cent and 15 per cent, the latter being the upper explosive limit, mixed with air are explosive and when a mixture of methane gas and air in this range is ignited, an explosion results. Mixtures of air and more than 15 per cent methane will not explode, as there is not enough oxygen to support combustion. Maximum violence and force are developed when approximately 9.5 per cent methane mixed with air is ignited and the intensity of the explosion depends upon the volume of the mixture.

Although an air mixture containing less than 5 per cent of methane is not explosive, it has been shown conclusively by experiments that lower concentrations of methane

in mine air increase the chances of coal dust explosions. With fine coal dust suspended in the air, one or two per cent of methane may produce an explosive mixture.

Mechanical mining and high speed haulage systems increase the amount of methane and explosive dust so that it is of primary importance to have sufficient ventilation to keep the methane content to a minimum at all times in all parts of coal mines. Under normal operating conditions, the percentage of methane should be so small that short interruptions in ventilation by doors being left open or broken stoppings will not permit the accumulation of an explosive mixture.

Adequate ventilation in modern mining is of primary importance and is the best means of preventing explosions. Sources of ignition are secondary in importance but should be guarded against in all production programs.

To have adequate ventilation, the detection of methane even in minute concentrations is a requisite and a most important factor with respect particularly to the efficiency and cost of air distribution. Ventilating equipment should be operated 24 hours every day, and a sufficient volume of air supplied to maintain specified ventilation standards. It is desirable to learn as much as possible regarding methane in mine air and to locate its sources whenever feasible. The quantity

and rate of escape of gas are unknown factors from solid coal as well as from reservoirs of gas in rock strata which may enter a mine through cracks or other openings in the roof or bottom as "feeders" or "blowers." Atmospheric conditions have some effect on the amount of methane liberated in a mine as a fall in barometric pressure may permit more gas to flow from "feeders" or crevices. Changes in barometric pressure may be considered as important in bleeding methane gas from gob or worked-out areas particularly.

In still air, methane, being about 45 per cent lighter than air, will stratify and be found near the roof. However, in moving air currents, methane gas usually becomes diffused or mixed readily and once diffused will not stratify again. The amount of methane in return air of a mine depends not only on the amount of gas given off but also on the amount of air for ventilation. The methane content may vary from day to day, even when the air current is kept at a uniform volume.

There are five important sections of any coal mine that should be regularly inspected so that complete information will be available regarding the percentages of methane in air currents under operating conditions. These are:

1. The face working, supplied with intake air.
2. Each open break-through after the air leaves the working face.
3. All split returns after the air leaves the last working place.
4. The tops of falls on the rib-line and the bleeder returns after the air leaves the gob section.
5. The outlet that includes the complete return of the air.

Three common methods for the determination of the methane content in the various sections of the mine are by laboratory analysis, using an Orsat or similar apparatus, flame safety lamps, and electrically operated, portable methane detectors.

In the laboratory method, samples are collected in sampling tubes or bottles and taken outside the mine, where the analysis is made by someone skilled in this work. Considerable time is required to collect the samples and there is usually a time delay until the results are available for practical use.

Flame safety lamps are commonly used

for the detection of methane and an estimation of the percentage above 1 per cent can usually be made with fair accuracy by those accustomed to this method of testing. Some experienced men may detect even less than 1 per cent. In any case, experience, condition of the eyesight, temperature, and condition of the lamps are factors that may cause differences in readings or observations by various individuals.

For the accurate detection and measurement of methane in mine air, even in extremely low concentrations, and as a guide to proper ventilation control, it is most desirable to use methane detectors approved by the Bureau of Mines. The operating principle of these is based on the burning of methane on the surface of a platinum wire heated by current from dry cells or the well known Edison Cap Lamp Battery.

Among the many valuable applications for electrical methane detectors, the following cases may serve as examples and be interesting. As a result of readings obtained with this type of detector, ventilation changes were possible that could not be taken care of by any other method of gas sampling.

1. One Mine Outlet carried .52 per cent and was reduced to .27 per cent. This was accomplished by removing falls and other obstructions in the air courses, constructing new overcasts, and adding new intakes and returns.

2. One Mine Outlet carried .6 per cent and was reduced to .4 per cent methane. The reduction in methane was due to removing obsolete stoppings, leveling off falls in the air courses, constructing new overcasts, and sweeping gob sections with the return air from other working sections by increasing the number of openings.

3. A split carried .35 per cent and was reduced to .18 per cent methane. This reduction in methane content was due to a regulator being changed to increase the air, falls cleaned, and an additional return added.

4. A split carrying .9 per cent was reduced to .45 per cent methane by opening up additional returns, leveling off falls and increasing the air.

5. A split carrying .43 per cent was reduced to .23 per cent methane by installation of a new overcast, an additional air course, and increased air.

6. A split carrying .37 per cent was reduced to .19 per cent methane by increasing the amount of air after a new overcast and return were added.

7. A reduction in methane and an increased volume of air resulted from a methane detector survey at one mine. At this particular location, a return carried .6 per cent methane in approximately 80,000 cu. ft. of air. Under certain conditions this air volume varied from 50,000 to 80,000 cu. ft. By opening up three intakes and two returns, constructing three new overcasts, and tightening up and rebuilding several stoppings, the volume of air was increased to 105,000 cu. ft. which was constant and carried only .28 per cent methane.

8. In a routine inspection, .79 per cent methane was found in a split which was reported clear by the mine officials in the section. Additional methane detector readings were made immediately at the face of the last room on the return side where .6 per cent methane was present and at the last breakthrough of the room on the intake where .85 per cent methane was indicated. As a result of these findings, the electric power was cut off and the men removed from the section immediately. On further inspection a fall was located on a single face return entry outby the developing butt. The entry was nearly closed and considerable gas was being liberated from the roof. Double doors outside the butt were opened which permitted 24,000 cu. ft. of air to sweep the section. The small inby area was ventilated and one of the two bleeder rooms parallel to the caval entry was cut through as it had only needed two cuts. Ventilation was immediately restored by this procedure to its proper course and further methane detector readings showed only .18 per cent.

9. At another mine it was necessary to completely reverse the air. As the mine generated considerable methane, it was most important in making the change which was to be permanent, that the methane content was determined immediately before and after the change in all sections of the mine. In making this change, a methane detector was used to obtain the percentages of methane which permitted the reversal of the air to be made without any undue delay.

10. At another mine, four machines were down because of gas, and no particularly large feeders were found. However, many

clay-veins were being cut at the same time and all were generating small quantities of methane. Tests made with the methane detector showed that there was too much gas being carried in the air current in two machine sections for the safe operation of the machines. The other two sections in the same split were found to be safe enough to move the machines, motors, and other electrical equipment to unaffected parts of the mine. This split of air had to remain idle for about a week until the air could be rearranged. Two machines were tied up for this length of time. Without the methane detector to determine the conditions in the air current, all the machines in this case would have been tied up for several days.

In commenting on the value of methane detectors, the Chief Mine Inspector of a large bituminous coal mining company made the following statement:

"We work in a coal area that is broken up by many clay-veins. At any time, one or more of these clay-veins may be cut, either by a cutting machine or a drill, and a large gas feeder liberated. Quite often the liberation is so rapid and heavy that the normal amount of air will not carry the gas away fast enough or keep it diluted to a safe limit. In these cases, we must shut down the section while the gas is bleeding off. When this occurs, we use the Detector to follow the progress of the "bleeding off" period. Several determinations are made each day. This gives us accurate knowledge of the condition of the air current. We can be positive that the gas has been reduced to a point where it is safe to start work again. There is not the guess work that we once had."

Although the methane detector can be used for detecting methane in any concentrations that may be encountered in mines, the importance of detecting low concentrations of methane should not be overlooked and it is well illustrated by this example:

Assuming a ventilating current carrying 200,000 cu. ft. of air per minute containing .1 per cent methane, it is obvious that 200 cu. ft. of this mixture is pure methane. In an hour, this ventilating current would discharge 12,000 cu. ft. of pure methane which converted to an explosive mixture of 5 per cent methane would be equivalent to 240,000 cu. ft. of explosive mixture. Should

this ventilating current be interrupted for a period of 24 hours and with the same amount of methane being liberated, there would be 5,760,000 cu. ft. of explosive mixture. Should this be contained in an entry 10 ft. square, the length of the entry would be approximately 11 miles.

Methane detectors are now available which will automatically indicate and record percentages of methane. One type may be located in working sections on cutting and loading machines, in the last breakthrough and along haulage roads. This can be adjusted to give a warning by a signal light or other means at any predetermined methane concentration. For example, at 1 per cent or any specified percentage between .5 per cent and 3 per cent, it will operate special electrical circuits through suitable relays to cut off the power in a section or

give warnings in other parts of the mine or to the outside. Methane recorders for continuously indicating and recording methane in main returns particularly have been perfected recently and are designed to be located in fan houses or other convenient places.

There is no relation between the volume of methane given off in a coal mine and the chemical composition of the coal, as both bituminous and anthracite mines produce methane, and methane has been found in metal and other mines when tunneling through carbonaceous shales. The common occurrence and explosibility of methane are responsible for numerous mine disasters and every precaution should be taken to keep it within safe limits. This can best be done by the use and guidance of methane detectors.

Pulmonary Diseases in the Mining Industry

By DR. R. R. SAYERS

Director, United States Bureau of Mines, Washington, D. C.

Although the attention of those interested in diseases peculiar to mining has been focused recently on one dust disease—silicosis—other respiratory diseases may cause more suffering and economic loss. The increased incidence of these diseases usually is attributed to exposure to abnormal air conditions underground, such as sudden changes from high to low temperatures, excessive dust, and noxious gases. The principal respiratory diseases to which the miner is subject are bronchitis, influenza and pneumonia, pulmonary tuberculosis, anthracosis, and silicosis. Although the mortality statistics in some of the tables included in this paper are old they have been corroborated by later, less complete data.

Bronchitis

Bronchitis is an inflammation of the bronchial tubes due, among other causes, to the inhalation of irritants such as dusts (organic and inorganic). Occupations that entail exposure to atmospheres polluted by irritating gases carry with them the risk of bronchitis. According to Collis,¹ it cannot be distinguished clinically from bronchitis occurring among the general population and its association with the inhalation of dust or gases usually is unrecognized.

During middle life bronchitis causes much recurrent invalidity and incapacity. Mortality records compiled by Collis² indicate that it is of a chronic traumatic origin associated with irritating atmospheric conditions, rather than of an infectious origin.

Statistics for bronchitis for the general population and for workers exposed to dusts in Great Britain³ for 1921-23 show the role played by dusts in the increased incidence of the disease in certain industries. The comparative mortality per thousand (ages 26 to 65) for those in occupations exposed to siliceous dust was 214, for those exposed to nonsiliceous dust 59.5, and for the general population 49.6. (See Table 1.)

In this connection it is interesting to note the mortality statistics per thousand (ages 26 to 65) for coal miners of counties of Wales (in which most of the coal mined is anthracite) compared with those for two other groups in England and Wales.⁴ The figures for coal miners are 112 for all underground workers and 139 for hewers and getters compared with 46 for males in the same social class and 50 for all occupied and retired males. (See Table 2.)

In a study by the United States Public Health Service⁵ 35 cases of chronic bron-

Table 1.—Mortality per 1,000 from Bronchitis in Dusty Occupations and in the General Population, by Age Groups

Occupations exposed to	Ages at Death					Comparative Mortality Figure
	20—	25—	35—	45—	55—	20—65
Siliceous dust.....	1.1	1.0	13.7	44.6	153.7	214.0
Nonsiliceous dust.....			4.9	12.8	41.8	59.5
General population.....	0.5	1.7	5.4	13.3	28.8	49.6

chitis were found among 344 employees of two anthracite mining companies examined.

In the study conducted by the Bureau of Mines and the Public Health Service at Picher, Okla.,⁶ the highest incidence of silicosis or tuberculosis, or both, was found among men who reported having had bronchitis, pleurisy, and asthma.

Table 2.—Comparative Mortality Figures for Bronchitis per 1,000 of Certain Groups in England and Wales

	Bronchitis
Coal miners ¹	112
All underground workers.....	139
Hewers and getters.....	46
Males in same social class.....	50
All occupied and retired males.....	302
Ratio of rate for hewers and getters to rate for same social class.....	

¹ In three counties in Wales.

Table 3.—Influenza-Pneumonia Mortality among Bituminous Coal Miners—October to December 1918

Age Period	Annual Death Rate per 1,000	
	Bituminous Coal Miners	All Industrial White Males
All Ages ¹	50.1	22.3
15-25	29.5	17.5
25-45	62.1	32.6
45-65	44.4	11.7

¹ Fifteen years and over.

Influenza and Pneumonia

Figures of mortality available for 4,700 miners insured in the group department of the Metropolitan Life Insurance Company⁷ show that in the last quarter of 1918 during the influenza epidemic 64 of these miners died of influenza or pneumonia. This is equivalent to an annual death rate of 50 per 1,000. Among all occupied males aged 15 years and over, the rate from influenza-pneumonia in the same 3 months was 22 per 1,000 or less than half as high. In the age period 45 to 65 years the rate among bituminous coal miners was about four times as high as among all occupied males in the same age group. (See Table 3.)

Influenza and pneumonia, as reported, were responsible, in the years under study, for 31 per cent of the mortality in the group of bituminous coal miners at ages 16 to 70 in Indiana, Missouri, and Wyoming compared with 19 per cent among both farmers and "all other males" at these ages in the same counties. (See Table 4.)

In 1918, the year of the great epidemic, influenza and pneumonia deaths constituted 55 per cent of total mortality exclusive of accidents among the bituminous miners in contrast with 27 per cent among the farmers and 34 per cent among all other males. These percentages were not as high as the figures for Wilkes-Barre. The fact that the soft-coal counties under consideration are largely rural areas may have made some difference.

In the epidemic year 1920, the proportion of deaths from influenza and pneumonia was smaller than in 1918, but, as was found for the anthracite miners, the bituminous group showed a wider difference in the pro-

Table 4.—Percentage of Deaths from Influenza and Pneumonia (After Deducting Accidents) Among Bituminous Coal Miners Compared with Farmers, and With Other Males in the Same Areas of Several Soft-Coal Producing States¹

Male Groups Under Comparison	Ages					
	16-70	16-30	31-40	41-50	51-60	61-70
Bituminous coal miners.....	31.1	49.4	44.7	25.1	19.7	10.3
Farmers.....	18.7	38.4	32.4	19.7	12.4	10.8
All other males.....	18.6	30.0	29.0	16.0	11.3	10.8

¹ The death records for soft-coal miners were obtained from 15 coal-producing counties of Indiana, 1916-20, inclusive; 8 coal counties of Missouri, 1917-21, inclusive; and the 6 principal coal-producing counties of Wyoming, 1919-23, inclusive. The record for farmers and for "all other males" was obtained from the above-mentioned coal-mining counties, and also from 3 agricultural counties of Wyoming, 1919-23.

portion of deaths from this cause compared with "all other males" than in 1918. The percentages in 1920 were 29 for the soft-coal miners and 16 for "all other males." In this epidemic the bituminous miners at ages 40 to 60 suffered heavy excess mortality from influenza-pneumonia, but the differential mortality was not quite so great as at ages 16 to 30.

Among hewers and getters of soft coal in England and Wales, the death rate from influenza and pneumonia, 1921-23, was about 12 per cent greater than among males of comparable social status (social class 3). The difference was found to be 5.8 times the probable error of the difference which is certainly a significant variation. Thus, an abnormal mortality from influenza and pneumonia is consistently indicated among miners of coal—both anthracite and bituminous—in England as well as in America.

The pneumonia mortality figures in 1921-23 for occupations in Great Britain exposed to siliceous and nonsiliceous dust compared with those for the general population were given by Collis² as 134.3, 76.0, and 85.3, respectively; similar figures for influenza were 47.1, 49.6, and 36.5, respectively. (See Table 5.)

According to Brundage,³ an outstanding feature of the statistics of death for hard-coal miners in the United States is their extraordinary mortality from influenza and pneumonia not only during influenza epidemics but at other times as well. In a study by the Public Health Service at Wilkes-Barre, Pa., in 1915-23 and 1906-25⁴ it was found that influenza and pneumonia were responsible for 40 per cent of the total deaths compared with 25 per cent among males at ages 15 to 65 who had been en-

gaged in pursuits other than coal mining in Wilkes-Barre and vicinity. The percentage of deaths from influenza and pneumonia for these two groups by ages for the years mentioned was 19.3 for anthracite miners compared with 13.3 for males in other industries. (See Table 6.)

Tuberculosis

In 1925 Collis⁵ said that for coal miners generally the tuberculosis rate apparently is low although miners at the coal face suffer from the disease more than other coal miners underground and workers above ground. Results of more recent investigations seem to contradict the assumption that tuberculosis does not occur among coal miners. An investigation by the Welsh School of Medicine, reported in 1937,⁶ indicates that this supposed exemption of coal miners from tuberculosis may be due to a mis- or partial diagnosis. This investigation revealed a high incidence of tuberculosis (35 per cent if the "probable" cases are included) among the pneumoconiotics of the South Wales coal fields and supports the theory that coal dust modifies the tuberculosis, leading to failure to recognize the disease or to the mistaken diagnosis of "bronchitis."

Studies by the United States Public Health Service⁷ revealed that 6 per cent of hard-coal miners examined had clinical pulmonary tuberculosis. The average prevalence in the adult male population of the United States is about 2 per cent. The prevalence of pulmonary tuberculosis among hard-coal mining employees at ages below 35 was slightly less than that found through studies among male adults in the general population. In the age group 35 to 44, however, the prevalence of tuberculosis was

Table 5.—Mortality per 1,000 from Pneumonia and Influenza in Dusty Occupations and in the General Population

Occupations exposed to	Pneumonia					
	Ages at Death					Comparative Mortality Figure
	20-	25-	35-	45-	55-	
Siliceous dust.....	3.3	14.4	30.6	47.2	38.7	134.3
Nonsiliceous dust.....	9.6	13.7	28.7	25.9	25.9	76.0
General population.....	4.3	11.5	19.6	24.2	25.7	85.3

Occupations exposed to	Influenza					
	20-	25-	35-	45-	55-	Comparative Mortality Figure
	20-	25-	35-	45-	55-	
Siliceous dust.....	1.1	7.7	11.3	8.7	18.3	47.1
Nonsiliceous dust.....	5.4	4.8	13.7	10.6	14.9	49.6
General population.....	2.0	5.2	7.7	9.7	12.0	36.5

about twice, at ages 45 to 54 about 5 times, and for ages above 55 it was about 10 times the rate found in the general population. The highest prevalence of clinical pulmonary tuberculosis occurred among the rock workers (men who had been employed in rock loading or rock extraction for more than 2 or 3 years). After 20 years' service, of which more than 2 or 3 years were in rock work, 37 per cent presented evidence of pulmonary tuberculosis. In a group of 135 completely disabled former anthracite workers, which did not include any known cases of tuberculosis, 10 per cent proved positive for pulmonary tuberculosis. These findings would appear to corroborate those of the Welsh National School of Medicine that indicate that the supposed exemption from tuberculosis of coal miners is erroneous due to incorrect diagnosis. There is evidence that the above increased incidence of tu-

berculosis is associated with exposure to silica dust.

The incidence of tuberculosis is much higher in metal mines than in coal mines, due no doubt to exposure to dust containing a higher concentration of silica. An investigation in 1914 by the Bureau of Mines in cooperation with the Public Health Service of pulmonary disease among the zinc miners of the Joplin, Mo., district, revealed a high death rate from pulmonary tuberculosis. The mortality rate for tuberculosis for Jasper County was 200.8 per 100,000 for 1911 and 1912 and 229.7 for 1913, according to statistics of the State Board of Health. On the other hand, according to the Jasper County Antituberculosis Society, during the calendar year 1912 there were 720 deaths among miners who had worked 2 years or more underground in Jasper County. Not all

Table 6.—Percentage of Deaths from Influenza and Pneumonia among Anthracite Miners and among Males in Occupations Other Than Mining in Wilkes-Barre and Vicinity

Groups Under Comparison	Ages					
	15-64	15-24	25-34	35-44	45-54	55-64
Anthracite miners.....	39.8	45.2	67.9	42.9	31.8	19.5
Males in other industries.....	25.3	28.7	46.2	31.0	16.8	13.3

Table 7.—Mortality per 1,000 from Pulmonary Tuberculosis in Dusty Occupations and in the General Population

	Ages at Death					
	20-	25-	35-	45-	55-	20-65
Occupations exposed to						
Siliceous dust.....	25.6	63.4	141.0	211.6	150.6	592.2
Nonsiliceous dust.....	13.6	26.3	46.1	56.4	29.9	172.4
General population.....	20.6	37.6	43.6	39.0	22.7	163.5

of these 720 deaths occurred in that county but they had contracted the disease there and some of them had moved away. Of 93 miners in the Joplin District examined by Lanza in 1914,¹⁰ 64 showed definite symptoms of pulmonary disease and 39 of the 64 had the classical symptoms of pulmonary tuberculosis.

In a study by the Bureau of Mines and the Public Health Service¹¹ in Butte, Mont., during 1916 to 1920 the death records of the State Board of Health were examined. These showed that during 1915, 122, during 1916, 126, and during 1917, 169 Butte miners died of tuberculosis. The significance of the death from tuberculosis of 169 miners in 1917 is indicated by comparison with the records of other regions. In 1917 approximately 14,000 men were employed underground in Butte mines; with 169 deaths from tuberculosis for the year, the rate per 100,000 was 1,207. The tuberculosis death rate of Michigan for the 10-year period 1910 to 1920 was 97.4 per 100,000; hence the tuberculosis death rate of Butte miners was nearly 13 times as great as that of Michigan.

The part played by dust, especially dust containing silica, in the production of pulmonary tuberculosis is shown clearly by figures for Great Britain for 1921-23.¹² The death rate per 1,000 for ages 20 to 65 was 592.2 for those exposed to siliceous dust, 172.4 for those exposed to nonsiliceous dust, and 163.5 for the general population; for ages 35 to 44 the figures were 141.0, 46.1, and 43.6, respectively; for ages 45-54 the figures were 211.6, 56.4, and 39.0, respectively; and for ages 55 and over the figures were 150.6, 29.9, and 22.7, respectively. (See Table 7.)

According to Collin¹ the prevalence of bronchitis, pneumonia, and tuberculosis is

high among those exposed to silica dust but the incidence of these diseases is not always the same under other conditions such as exposure to other dusts, heat and fumes, or working indoors. (See Table 8.)

Anthracosilicosis

From 1931 to 1937, 87 per cent of the total deaths in Great Britain due to silicosis occurred among the coal miners of South Wales; two-thirds of the deaths and disease occurred in the Swansea Division; and 89 per cent of the medical certificates granted in the Swansea Division related to anthracite collieries.¹³

In the United States the chronic disease among miners due to breathing air containing dust generated in the various processes involved in the mining and preparation of anthracite is called anthracosilicosis. This is a descriptive title for the form of pneumoconiosis commonly called miners' asthma. The disease was found in about 23 per cent of 2,711 employees of three anthracite mining companies studied by the United States Public Health Service in 1933. About 63 per cent of those having anthracosilicosis showed evidence of disability, compared with less than 10 per cent in the control group. Moderate and marked degrees of disability handicapped approximately 21 per cent of those with anthracosilicosis compared with less than 2 per cent of the men serving as controls.

Wide differences were found in the extent of physical impairment in the several occupational groups. The highest rate of disability from all causes combined was found in the group of men that had changed more than 5 years before the date of examination from very dusty to relatively nondusty occupations in the industry. In a

Table 8.—Prevalence of Bronchitis, Pneumonia and Tuberculosis Under Certain Conditions of Exposure

Exposure	Bronchitis	Pneumonia	Tuberculosis
Outdoor and indoor life.....	low	low	low
Indoor industries.....	low	low	high
Coal trade.....	high	high	low
Alcohol trade.....	moderate	high	high
Heat and fumes.....	high	high	low
Dust of.....			
1. Animal origin.....	low	low	low
2. Vegetable husks and debris, certain inorganic materials.....	high	medium	low
3. Silica.....	high	high	high

number of instances the change in occupation probably was made on account of physical condition. Miners at the coal face, rock workers, and men who had had appreciable exposure to harmful dusts in other industries also showed evidence of much greater physical impairment than was found in the control group.

Moderate or marked physical impairment from any cause was found in 1.7 per cent of the control group, in 9.9 per cent of the regular miners, and among 12.6 per cent of the rock workers.

There was a marked tendency toward increase in the proportion having physical impairments with increase in the number of years of employment in anthracite. This tendency is manifested whether one considers disability of any kind, disability in which pulmonary infection was contributory, or disability due largely to tuberculosis. In each case the occupational groups arrayed themselves according to extent of physical impairment as follows: (1) Rock workers; (2) regular miners; (3) all others exposed to more than 100 million dust particles per cubic foot of air; and (4) men in haulage-ways except rock workers.

The pathology of anthracosilicosis as observed in these cases is essentially a deposition of coal dust in the lungs, accompanied by an extensive fibrosis, both diffuse and nodular, with associated functional and degenerative changes, (silicosis modified by coal dust).

That excess mortality from respiratory diseases as a whole is experienced by American hard-coal miners is clear from the studies made by the Public Health Service.⁴

The anthracite miners' proportionate mortality from all respiratory diseases was about 1½ times that of the other adult males in the same region. When proportionate mortality was computed for ages 16 to 65 in Wales,⁴ it was found that respiratory diseases accounted for 53 per cent of the deaths of anthracite miners compared with 38.2 per cent among males in the same social class. The proportion among hewers and getters of anthracite therefore was 1.4 times that of men of the same social status.

Silicosis

There are various definitions of silicosis but all agree that the cause of the disease is the inhalation of silica or quartz dust.¹⁴ Silicosis is a well-recognized clinical and pathological entity at least as characteristic as that of any cause of death known to epidemiologists.¹⁵ The definition of silicosis, adopted at the International Silicosis Conference in 1930 and reaffirmed at the 1939 Conference and generally accepted is:

"Silicosis is a pathological condition of the lungs due to inhalation of silicon dioxide. It can be produced experimentally in animals."

The first investigation of silicosis in the mining industry in the United States was made in 1914-15 by the Federal Bureau of Mines in cooperation with the United States Public Health Service in the Joplin (Mo.) mining district.¹⁶ As only a few men were examined at that time, it was decided to examine a larger number to gain a more accurate idea of the prevalence of consumption among the miners of this district. From

Table 9.—Mortality from Certain Respiratory Diseases of Those Exposed to Siliceous Dust, to Nonsiliceous Dust, and the General Population—by Age Groups¹

Groups	Respiratory Diseases											
	Bronchitis				Influenza				Pneumonia			
	20-25	25-35	35-45	45-55	20-25	25-35	35-45	45-55	20-25	25-35	35-45	45-55
Siliceous dust.....	1.1	1.0	13.7	44.6	153.7	214.9	1.1	7.7	11.3	8.7	18.3	47.1
Nonsiliceous dust.....			4.9	12.8	41.8	59.5	5.4	4.8	13.7	10.6	14.9	49.6
General population.....	0.5	1.7	5.4	13.3	28.8	49.6	2.0	5.2	7.7	9.7	12.0	36.5

¹ Made up from tables 1, 2 and 7.

May 15 to December 31, 1915, 720 miners were examined: 45.7 per cent had silicosis and tuberculosis and 5.3 per cent had tuberculosis.¹⁰ A later report (1917) of this same investigation by Lanza and Childs¹¹ included the results of the first detailed X-ray studies of silicosis made in the United States.

Investigations of mining conditions by Harrington and Lanza¹² in Butte, Mont., in 1921, revealed that 42.4 per cent of 1,018 miners examined showed definite signs of lung damage due to dust.

From July 1, 1927, to June 30, 1932, the Metropolitan Life Insurance Co., the Tri-State Zinc & Lead Ore Producers Association, and the Federal Bureau of Mines operated a cooperative clinic at Picher, Okla.,¹³ to demonstrate to industry a workable method for diagnosis of silicosis, to educate workers in preventive measures, and to serve as a model to industries presenting a dust hazard. Of 27,553 individuals examined during this period 5,366 had silicosis, 742 silicosis plus tuberculosis, and 320 uncomplicated tuberculosis.

The chief cause of disability in silicosis is tubercle infection. The silicotic lung appears to be a more favorable medium for the growth of the tubercle bacillus than the normal lung, not because it is fibrotic, nor because its lymphatic drainage is interfered with, but because it contains silica.¹⁴ Apparently silica dust possesses this characteristic of increasing the liability to pulmonary tuberculosis. That this is true is indicated by the statistics quoted in this paper which indicate also that silica dust increases the liability to other respiratory diseases. (See Table 9.)

The results of virtually all studies are in agreement regarding the high mortality rates from tuberculosis for industries in which large numbers of men are exposed to a silica hazard. These rates are so high that they leave no room for doubt of the cause-and-effect relationship between the hazard and the high mortality.¹⁵

Joint studies made by the Actuarial Society of America and the Association of Life Insurance Medical Directors¹⁶ revealed that there were 65 deaths where 6 were expected (about 11 times the expected number) from tuberculosis in 1925-1936 among a group of underground miners, most of

whom were employed in metal mines. Tuberculosis deaths were fourteen times the expected among copper miners, nine times the expected among gold and silver miners, and eight and a half times the expected among iron miners. In an earlier study¹⁷ covering the years 1915-1926, there were 18 times as many deaths as expected among lead and zinc miners.

An analysis by the field division of the Saranac Laboratory¹⁸ of the roentgenograms of 5,000 white miners exposed to the inhalation of harmful concentration of silica dust shows that the incidence of pulmonary tuberculosis lesions increases as the degree of reaction to dust progresses. In this group of miners tuberculous lesions were found in approximately one-fourth of those with first stage silicosis, one-half of those in the second stage, and 65 per cent of those in the third stage.¹⁹

Prevention of Dust Diseases in Mining

The data given in this paper point to dust as the greatest contributor to the excessive mortality from pulmonary diseases experienced in the mining industry and to silica dust as the immediate cause of the disease silicosis. Therefore, the principal method of preventing these diseases is to eliminate as far as possible or reduce to harmless concentration the dust in the breathing zone of the workers. Experience has shown that the properties of a dust that determine its capacity to produce injurious effects are its composition, the quantity suspended in the atmosphere breathed by the worker, and its particle size.

Although any dust may be harmful to breath under certain conditions, as indicated by the data presented here that show a higher incidence of pulmonary diseases in nonsiliceous dusty industries than in the general population, physiological studies reveal that, in mining the harmfulness of a dust is proportional to its content of free silica or quartz, in particles small enough to enter the finer spaces of the lungs, and in high enough concentration to overcome the normal defenses of the respiratory system.

The prevention of dust diseases is the function of the physician and the engineer, working together to determine the extent of the dust hazard in industry and methods for its control.

The first step is to determine what dusts are harmful and in what concentrations. The procedure is somewhat as follows: It is observed that respiratory diseases appear more frequently or with greater severity among workers in certain industries or in connection with certain operations within an industry. The physician attempts to determine the extent of the injury to the health of those exposed and the cause. If the cause appears to be exposure to excessive dust, the engineer samples the air to determine the kind, amount, and size of the dust present. The physician and the engineer can correlate the results of their investigations to determine allowable concentrations of dust, exposure to which is not likely to cause harmful physiological reactions. The engineer is then in a position to devise measures for the reduction of the dust to a harmless concentration. The aim, of course, should be to eliminate the dust entirely or to reduce the dust to a concentration that will not cause disability during the working lifetime.

Allowable Concentrations of Dust in Mining

Investigations conducted over a period of years show that exposure to certain concentrations of harmful dusts for a certain time causes varying degrees of respiratory disability but that below these concentrations disabling pulmonary diseases do not occur within a working lifetime. The classical example of this is the experience in South Africa with the reduction in mortality from silicosis that has followed the reduction in air dustiness in the mines of that country.

The reduction in the incidence of silicosis in the South African mines attests the effectiveness of the control measures employed and the practicability of using a definite dust concentration as a guide in setting allowable limits of air dustiness in the prevention of pneumoconiosis in dusty industries. The production rate of silicosis in the scheduled mines of South Africa²⁰ in 1932-33 was 9.59 per 1,000 compared with 21.95 in 1917-18. (See Table 10.)

The incidence rates for silicosis uncomplicated by active tuberculosis among South African miners in 1936-1937 was between 8 and 9 per 1,000 per annum.²¹ The liability among the whole body of miners to contract the disease in 1936-37 was less by 65

Table 10.—Average Number of Miners Examined Annually and Production Rates for Silicosis in Each Triennial Period Since 1917-18

Period	Average Number of Miners Examined Annually	Production Rate of Silicosis per 1,000	Period	Average Number of Miners Examined Annually	Production Rate of Silicosis per 1,000
1917-20	14,070	21.95	1926-29	14,624	21.11
1920-23	13,260	19.16	1929-32	16,774	13.87
1923-26	12,523	33.28	1932-35	20,139	9.59

per cent than it was in 1920-23. Among the "new Rand miners" who entered the industry by way of initial examination since 1916 and who have been exposed solely to the progressively improving occupation conditions that have obtained since that date, the liability to contract silicosis was less by 87 per cent than the similar liability among all miners working for an equal period in 1920-23. These "new Rand miners" constituted 77 per cent of all working miners examined. The group of pre-1916 miners, who in 1935-36 constituted less than 17 per cent of the total number of working miners contributed nearly 78 per cent of the new cases of silicosis.

In the study by the Public Health Service of anthracosilicosis among hard coal miners silicosis was not found in a control group of mining employees whose dust exposure averaged less than 5 million particles per cubic foot of air.

The prevalence of anthracosilicosis among the entire group of employees was found to be about 23 per cent.

Among all except rock workers, less than 2 per cent of the men developed anthracosilicosis when the duration of employment was less than 15 years, regardless of the amount of dust in the air.

Among men exposed 15 to 24 years to dust containing less than 5 per cent free silica, 14 per cent of those who had worked where the average dust count was 100 to 199 million particles per cubic foot, 29 per cent of those exposed to 200 to 299 million particles, and 58 per cent of the men who had worked for this period in more than 300 million particles per cubic foot, developed anthracosilicosis.

Among men employed for more than 25 years in dust containing less than 5 per cent free silica, the proportion of persons found with anthracosilicosis under different concentrations of dust was as follows: 5 to 99 million particles, 7 per cent; 100 to 199 million particles, 54 per cent; 200 to 299 million particles, 71 per cent; 300 or more million particles per cubic foot, 89 per cent.

With the exception of miners, their helpers, and rock workers, about 25 per cent of all the men employed underground developed anthracosilicosis after a working period of more than 25 years. This group was exposed to dust having a quartz content of about 13 per cent.

The prevalence of anthracosilicosis among persons who had been exposed for more than 2 or 3 years to dust of which about 35 per cent was free silica, varied from 10 per cent among those who had worked in concentrations of less than 200 million particles per cubic foot for less than 15 years, to 92 per cent among those who had been employed for more than 25 years in dust concentrations exceeding 300 million particles per cubic foot, more than 2 or 3 years of which time was spent in rock work.

Age per se appeared to play a minor role in the development of anthracosilicosis.

Analysis of the data for the purpose of determining safe limits of dust exposure indicated that employment in an atmosphere containing less than 50 million dust particles per cubic foot would produce a negligible number of cases of anthracosilicosis when the quartz content of the dust was less than 5 per cent. In the gangways where the silica content of the dust was about 13 per cent, a safe limit appeared to be 10 to 15 million

Table 11.—Pneumoconiosis Cases Occurring Among 798 Workers Exposed to Mixed Dust, Classified by Average Dust Concentration, Length of Employment, and Number of Workers Exposed

Average Dust Concentration (Million Particles per Cubic Foot)	Years in Industry				
	0-4.9	5-9.9	10-14.9	15-19.9	20 and Over
0-9:					
Number of pneumoconiosis cases.....	0	0	0	0	0
Number of workers exposed.....	81	56	29	13	8
Percent with pneumoconiosis.....	0%	0%	0%	0%	0%
10-24:					
Number of pneumoconiosis cases.....	0	0	0	2	4
Number of workers exposed.....	123	94	66	29	23
Percent with pneumoconiosis.....	0%	0%	0%	6.9%	17.4%
25-49:					
Number of pneumoconiosis cases.....	0	0	3	3	6
Number of workers exposed.....	43	45	31	11	18
Percent with pneumoconiosis.....	0%	0%	9.7%	27.3%	33.3%
50 and over:					
Number of pneumoconiosis cases.....	0	4	5	4	4
Number of workers exposed.....	45	44	25	8	6
Percent with pneumoconiosis.....	0%	9.1%	20.0%	50.0%	66.7%

particles per cubic foot. The limit of toleration for rock workers was set tentatively at 5 to 10 million particles per cubic foot of air. Similar results were obtained by the Public Health Service in an investigation of pneumoconiosis among mica and permatite workers. (See Table 11.)

The relation of the average dust concentration and duration of exposure to the percentage of workers found to have pneumoconiosis was as follows: Of those who had worked in an average concentration of 50 million particles of dust per cubic foot of air, 9 per cent had pneumoconiosis in 5 years, 20 per cent in 10 years, 50 per cent in 15 years, and 66 per cent in 20 years. Of those who worked in an average concentration of 25 million particles 10 per cent had pneumoconiosis in 10 years, 27 per cent in 15 years, and 33 per cent in 20 years. Of those who had worked in an average concentration of 10 million particles of dust, 7 per cent had pneumoconiosis in 15 years and 17 per cent in 20 years. (See Fig. 1.)

The data obtained in other studies of dusty trades, anthracite mining, asbestos textile manufacture, and the pottery industry have been treated in a similar fashion and have yielded similar, although usually less regular, results. The position of the threshold

value below which no cases were found and the magnitude of the trends between per cent affected and both time and intensity of exposure varies in different sets of data, depending, to a large extent, on the chemical nature of the dust to which workers were exposed and possibly on the regularity of employment.

It is tempting to seek to summarize the data of table 12 and figure 1 into a simple mathematical relation such as the following: With each twofold increase in average dust concentration above 10 million particles per cubic foot, the probability of finding cases of silicosis (in men exposed for comparable lengths of time) is approximately doubled. Application of the standard methods of curve fitting would yield more refined descriptions of these data. Nevertheless, it does not seem to be advisable to set up any mathematical treatment because, of all the men who entered the industry, only the survivors have been studied. There is no adequate way of finding out whether or not men who dropped out of the industry were in a better or worse state of health as far as silicosis is concerned than men who remained in the industry, and thus there is no way of introducing a correction for this element of selection into a mathematical

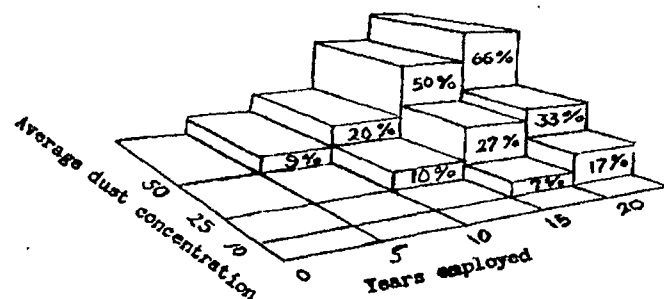


Figure 1.—Relation of average dust concentration and duration of dust exposure to the percentage of workers found to have pneumoconiosis. Based on data presented in Table 11.

treatment. It seems to be preferable to present the facts as simply as possible, together with the precautions to be kept in mind in studying them, and to emphasize that the principal use of these data is to show the degree of improvement in health to be expected in the future if dust formation and dust dispersal are brought under control in these and in similar industries.

Methods of Dust Control

After the physician and engineer have learned by observation and experimentation what kinds of dust are harmful and in what concentrations, it is the function of the engineer to evaluate the hazard in a particular industry, plant, or mine and devise measures for its elimination. The first step is to become thoroughly familiar with the industry being studied to determine the dusty occupations, the number of persons in each, and the various activities and time devoted to each activity in any one occupation.²⁰

The amount of harmful dust created by various activities can be determined by taking samples of the atmosphere in their vicinity and counting and identifying the dust particles. Sampling of air is also a means of checking the efficiency of any control measures that may be adopted.

Several devices are available for collecting and counting dust samples. The im-

pinger, however, is the instrument used most frequently in the United States. The Bureau of Mines and the Public Health Service have issued publications describing the method of sampling dust by the impinger (as well as by other methods) and procedures for counting and identifying the particles.^{21, 22}

Dust sampling is complicated by the fact that air dustiness fluctuates rapidly from moment to moment. A single dust count represents only the amount of dust in the atmosphere at the time and place of sampling and gives no indication of the average exposure of the worker over a period of years, especially if he has not worked continuously at one job. The ultimate lung injury that he may suffer will depend upon the integrated effect of the dust over a long period.²³ A proper measure of dust exposure requires a picture of the variations in dustiness. The best procedure is to determine the dustiness during different stages of an operation and, with the aid of a time study, break down the worker's day according to the time spent in each step; from these data the average dust exposure of the worker can be calculated.

Drilling.—Experience in South Africa²⁴ with new methods of sampling have revealed that more dust is produced by rock drills

Table 12.—Period Worked at Face by First-Stage Silicotics

Job	Average Number of Years	Number of Men	Job	Average Number of Years	Number of Men
Shovelers' helpers (bruno men).....	6.8	8	Machinemen (drillers).....	11.4	348
Shovelers.....	8.4	428	Powdermen.....	11.5	24
Drillers' helpers (dummies).....	8.4	79	Shovel bosses.....	15.8	21
Trackmen.....	9.8	52	Ground bosses.....	19.0	54
Roof trimmers.....	11.3	26			

than had been suspected, the difference consisting entirely of dust too fine to be detected by the older methods. The importance of control of drilling dust as a measure of the prevention of silicosis is demonstrated by the fact that the incidence of silicosis has remained consistently and considerably higher among machine drillers than among those who have never worked machines, and the excess incidence among machine drillers has been in direct proportion to the amount of time spent upon rock drilling.

Until relatively recently drilling of holes for blasting was a negligible producer of dust or air dustiness in coal mines especially other than anthracite mines. The hand-operated auger drill produces very little fine dust, but with the extension of mechanized mining power drills are becoming more and more essential and some of them are heavy producers of finely divided dust: this is especially true of reciprocating drills of the jackhammer type drilling dry and using compressed air in the clearing of holes either in coal or in roof or floor material.

Blasting.—The exceptionally heavy incidence of silicosis among rock drill miners in the early period of the gold-mining industry in South Africa²⁵ was due to the exposure of the rock-drill miner not only to drilling dust but to high concentrations of dust from blasting, and frequently to the inhalation of varying amounts of the irritant fumes produced by blasting, owing to the methods of blasting then in use. Blasting produces large quantities of very fine dust, the finest fractions of which tend to remain suspended in the mine air for a long time, unless removed by ventilation.

Shoveling or Mucking.—In the Picher, Okla., study,²⁶ it was difficult to show the relationship of the duties of the men to

silicosis because of frequent change of occupation. All examined were divided into two groups—those exposed to large amounts of dust (those employed at the face) and those exposed to relatively small amounts (those away from the face). In the order of exposure to the dust hazard, the men at the face included shovelers' helpers, shovelers, drill helpers, machinemen, trackmen, roof trimmers, powdermen, shovel bosses, and ground bosses. According to analysis of the occupations of face workers the hazard was greater for shovelers' helpers and shovelers than for machinemen if length of time required to produce first-stage silicosis is a criterion. It is noted from table 13 that the average number of years worked by shovelers' helpers and shovelers was 6.8 and 8.4 years, respectively, while that for machinemen was 11.4 years.

Loading and Hauling.—Under some conditions hand loading of coal throws into the air of the working place considerable quantities of dust, but the amount is about one-tenth that caused by some types of mechanical loading. The greatly increased occurrence of dust from mechanical loading is due not only to the stirring of the dust into the air by the loading machines themselves but also to the greater capillarity of breaking down and taking coal from the face regions which increases other dust-producing processes, especially blasting, cutting, and hauling.²⁷

Poorly constructed or poorly maintained pit cars or over-topping of coal in cars allows fall off or fine material to sift through to the tracks to be ground under the wheels of rolling equipment or the hoofs of mules and then to be thrown into the air by speeding cars or shuffling mules or men.²⁸

Where conveyors (either the shaker or belt type) are used they form potential sources of dust clouds at the points where the coal is dropped or thrown which occurs at the discharge ends only. Also, where conveyors are used conditions at the face differ from those experienced with the older methods of working in that the miners are closer together, there is a tendency with the more systematic working for a larger number of the men to perform dust-raising operations at the same time, and the air speed at the faces is higher.²⁰ These conditions, if not controlled, tend to increase the dust exposure to the face workers.

Machine coal cutting.—When coal-cutting machines came into the picture early in the present century to supersede in large part both hand cutting and blasting off the solid, the really heavy producer of coal dust that the worker has had to endure was at hand, and this was especially true of the chain machines operated by electricity. Top cutting is the worst offender in so far as impregnating the air with dust is concerned, shearing occupies an intermediate position, and undercutting is the least offensive in this respect. However, undercutting machines under some conditions (such as cutting dry in friable coal with dull bite in a confined place with little or no circulating air) may produce air dustiness so dense as to reduce visibility almost to zero with available types of mine lighting and to cause between 100,000,000 and 500,000,000 (or even more) dust particles to be carried per cubic foot of air of the face region.²¹

Methods of Control

The principal measures for controlling dust in mining operations are ventilation, wet methods, proper blasting practice, the use of personal respiratory protection, and physical examination.

Ventilation.—The more or less generally accepted conclusion that coal miners suffer less from miners' consumption than metal miners, who either die early in life or are incapacitated in middle age, is due almost entirely to the superior working conditions in coal mines as a result chiefly of ventilation.

Approximately in order of their importance, the main features that affect air in metal mines are (1) movement, (2) temperature, (3) relative humidity, (4) gases, and

(5) dusts. In coal mines the order of importance would probably be (1) movement, (2) gases, (3) dusts, (4) relative humidity, and (5) temperature.²²

The matter of movement of air from the surface, through the working faces or places, and then back to the surface is by all means the most important consideration in effecting adequate ventilation of mines and in protecting the health and forwarding and maintaining the working efficiency of the underground workers. If adequate quantities of pure air are directed to the places where men work, most of the requirements of health and many of the demands of safety will be well served.²³

Ventilation probably is the most effective dust-control measure although under some conditions it ranks second to wet methods. Where ventilation can be applied effectively, dust can be removed from the air or its concentration can be so diluted as to render it almost harmless.²⁴

Wet methods.—As dry drilling is the dustiest operation in mining, wet drilling will keep air dustiness within safe limits if used with care and judgment in collaring wet, using plenty of clean, dirt-free water, and keeping the drills in good repair with adequate regulation of the proportion of water and compressed air flowing through the drill steel.²⁵

In tests by the Bureau of Mines²⁶ the dust concentration in the air during actual drilling decreased as the water flow through the drill increased. The water flows for stopers was 0 to 3 gallons per minute, and that for drifters from 0 to 1.02 gallons per minute. The rate of decrease for stoper drills was greater for water flows from 0 to 1.3 gallons per minute than for higher water flows. The rate of decrease for drifter drills was similar to that for stoper drills at corresponding water flows and rather constant for water flows of 0 to 1.02 gallons per minute.

The results of this study shows that as water flow through the drills was increased the dust concentrations in the air decreased, but they do not show whether the decrease was caused directly by the increased water flow, by some condition influenced by variation in water flow, or by a combination of these factors.

In most pneumatic rock drills air passes

through the drill steel with the water. Ordinarily some of the high-pressure air supplied to the drill for its operation escapes into the back end of the drill steel, even when the operating throttle is not in the blowing position, and travels up to the face of the hole being drilled. The amount of air escaping is affected by the water flow through the drill steel; as the water flow through the drill steel increases the air flow decreases. Mining officials in South Africa concluded that such air leakage, although probably facilitating removal by the water of the cuttings from the hole, was responsible for entrapping fine dust and blowing it into the air during drilling.²⁷ Consequently they have devoted much attention to designing drills that permit the minimum practical air leakage through the drill steel and have established regulations on the use of such drills. Canada is also doing much work along this line, and recent reports state that such drills are practical and produce about one-fourth the dust concentration of corresponding drills without the "dustless-head" features.²⁸

The results of this study show that operators can reduce dust concentrations resulting from drilling by increasing the water flow through the drill steel, either by increasing water pressure or by the use of water tubes of larger inside diameter.

Tests also have been conducted by the Bureau of Mines²⁹ on the effectiveness of spraying water along the outside of the drill steel compared with that of standard wet-drilling practice. The tests show that spraying water along the outside of the drill steel should not take the place of regular wet drilling. However, if a method is developed by which the device may be used on holes of any inclination, it might prove to be a valuable accessory to regular wet drilling in collaring and drilling the first 2 feet of a hole. Tests show that the greatest amount of dust is thrown into the air of a working place in drilling the first 2 feet of a hole.³⁰

Wet drilling standards have been adopted in New York State for drilling in various classes of rock. The requirements for drilling in Class II rock (rock containing more than 10 per cent free silica) in confined areas, which include the use of mechanical ventilation, are quoted below.³¹

1. "Wet drilling shall mean the continuous application of water through the central

hole in the hollow drill steel to the bottom of the drill hole. The central hole in the steel shall not be less than $\frac{1}{8}$ " diameter.

2. "The water flow shall be maintained continuously whenever the drill is in operation, including the period of collaring or starting the drill hole. The valve in the water line shall be of such design that it has only two fixed positions, namely, closed and completely open. Six months after date of approval, all wet drills shall be equipped with a combination air throttle and water valve of such design that the required rate of water flow through the drill steel will be insured whenever the air throttle is in the operating positions, half speed as well as full speed.

3. "The water shall be clean and bacteria free and shall be delivered to the drills under pressure from an adequate source of supply. Portable water tanks for individual drills shall not be used unless approved by the Industrial Commissioner.

"Wet drilling in Class II rock in confined areas shall be used with mechanical ventilation, or in confined areas under decking by natural ventilation, if approved by the Industrial Commissioner and subject to the following provisions:

1. "The rock surfaces for a distance of 30 feet from the heading or other drilling area shall be maintained in a damp condition.

2. "Hand-held drills (maximum piston bore, 3") minimum rate of water flow through drill steel, 0.75 gallon per minute; maximum rate of air flow through drill steel at full speed, 2.0 cubic feet per minute; maximum rate of air flow through the drill steel at half-speed operation, 1.0 cubic foot per minute; minimum rate of general ventilation in the drilling area, 500 cubic feet per minute per drill and shall be increased if found upon tests by the Industrial Commissioner that the dust concentration is not in accordance with the requirements of the Code.

3. "Drifter-mounted and wagon-mounted drills (maximum piston bore, 4") minimum rate of general ventilation per drill in the drilling area, as shown in the table 'Limitations in Air and Water Flow Through Steel.'

4. "In the case of positive-pressure ventilation, the air must be well distributed over the drilling and must not create drafts

at the various drilling positions, in a manner satisfactory to the Industrial Commissioner. The intake for the ventilating system must be located at a point free from contamination with dust or provided with an efficient filter.

5. "In the case of exhaust ventilation, the location of the intake pipe or pipes must be such as to insure the removal of air from the entire drilling area in a manner satisfactory to the Industrial Commissioner.

6. "The required ventilation may be obtained by means of a recirculating air-cleaning apparatus provided the dust concentration in the air at the breathing zone of the drill operators is maintained at a level below that required in Rule 33-2.3 and the apparatus is otherwise acceptable to the Industrial Commissioner.

7. "The above rates of ventilation shall be increased whenever necessary to reduce dust concentration to the amount permitted by Rule 33-2.3."

Proper blasting practice.—Methods of controlling dust and fumes in mines by proper blasting practice have been determined by members of the Bureau of Mines staff by observation and experiment.²⁴ If at all feasible, blasting should be done at the end of the working shift or on an off shift, and the dust- and gas-laden air should be removed or thoroughly diluted before the men return to work. Ventilation is an essential agency in cleansing the air where blasting has been done. Results of investigations by the Bureau of Mines²⁵ show settling rate of dust after blasting under the following conditions:

1. The atmosphere was bratticed off for 3 hours while the dust samples were being taken. In this period, under these conditions, the dust concentration dropped from approximately 5,000 million particles per cubic foot to 50 million particles per cubic foot.

2. The atmosphere was bratticed off until 26 minutes after blasting when the brattice was raised and natural ventilation (which was virtually negligible except for eddy currents was allowed to dilute the dust-laden air. It required 2 hours and 20 minutes after blasting for the dust concentration to drop from approximately 5,000 million particles per cubic foot to 50 million particles per cubic foot, and 2 hours and 50 minutes to drop to 15 million particles per cubic foot.

3. The atmosphere was bratticed off until 37 minutes after blasting, when the brattice was raised and 10-inch canvas tubing installed to about 50 feet from the face. At 46 minutes after blasting, about 1,000 cubic feet of air per minute was forced into the face. It required 66 minutes after blasting for the dust concentration to drop to 50 million particles per cubic foot, and 70 minutes to drop to 15 million particles per cubic foot.

The accompanying table shows the time, in minutes, required for the dust concentration to drop from 825 million particles per cubic foot to 50 million and to 15 million particles per cubic foot under the three different conditions:

Ventilating Condition	Time, in minutes, to drop from 825,000,000 particles per cubic foot to—	
No ventilation.....	121	181
Natural ventilation.....	105	135
Mechanical ventilation.....	20	24

In addition, the place (walls, floor, roof or top, and timbers) should be wetted thoroughly before blasting is done, and a water blast should be used during and after the blasting. The region should be wetted thoroughly when the men return to the face region after blasting, and the muck pile should be kept well wetted at all times while it is loaded out, as the water not only lays the dust but also either absorbs or otherwise aids in diluting or eliminating harmful or poisonous gases that follow blasting and that usually cling to the blasted material.

Tests²⁶ on the effectiveness of a spray of water mist in reducing the concentration of dust in the air after blasting and during mucking of the blasted material were conducted in three headings in medium hard to hard rock. The use of the spray apparently made it possible to reduce the concentration of dust generated and thrown into the air during blasting more than 99 per cent from the amount present when the spray was not used. Dust dissemination during mucking of material sprayed several hours before mucking was begun was much less than during shoveling of material thoroughly sprinkled just before and during mucking; and, of course, the dust present after use of either the spray or the sprinkling method is

far less than if the mucking had been done dry.

In general, the larger the quantity of explosive used, the more finely divided the blasted material, the more heavily the air will be impregnated with dust and smoke, and the greater will be the quantity of poisonous gases left at the place; hence, methods should be used that will tend to reduce the quantity of explosives used and of gases and dust produced. In this connection it will be found that the use of stemming or of some types of blasting plugs now available will confine more definitely the explosive, hence, increase its efficiency and reduce the quantity of explosive used and also reduce the amount of poisonous gas produced and possibly reduce the violence of the blast and its tendency to raise dust and disseminate it into the surrounding air. It would be well for users of explosives to investigate types of explosives that are known to give off minimum quantities of harmful gases on detonation and to use them; also, the discontinuance of the use of fuse and the substitution of electric blasting would aid in reducing the amount of poisonous gases from blasting. Explosives that have been held in storage too long or that have been stored under unfavorable conditions as to moisture, temperature, etc., are likely to give off maximum quantities of harmful gases, if they detonate at all; hence, utmost care should be taken in the storing of explosives to see that they are not held too long before being used.

Personal respirator protection.—This method of control of air dustiness is unsatisfactory in underground mining except for temporary use in emergencies. Although dust respirators give adequate protection against dust, they afford the wearer essentially no protection against toxic or asphyxiating gases, and are too cumbersome and uncomfortable for constant wear.

The Bureau of Mines has established a schedule of minimum requirements for mechanical respirators, one type of which is for protection against dust generated by disintegration as in drilling and blasting. About 30 respirators have been approved under this schedule.

Physical examination.—Although strictly speaking physical examination is not a dust-control measure, it is an important means of determining the efficacy of the methods em-

ployed to reduce the dust hazard. If workers exposed to dust are examined periodically increased incidence of respiratory disease can be discovered and measures taken to reduce the amount of dust in the air or remove any affected workers to a less hazardous environment.

In South Africa all white applicants for underground work are examined and certified to be physically fit and free of any disease of the respiratory organs and then re-examined every 6 months to determine and report all cases of simple silicosis, tuberculosis with silicosis, and simple tuberculosis that may have developed. In this way comparable records can be obtained for measuring the degree of pneumoconiosis and the extent of impairment of working capacity among employees from year to year. Comparable records will not be obtained unless periodic examinations are conducted in a standardized way, preferably by a permanent medical board composed of physicians specially trained and having adequate experience in the diagnosis of pulmonary diseases.

Summary

1. The principal pulmonary diseases to which the miner is subject are bronchitis, influenza and pneumonia, pulmonary tuberculosis, anthracosilicosis, and silicosis.

2. Statistics indicate that much higher morbidity and death rates from pulmonary diseases are experienced in dusty than in nondusty industries, especially where silica dust is used or produced.

3. Investigations by the Public Health Service reveal that hard-coal miners suffer a high mortality rate from influenza and pneumonia not only during influenza epidemics but at other times as well. In 1915-23 and 1906-25 influenza and pneumonia were responsible for 40 per cent of the total deaths among hard-coal miners compared with 25 per cent among males at ages 15 to 65 who were engaged in pursuits other than coal mining. Six per cent of hard-coal miners had pulmonary tuberculosis compared with 2 per cent in the adult male population of the United States. The rate for metal miners is still higher.

4. Anthracosilicosis was found in about 23 per cent of 2,711 employees of three anthracite mining companies studied by the United States Public Health Service in 1933.

About 63 per cent of those having anthracosis showed evidence of disability, compared with less than 10 per cent in the control group. Moderate and marked degrees of disability handicapped approximately 21 per cent of those with anthracosis compared with less than 2 per cent of the men serving as controls.

5. The occupational groups in anthracite mining, arrayed by the Public Health Service according to extent of physical impairment, are (1) rock workers, (2) regular miners, (3) all others exposed to more than 100 million dust particles per cubic foot of air, and (4) men in haulageways except rock workers.

6. The principal pulmonary disease in metal mines is silicosis and the chief menace in silicosis is tubercle infection. Apparently silica dust alone increases the liability to pulmonary tuberculosis.

Joint studies made by the Actuarial Society of America and the Association of Life Insurance Medical Directors²⁸ revealed that there were 65 deaths where 6 were expected (about 11 times the expected number) from tuberculosis in 1925-1936 among a group of underground miners, most of whom were employed in metal mines. Tuberculosis deaths were fourteen times the expected among copper miners, nine times the expected among gold and silver miners, and eight and a half times the expected among iron miners. In an earlier study²⁹ covering the years 1915-1926, there were 18 times as many deaths as expected among lead and zinc miners.

7. As dust is the greatest contributor to the excessive mortality from pulmonary diseases in the mining industry, the principal method of preventing these diseases is to eliminate as far as possible or reduce to harmless concentrations the dust in the breathing zone of the worker.

8. The aim should be to eliminate the dust entirely from the air breathed. Where this is not always feasible it may be possible to reduce the dust to a concentration that will not cause disability during a working lifetime.

9. Analysis of data collected by the Public Health Service to determine safe limits of dust exposure indicate that employment in an atmosphere containing less than 50 million dust particles per cubic foot produces a negligible number of cases of sili-

cosis when the quartz content of the dust is less than 5 per cent; when the silica content is about 13 per cent 10 to 15 million particles appears to be a safe limit.

10. The amount of harmful dust created by various activities in mining can be determined by sampling the atmosphere in their vicinity and counting and identifying the dust particles. Sampling of air is also a means of checking the efficiency of dust control measures.

11. The impinger is the dust-sampling instrument used most frequently in the United States.

12. The dustiest operations in mining are dry drilling, blasting of dry rock or ore, shoveling or mucking, loading and haulage, and machine coal cutting.

13. The principal measures for controlling the ill effects of dust in mining operations are ventilation, wet methods, proper blasting practice, the use of personal respiratory protection, and physical examination of workers.

14. The efficiency of these measures in the reduction of the incidence of dust diseases is attested by the experience in the mines of South Africa where among the whole body of miners the liability to contract silicosis in 1936-37 was less by 65 per cent than it was in 1920-33. Among the "new Rand miners" who entered the industry by way of initial examination since 1916 and who have been exposed solely to the progressively improving occupational conditions that have obtained since that date, the liability to contract silicosis was less by 87 per cent than the similar liability among all miners working for an equal period in 1920-23. These "new Rand miners" constituted 77 per cent of all working miners examined.

Conclusion

The mortality and morbidity from pulmonary diseases are excessive in the mining industry as a result of exposure to large amounts of dust in the air breathed. Therefore, control of the dust hazard is necessary to prevent these diseases. No single measure of control is applicable to all dusty operations and processes, therefore, all the means of prevention must be practiced to insure success in the solution of the problem.

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MONDAY AFTERNOON SESSION

October 7, 1940

The opening session of the Paper and Pulp Section convened with General Chairman D. B. Chant, Ontario Pulp & Paper Makers' Safety Association, Toronto, Ontario, Canada, presiding.

CHAIRMAN CHANT: We are very glad to see so many here at this first session. We have an old custom which we have followed for a number of years: that is, for each person attending this first session of our Congress to rise in turn and introduce himself, naming his company affiliation. Let us again follow the custom this year.

(The members arose individually and introduced themselves.)

CHAIRMAN CHANT: As your General Chairman, I look back over the past year with mingled feelings of satisfaction and regret: satisfaction because of progress made, and regret over lost opportunities and failure to accomplish some of the things we had hoped we might achieve.

The year has not been a normal one, either in our industry or the economic life of North America. There is no need for me

to detail to you the disturbing elements which have made themselves felt with growing force as the flames of war rose higher and higher with each month since the Atlantic City Congress. No doubt the months ahead will also bring many surprises and many new and difficult problems to each of us.

To me, however, there is something particularly encouraging in the way the work of the National Safety Council has been steadily pushed forward during these evil days. With so much of the world's area seemingly abandoned to the forces of destruction and violence, the knowledge that here in America thousands of men and women are voluntarily giving unselfishly of their time and efforts for the betterment of human welfare, safety and health, must constitute a sure guarantee that those great democratic ideals of liberty and justice, to which your nation and mine are dedicated, shall forever prevail, and, come what may, that "government of the people, by the people, and for the people shall not perish from the earth."

(The General Chairman then briefly reviewed the activities of the standing committees of the Section during the year, and gave to each Committee Chairman some words of praise for his efforts and encouragement for the future. In closing, he said further):

As to what the immediate future holds for us, I would not venture to prophesy. I do feel most strongly, however, that whatever problems may confront us as a Section, as an industry or in the national or international sense, we need have no fear of the eventual outcome of the struggle between free democracy and the evil forces now attempting to destroy it, as long as our lib-

erties are defended by men and women in whose hearts the pure flame of self-sacrifice and service to humanity still dwells. The same spirit of mutual assistance, which has in the past enabled us to meet the problems of our Section with marked success, will make it possible for us to deal effectively with the larger and more vital questions of national defense and ensure to us that peace and security which we all so earnestly desire.

The first item on our program consists of two papers on the "Safe Handling of Materials." I will first introduce to you Mr. J. A. Long, of the Bay West Paper Company, Green Bay, Wis.

Safe Handling of Unit Materials

By J. A. LONG

Superintendent, Bay West Paper Company, Green Bay, Wis.

No doubt, the reason I was selected to discuss this subject is because of the safety record established at Bay West Paper Company. A record of 39 months without a lost time accident has been made by our employees. We are very proud of them for it.

It is necessary that a brief comparison of a small converting plant like ours be made with the larger mill which, I assume, most of you represent.

While we are owned by a large mill, the Mosinee Paper Mills Company, our operations are entirely separate and different. We are converters, and deal only in finished paper. Our paper is trucked from Mosinee (100 miles) to our Green Bay plant in rolls—it is unloaded and stored on our floor for a few days before it is run through the converting machines into Mosinee towels, after which it is either shipped or stored as a finished product.

The process sounds very simple and yet we have had our struggle trying to cope with accidents, like any other mill. The small mill or converting plant is not adequately equipped as a rule to handle materials as compared to the large mills. In my opinion, there are three basic reasons for this:

1. Large mills construct their buildings to best meet their production requirements.

The safe handling of materials is taken into consideration with these production requirements. Many converters like the Bay West Paper Company, operate in rented buildings and there isn't always sufficient space for the safe handling of each material.

2. Large mills think very little of purchasing proper and expensive equipment with which to handle their materials. Small plants can seldom afford to buy expensive material handling equipment to install in a rented building which usually is not laid out properly for such an installation.

3. Another comparison is that of labor experience—the large mills usually have certain men trained to handle each material. The stockroom men in the converter's plant must know the safe method of handling all materials involved. They must know how to handle safely rolls of paper in various sizes and weights, how to pile finished cases in freight cars and warehouses, how to store bundles of cartons knocked down, how to handle bales of broke (waste), how to move heavy machinery—yes, in some instances they are expected to be machine operators as well.

Fortunately, our mill is constructed fairly well for our operations and during the past few years we have done a lot to make work easier and safer for our employees—and we have found the experience profitable as well.

However, there is right and wrong equipment as well as right and wrong methods in handling unit materials of any kind and that is my point—the right equipment for the job. For example, about seven years ago our men used planks to triple deck rolls 40 inches long, 33 inches in diameter, and weighing from 500 to 600 pounds. It took four men to triple deck each of these rolls and the method was slow and also unsafe. Many strains developed from this daily practice.

To remedy this situation, we purchased an electric lifter at a cost of only \$520 which does the job with the help of two men in half the time.

Let me call your attention again to the fact that our mill is small. We have to be sure that equipment of this kind isn't too large or bulky for our needs, which would discourage its use by our employees. The platform, with turned down edges, lowers to within one inch of the floor so that stock can be easily rolled onto it in front or from either side directly from the floor surface.

A few years ago one of our men experienced a hernia when he tried to tip a roll onto a two wheel truck. This roll, because of its 33-inch diameter and 40-inch height and weight of 600 pounds, is hard to tip by a rather small man. This experience taught us to use the lifter for loading these rolls onto two wheel trucks. Now the only time this particular material has to be tipped is when it is unloaded from our Mosinee trucks.

After the roll has been placed on the platform and blocked, it is easily elevated to the proper height and rolled onto the pile. It is also an easy process to remove a roll from the pile with the aid of the lifter, although the process is much slower than placing a roll on the pile. We do not use the lifter for removing these rolls from the stock pile, because of insufficient floor space in which to operate. Therefore, it is necessary that we lower them by removing the blocking. This was a dangerous process and it called for real employee and employer cooperation to remove the hazard.

First let us explain what happens when these rolls are lowered without proper blocking.

If the second roll from the front of the pile has not been properly blocked, and the roll hauler knocks out the block from the

front roll, immediately the rolls in the second and third tiers force the bottom rolls out and all the six rolls are soon out of the roll hauler's control. He is forced to leap for a safe spot allowing the rolls to go at will.

We experienced difficulty with six rolls coming down unexpectedly from time to time for quite a few years. Even though it was an infraction of a safety rule not to check the blocking on the second roll, the unsafe practice continued. There were many strained knees, injured legs and considerable loss in damaged paper, before the "positive visible block" was developed.

Rolls that are triple decked (nested or cradled) can very easily be removed safely from the pile, one at a time. However, this can only be done safely when the second roll from the front of the pile is securely blocked. When this is done the roll hauler has complete control of the three rolls being removed.

Let us follow the procedure of removing a roll from the pile. First the second roll from the front on the floor is blocked, then the roll hauler stands directly in front of the first roll and keeps it from rolling with one hand, while he knocks the block out with an iron bar used in the other hand. He then allows the first roll to roll out slowly in a clockwise direction. This movement causes the second tier roll to turn in a counter clockwise direction until it comes to rest on the floor immediately back of the first roll. The roll in the third tier follows down and stops in the second tier. From there it is lowered to the floor by the same method described above.

We use a block which is nothing more than a regular wedge-shaped hard wood block about $7\frac{1}{2}$ inches long with a $\frac{1}{4}$ -inch iron rod running through its length with a washer and cotter pin to keep the block in place. The other end of the rod is bent at right angle and is welded to an iron $\frac{1}{4}$ -inch pipe 14 inches long. Into the end of this pipe, a $\frac{1}{2}$ -inch iron rod or pipe is inserted, on the end of which is attached a six-inch spring. The other end of the spring is pinned firmly to the lower part of the pipe which pulls the rod down into the pipe until the handle brings it to a stop. In order to keep the block in a fixed position while it is being handled, the rod going into the pipe has a $\frac{1}{8}$ -inch slot and a pin is then installed through the pipe and the rod.

The handle of the blocking device is a 3/4-inch iron rod welded horizontally across the top end of the spring rod. The outside end is bent downward to form a hand grip while the opposite end is also bent slightly downward with a sharpened point. This is the inside end of the handle, and it is inserted into the core after the block has been placed under the roll and the tension placed on the spring. If the roll should move slightly the block will be pulled all the more firmly into place. However, the greatest feature of this blocking device is the fact that it is always visible. A safety rule prohibits the lowering of these rolls without first having this block in place.

Beginning a few years ago, our operations demanded the handling of much larger rolls than those already described. These rolls, 66 inches long, 33 inches in diameter, and weighing approximately 1,000 pounds, soon had us searching for a truck with which we could move them about our mill easily and safely.

Several truck manufacturers sent us trucks on trial. Most of them were too large and bulky for our little plant. The

CHAIRMAN CHANT: In the absence of Mr. J. F. Robertson, of the Crown Willamette Paper Company, Camas, Washington, I am going to ask Mr. John Roche, of

trial operation of one of them nearly caused a serious accident.

Finally, we decided to visit some of our neighboring mills to see if we could find the answer to our problem. We were happy to find a truck which is equipped with a special tipping rod with a hand grip on one end and a curved metal plate to fit the contour of the roll on the other end. The operator first works the shoe of the truck under the roll, and then tips the roll onto the truck with the aid of the pull-rod which is extended over the far side of the roll, thus giving more leverage to the pull than when pulled from the core or center of the roll.

The turned down handles make it easier for the operator to handle it with his hands in a natural position away from the roll. These handles also serve as an extension so that the operator has better visibility over the roll when moving forward. The third or rear ballbearing wheel, because of its central location, allows the operator a natural walk which is essential in the safe operation of this type of truck. All the wheels are large enough to assure easy handling.

the National Safety Council Staff to read the paper prepared by Mr. Robertson. Mr. Roche complied.

Safe Handling of Bulk Materials

By J. F. ROBERTSON

Personnel Director, Crown Willamette Paper Co., Camas, Wash.

The responsibility of the management of a mill rests heavily on a few individuals. The success of a safety program depends on the interest taken by employees in the duties assigned to them by the foremen and sub-foremen.

Let us call it planning your time and timing your plans. In other words, you run the job, don't let the job run you.

Every supervisor, foreman or sub-foreman must have a plan for his own day's activities and must have a plan for the work of each of his men. If we allow the emergency of the hour to determine our course of action, we cannot hope to accomplish definite results on schedule. Very

often a foreman has occasion to send a man to the storeroom for supplies such as bolts, rope, wire or belting. Be sure the measurements taken or the quantity required is correct and avoid waste. However, the big item of waste in almost any organization is time lost by lack of supervisory planning.

The safe handling of bulk materials undoubtedly presents many problems which are the direct responsibility of the foremen in the proper planning of work. In a number of plants a lot of our raw materials are received in such a manner as to require considerable manual labor. It becomes necessary to carry out a well thought-out plan

of job training, for unless this is done, it is practically impossible to avoid accidents by the installation of guards.

Let us concentrate for a short time on the handling and delivering of materials such as hog fuel, lime rock, saltcake and sulphur. I believe that the handling of hog fuel from the time it is first received at the mill up to the time it is used can present more problems than any of the others mentioned. In a great many instances this fuel is received by barge and cannot always be obtained in a regular supply so that it may be used without a considerable amount being stored either on outside storage piles or in fuel houses. It is quite generally recognized that work on piles or in a storage house is hazardous.

Perhaps we should start with the unloading from the barge. This requires certain work to be done on or around barges. It should be the practice never to allow the operators to perform these duties alone; in all cases when work is being done on a barge, it should be a rule that the individual be required to wear at all times, a life preserver of a type that is in no way a hindrance or cumbersome.

From the barge the fuel is generally unloaded to a bunker from which it is carried to the storage pile, storage house or power plant by belt conveyors. Fuel from the bunkers is carried on an overhead belt conveyor and is removed from this conveyor with shear boards, after which it must be distributed over the pile. There are various methods of doing this but I believe the more general practice is with the use of a caterpillar. Few hazards exist here if the operator is experienced with his equipment and uses it as it is intended to be used.

A caterpillar for a hog fuel pile operating at times under the conveyor should be equipped with a substantial cab to protect him from anything that might fall from the conveyor above. The conveyor should also be provided with safety boards along each side and only the short section removed where the fuel is being raked from the conveyor to the pile. If this is done, there is slight possibility of accidents occurring at this place. It has been found advisable, though, to see that at all times when such an operation is carried on at night the pile should be encircled by lights strung on poles

that can readily be stuck in the pile around the edge and changed at any time by the man on the job.

Now let us assume that the fuel is to be delivered directly to the power plant after some has been delivered to the pile. All safety boards alongside the conveyor over the pile should be in place to prevent anything from falling from the belt. Fuel to be stored in the house is handled in a manner very similar to the pile.

However, sometimes it becomes necessary to supply your power plant with fuel from the storage house due to interruptions in fuel delivery from the source of supply. The storage house operator may be inclined to enter the house to dig a little fuel without taking the necessary precautions of going overhead to put his safety boards along the side of the conveyor. As a means of overcoming this, we have found it advisable to equip our storage house with an entrance gate, making it necessary for the operator to raise this gate before he enters the house. Connected with this are hinged boards running parallel to the overhead conveyor that are automatically dropped into place at all times when the house is entered. This, along with the insistence that at no time is an operator allowed to work in the storage house alone, has practically eliminated any possible chance of an accident occurring in this location.

Needless to say it is important that the driving mechanism of the conveyor be properly guarded. If necessary to cross a conveyor proper, special places and means should be provided. One of the outstanding dangers is that men are tempted to clean off material that sticks to drums or pulleys while the conveyor is in motion. Fixed scrapers or brushes should be provided so it will not be necessary to perform this operation by hand. Guards placed directly in front of the belt nips are advisable and the rollers under the belt should never be placed so near a bracket holding shear boards that it is possible for any object to pass through.

Switches are another important part of a conveyor system. The fewer starting switches the better, but an emergency stop switch should always be provided that may be readily reached. One of the best methods is a cable along the entire length of the conveyor that may even be reached by an employee should he in some manner be caught in it.

Only workers who are thoroughly acquainted with the dangers involved should be allowed to work on conveyors. New employees should be thoroughly instructed by the foremen as to the correct methods of operation. In spite of all safeguards which may be installed, accidents will occur un-

less workmen are constantly instructed and warned about the dangers that exist. New men should never be permitted to work around equipment merely after being instructed. They should always work under the supervision of an experienced worker until such time as they become aware of the existing hazards.

General Discussion

CHAIRMAN CHANT: Now we have an opportunity for discussion of the two papers just presented. Mr. Long, there are one or two questions that I would like to ask you. You referred to your drawing of prizes or sweepstakes. I would like to ask you if you have these prize drawings monthly?

MR. LONG: That's right. We have prize drawings each month on the anniversary of the last lost-time accident, and it is a kind of reminder. We build up the cash award by starting out with fifty cents; that is, after there has been an accident, the following month the award is fifty cents, the next month it is a dollar, the month following that it is a dollar-and-a-half, so that it takes them a long time to build it up to ten dollars, a period of twenty months. While this amount is small, it could easily be worked out in larger mills by departments. We have found it very successful in our plant. This, of course, goes on indefinitely until there has been a lost-time accident. On the eleventh of this month, which is this week, we will have gone (let me knock on wood) forty months without a lost-time accident.

CHAIRMAN CHANT: How many men do you have in your plant?

MR. LONG: There are about fifty workers in our organization.

CHAIRMAN CHANT: Do you include the foremen in the prize drawing? Are their names put in with the others?

MR. LONG: Yes, they are.

ROLLAND W. RICHARDSON (Gardner-Richardson Co., Lockland, O.): Mr. Long, do you have any trouble with men having their hands injured when using a two-wheel truck? Have you made any kind of provision whereby their hands are protected?

MR. LONG: No, we have not had that experience. We usually have our aisles wide enough to operate in. We use this three-

wheel truck mostly for unloading rolls of paper. It is not very good, for example, if you have to take your rolls out of the pile, then take them to the backstands of a winder, and then let them down. You see, there is no way of lowering that roll unless you have a chain hoist. So we use that truck mostly for unloading, taking the rolls from the truck and standing them on end in the stock pile.

ERNEST AUGUSTUS (The Mean Corporation, Chillicothe, O.): I have never heard of this particular type of three-wheel truck and I am quite interested in it. Why not have something printed about it in the Safety Exchange section of the *National Safety News*?

MR. LONG: I shall be glad to give them any information they would like to have.

W. A. GLEASON (Hammermill Paper Co., Erie, O.): Perhaps Mr. Long will tell us how he gets the rolls down from storage?

MR. LONG: Well, we take those rolls and tip them over with the regular type of heavy two-wheel truck, and then we bring them over to the backstand and put them in the backstands with a hoist.

LYLE PARMENTER (Kimberly Clark Corp., Neenah, Wis.): I didn't notice any foot brake on the wheels on an ordinary two-wheel truck. I have seen accidents happen while you are tipping a roll over onto such a truck without a foot brake on it.

MR. LONG: You mean the ordinary two-wheel truck? Oh, yes, we have foot brakes on all of those.

MR. PARMENTER: It is always possible to block the two front wheels.

MR. LONG: Yes, they do that.

W. J. COWLES (Commonwealth Edison Company): I am not familiar with the handling of paper, but did I understand you to say that as regards these extra long rolls your operator stands up on top and tilts those over?

MR. LONG: They stick a bar in as you saw in one of the pictures that I showed you.

MR. COWLES: Is there any danger of that bottom slipping out and the top coming over and hitting the operator while he is going through that operation?

MR. LONG: There is very little danger because there is a shoe that goes underneath the roll.

CHAIRMAN CHANT: Has anyone any particular problem which has been causing accidents in the handling of unit materials?

MR. GLEASON: In connection with the Occupational Disease Act, the unloading of bulk sulphur from the box car to the wheelbarrow, wheeling it out, do you have any suction fans to take care of the extra dust that arises?

CHAIRMAN CHANT: Personally I haven't seen the vacuum system used in the handling of sulphur from cars; I have seen it used in the handling of lime. I see no reason why it couldn't be used in the handling of sulphur, provided, of course, that the necessary precautions were taken to avoid any sparking which might cause an explosion of sulphur dust. It is not at all uncommon to see sulphur handled from cars with shovels. In two mills that I know of the sulphur is handled out of incoming freight cars by hand, shoveled into barrows and wheeled a short distance to a dumping ground, and the men doing that work are regularly required to wear respirators of the simple nuisance-dust type.

I don't know of any place where a ventilating system is being used. I think perhaps the bulk of the sulphur—certainly the

bulk of it coming into the mills with which I am familiar—is handled mechanically, either dropped from hopper cars or unloaded with a clam-shell and mechanically dumped into piles.

It is a bit unfortunate that Mr. Robertson chose to deal principally with the handling of hog fuel. A good many of our mills do not use hog fuel. I understand it is quite a general practice on the Pacific Coast to use hog fuel as a principal source of steam, large quantities of it being used for boiler fuel. But the same hazards that Mr. Robertson dealt with in connection with hog fuel would also apply in the handling of other similar bulk materials. Coal, for example, would be handled very much in the same way in a good many of our plants, I'm sure.

MR. RICHARDSON: I would like to know what hog fuel is?

CHAIRMAN CHANT: I believe it is wood refuse run through a hog or chipper to produce a sort of mixture of chips and sawdust that will burn rapidly even though the wood itself is not very dry. Paper and woodpulp mills that are operated in close conjunction with a large sawmill often obtain much of their fuel from the wood refuse supplied by the sawmill. Up in Canada we are reckless with our timber resources: we just burn up the slabs in a burner outdoors in order to try to modify our severe winters, and then we import coal from Pennsylvania to run our boilers and paper mills. It hasn't occurred to us to use hog fuel.

CHAIRMAN CHANT: We will proceed with the next item on our program, which is the report by Fred Braun, Chairman of our Statistics Committee.

Review of 1939-40 Accident Experience

By F. W. BRAUN

Vice-President and Chief Engineer, Employers Mutuals, Wausau, Wis., and Chairman, Statistics Committee, Paper and Pulp Section, N. S. C.

I would like to tell you that we had another very successful year in accident prevention, as I did last year. Each year during the past thirteen the paper industry has made progress in reducing either the frequency or severity of injuries, and often

both; but last year we lost some ground.

According to reports covering 236 mills and factories which worked: 206,300,000 hours during the year, the paper industry averaged 15.2 injuries per million hours worked—no improvement over 1938. The

severity of injuries—days lost per thousand hours worked—soared 41 per cent to 1.71. Perhaps it was too much to expect another improvement in severity rates after an average drop of 48 per cent in 1938. While we had a sharp rise in severity and no change in our frequency rate, American industry as a whole took a step forward by making progress in both injury rates.

This general improvement means, of course, that we have fallen behind a little in our efforts for a place in the group of low rate industries. Our 1939 frequency rate of 15.2 was 28 per cent above the average for all industries. In 1938 we broke into the group of industries with lower than average severity rates, but the large 1939 increase resulted in a rate 21 per cent higher than the all-industries average.

The analysis of our injury experience discloses some facts which I believe are helpful.

It is unnecessary for us to consider steps for more effective work in small mills and factories. Unlike small organizations in some industries, ours have kept pace with their larger neighbors in reducing both frequency and severity. Frequency rates have been somewhat higher in the small organizations of the industry but in 1939, for example, severity rates averaged lower than in large plants.

But when we examine the records of different branches of the industry, such as re-manufacturing plants, paper mills and board mills, we find the types of mills with substantial safety problems. The industry's accident rates are determined to a considerable extent by the experience of paper mills. The exposure of re-manufacturing plants is less than one-fourth of the total for the entire industry and furthermore, the frequency and severity of injuries in this type of work are considerably less than in other branches. For 1939 re-manufacturing establishments averaged only 11.6 for frequency and 0.9 for severity. I do not infer that the record of this division is completely satisfactory. The fact is that frequency rates have not decreased during the past four years and during this period severity rates have gone up in box and container manufacturing.

My purpose is to emphasize where special attention is needed in order that we may make the most progress and at the same time con-

tinue efforts in less hazardous branches of the industry. In the important paper mill group our problem is principally in news print and wrapping mills. 1939 rates for wrapping mills, for example, average 23.5 for frequency and 2.2 for severity. The exposure of these two types of mills is almost one-half of the total for all paper mills. Newsprint mills have made consistent progress in reducing frequency during the past six years but no improvement has been made in severity.

Board mills have the highest injury rates in the industry, averaging 27.6 for frequency and 4.00 for severity during 1939. The reduction of these rates, therefore, would materially improve the general experience of the entire industry.

Getting down now to the individual departments the question is, "Which have the worst records and, therefore, require the most study and attention?" Based on reports made to the National Safety Council, I call your attention particularly to the records of employees engaged in paper and board making operations. This is one of the largest departments in paper mills; frequency rates are high—averaging about 22.0; and severity is sharply higher than the average for any other department, being about 4.0. I believe that a study of the circumstances of accidents would reveal that the nip hazard is an outstanding factor in the high severity for paper board making.

The hazards involved in handling and storing raw materials rank second in importance as shown by a frequency rate of 40 and a severity rate of 2.8. The safety problem in yard operations, according to our statistics, takes third place with an average frequency rate of 26.0 and a severity rate of 2.4. While the severity of injuries in wood room operations is only about one-half of the average in other high-rate departments, frequency averages 28.0 and, therefore, I believe this department warrants special efforts. The high-rate departments, in order of their importance, are paper and board making, handling and storage of raw materials, yard, and wood room.

There is room for improvement in other branches of the industry and in departments with better experience. Many factories have worse than average records; in fact their injury rates are higher than those of many organizations in more hazardous branches.

Paper goods manufacturers, for example, averaged only 9.46 for frequency and 0.44 for severity during 1939. Some factories, however, had rates that were two and three times these averages. In the paper mill group, book and specialty mills have low rates, averaging 12.8 for frequency and 1.5 for severity but frequency rates above 20.0 and severity rates above 2.0 are not unusual. Therefore we must also look to these mills and factories for the reductions which will help to lower rates for the industry as a whole.

Many paper mills and factories, on the other hand, have achieved records comparable with the best in industries with low injury rates. The 1939 honor roll in "Accident Rates in the Paper and Pulp Industry," the annual statistical publication of the National Safety Council, gives the names of some of them.

In efforts to find answers to some of our accident problems and thus help members to achieve low injury rates, officers of the Paper & Pulp Section have given considerable time to developing information on the outstanding causes and circumstances of accidents in the industry. As far as I know, no other section has done as much in this work. The 1939-1940 paper industry safety contest rules required a report on the details of each accident resulting in a reportable injury and I want to summarize some of the outstanding facts from a study of these reports. We had splendid cooperation from contestants; I am able to present information based on 1,000 of these reports.

For years we have discussed the nip hazard and struggled with the problem of eliminating it. I do not believe that we have ever had any reliable measure of the importance of this hazard in our injury experience, but according to this study the nip hazard accounts for about 10 per cent of the injuries. Please remember also that this hazard stands out particularly in plants participating in the Contest—a group of leaders in safety work.

The analysis showed that employees were usually engaged in performing one of the three following duties when caught in the nip of in-running rolls. They were, first, threading or feeding paper into rolls; second, cleaning rolls; third, checking the condition of the paper by feeling for wrinkles, checking the size, etc.

Reports showed that efforts to eliminate the hazard through mechanical means were directed principally at guarding, formulating a safer method of doing the work, and changing the arrangement or design of the equipment or installing safety devices.

Elimination of the nip hazard through guarding is a real problem. Numerous statements were made that a guard was impractical and in other cases existing guards were redesigned and in still others guards were installed for the first time. One-third of the injuries due to the nip hazard were charged to lack of or inadequate guarding.

Changes in the design, construction, and arrangement of rolls, reels and winders were made less frequently. Improved guides, rope carriers and air pipes for drawing the paper from one felt to another, foot boards for preventing slipping were installed.

For one-half of the injuries resulting from being caught in a nip, mechanical preventive measures were principally a safer method of doing the work. Efforts were made particularly to keep employees a safe distance from the nip by providing long-handled scrapers for certain cleaning operations, air for feeding and cleaning, hooks and spear poles for removing paper and rubber tipped paddles for feeding sheets into the rolls. Reports showed, however, that these methods were not entirely effective because the hose or scraper was caught in the nip and before the employee released his hold, his hand or arm was drawn in.

Other changes in working methods placed still more dependence on safe performance by the employee. These were performing cleaning operations from the out-running side of rolls whenever possible, stopping the rolls on certain equipment for adjusting and cleaning, tearing paper to a point for threading, testing for wrinkles only when the roll reached a diameter of 8 or 10 inches. Many reports, however, did not show that improved working methods were formulated either previous to or after the accident; responsibility for avoiding the hazard was placed entirely on the employee by ascribing the accident to a personal cause, such as disobedience of instructions, inattention, carelessness, or unawareness of the safe practice or lack of knowledge or skill.

Such personal causes, however, were factors in 80 per cent of the injuries. Disregarding instructions was of most impor-

tance particularly among employees with years of service. Violations of safe practices were often ascribed to lack of supervision. On the other hand, it is doubtful from many reports whether the experienced employee was instructed or thoroughly trained in the work. In addition, numerous injuries were assigned to haste, abstraction, and similar attitudes showing failure to keep safety uppermost in their work.

New employees with less than one year's experience also figured frequently in accidents due to the nip hazard. They often failed to follow instructions. It is doubtful from many reports, however, whether specific instructions were given and whether orders were clearly understood. Aside from an unsafe mechanical condition, most injuries involving new employees were assigned to unawareness of safe practice.

For our No. 2 safety problem the analysis pointed to floors particularly and to stairs, platforms, scaffolds, and similar working surfaces. These were involved in 12 per cent of the injuries. Outside of the mill the principal danger spot was log piles, especially when employees climbed and walked on them during wet or cold weather. I was surprised, also, at the number of injuries resulting from falls on icy sidewalks and steps.

The slippery condition of floors especially, stairs and runways was a particularly outstanding cause of accidents. Oil spots on floors, worn treads on stairs, and smooth steel floor plates used for runways were often reported but wet floors, due to the extensive use of water in certain processes, far outnumbered any other single slippery condition. Numerous reports stated that the

condition was inherent in the process and there was no remedy other than vigilance on the part of employees.

Numerous injuries also resulted from rough floors due to holes and ridges, open drain and broke holes, and poor housekeeping. Rough floors and poor housekeeping figured particularly in accidents to truckers.

In accidents involving floors, stairs, runways, platforms, etc., 90 per cent of the injuries involved some unsafe condition in comparison with 50 per cent involving employee causes. It seems logical, therefore, to look principally to engineering measures for eliminating these hazards.

Two additional safety problems were disclosed by this study, of about equal importance—one involving the operation of trucks and the other the use of hand tools. The condition of tools and trucks was not an important factor in accidents. Causes of employee actions figured in more accidents than did mechanical causes. This is especially true of causes of lack of training, skill and experience.

On the basis of this study we can well afford to give more time to instruction and emphasis on the safe use of picaroons, axes, hammers of all types, crow bars and knives.

In truck accidents we found a wide variety of circumstances figuring in their occurrence. The following factors were reported frequently: overloading; shifting of load due to improper arrangement or failing to secure it; pulling instead of pushing; operating trucks too fast; jumping off trucks; failure to wear safety shoes—foot injuries occurred frequently when struck by falling materials or when the feet were caught under the wheels.

through our pulp and paper mills we have equipment which in its operation and in its very nature creates nip hazards; but I am not prepared to admit and will not admit that the nip hazard cannot be overcome.

I am thinking of one particular plant, a large, modern, fast-running newsprint plant wherein the paper machines operate at a speed of approximately 1,200 feet per minute, and where the winders, of course, to keep up with the machines, must operate at a much higher speed. In this plant up until about two years ago winder accidents were alarmingly frequent and serious. A

relatively large number of their paper machine crews, particularly the fifth hands, fourth hands and third hands operating those winders and working around them, got caught in the running nip of the winders with more or less serious injury resulting.

The superintendent of that mill determined to put an end once and for all to accidents of that nature on his winders, and he fenced those winders in so that they were completely enclosed. The fence was made in such a way that it could be dropped down below the floor level or to the floor level for access to the winder in making splices or in starting up, or removing the finished set. Strict instructions were given the crews that the winders were not at any time to be operated unless those fences were up and in position.

About a month after that, during one of the night shifts, one of the winder men was again the victim of a winder accident. Upon investigation it was found that he had, contrary to instructions—or his crew had done so contrary to instructions—operated the winder with the fence down so that the winder man could have access to the roll on the winder in order to feel it. The superintendent immediately took steps to have those fences interlocked electrically with the starting mechanism on the winders, and from that day to this there have been no nip accidents on those winders for the simple reason that it is utterly impossible to start the winders unless the fence is in position. Unless a member of the crew sees fit to climb up higher than his head over the fence and then climb down again on the inside, he can't possibly get into the winder nip.

To a great many paper makers of my day that would have been considered a physical and operating impossibility. The first answer you would have received from any of the paper makers that I grew up with would simply have been that "You can't operate a paper machine winder if you can't get at the rolls." Well, they are doing it and they are not having any more culled rolls than they had before; in fact, they are having less. It does mean that the back-tender a step further back in the operation must make a better reel, because he has to wind the paper off on the winder without having the opportunity to feel the roll and perhaps make some adjustments during the winding.

Part of the development, of course, has

been due to the advancement in the art of paper making and in the equipment of the winder itself and the provision of a rider roll to ride on top of the growing roll of paper. I am just citing that instance to show what can be done to eliminate nip hazards and the accidents from them when the management of a plant is sufficiently determined that accidents of that nature shall cease.

F. H. ROSEBUSH (Nekoosa Edwards Paper Co., Port Edwards, Wis.): Mr. Chairman, I think if you will look back in the records of this section 15 or 16 years, you will discover that we have discussed these nip hazards quite a number of times. I don't think that this problem of overcoming the hazard on sheet rolls is insoluble. I believe it can be met. There was a guard perfected by Beauguard of the Flambeau Paper Company at Park Falls, Wisconsin, which overcame the difficulty. But the thing that we haven't solved in our discussion is the hazards attendant to the making of the counter rolls where the 9 inch counter roll is dropped between the winders and then taken off every couple of minutes.

This Beauguard guard had a shell that came over the winder close up to the sheet roll, and a few years ago they were trying to work over that guard so that it would take care of counter rolls; but I don't think anything has been done to overcome that particular hazard.

CHAIRMAN CHANT: Has anybody had any experience in making counter rolls—these rolls with a small diameter—with the direction of winding reversed? I don't know whether that is practical or not.

E. A. PAGE (Kimberly-Clark Corp., Neenah, Wis.): What do you mean by counter rolls?

CHAIRMAN CHANT: Small diameter rolls of about 9 inches. I have seen newsprint winders where the direction of rotation of the winder drums was changed, simply reversed. It is a simple mechanical operation. I don't know whether it has been attempted on counter rolls. No doubt, however, that in the event of being caught the resulting injury might even be worse because it would involve not only the burning and mashing of fingers but perhaps the throwing of the whole body over the winder. However, I believe we would all agree that the hazard would be less when the inrunning

General Discussion

CHAIRMAN CHANT: Mr. Braun referred particularly to the important part that nip hazards continue to play in the production of accidents in our industry. He suggested that it might be again made a subject of discussion at our next annual gathering. I am wondering personally whether much could be done by a further discussion of the problem of nip hazards in general. It is not particularly surprising to me that nip hazards continue to figure in 10 per cent of the accidents of the paper industry. All the way

nip is over and out of sight than when it is on the front.

MR. PAGE: It would reverse your sheet, too, wouldn't it?

CHAIRMAN CHANT: Yes, you have to make provision for it right through your setup. It can be done on your reel, you see, by reversing your reel rotation also.

MR. PAGE: As regards this problem of nip hazards, has anybody any device or any means of enforcement of the rules? For instance, a rule that a roll less than 9 inches is not to be felt.

MR. AUGUSTUS: After we had had a couple of accidents on our winders, where a fellow was feeling a roll just being started, we made it an iron-bound rule that regardless of what might be the necessity, a man was not to feel a roll until it was at least 9 inches in diameter. They don't do it any more and we are not losing more paper.

CHAIRMAN CHANT: That's fine!

How many of you have seen and read the data sheet relating to drum-type rolls which came out during the year? (Several hands raised.) I would like to know whether you think the data sheet has dealt adequately with that problem, which has also the hazard of an incriminating nip on a drum-type roll? Is it your general feeling that it does answer some of the questions involved in that piece of equipment, or should it be considered a fit subject for further development and further study?

A considerable amount of difficulty was

encountered in the preparation of that data sheet, mainly because of the very wide differences in the type and arrangement of drum-type rolls in various plants in various parts of the country. That is one of the problems that we have run up against in this industry, trying to develop safety instruction cards, pamphlets and data sheets. What is a perfectly good recommendation as to the avoidance of a nip hazard in one plant is inapplicable in another plant because of some difference in arrangement or some difference in type of equipment. That is a condition, I'm afraid, which we will always have with us as an industry.

I am not going to add anything to what Fred Braun has already told you in connection with the accident experience data that is to be issued periodically by council headquarters for the use of our section members. I am sure that as the practice is instituted and goes on from month to month, we will find very great usefulness in that information, and if it needs any revision as to its form or as to the basis on which it is prepared, I am sure that such revision can be made as soon as we have decided what changes we would like to have. I think that is a great forward step in the service which the Council headquarters staff is rendering to this Section and to this industry as a whole, namely: the provision of accident data and accident statistics as we go along rather than as a report at our annual meetings only.

TUESDAY AFTERNOON SESSION

October 8, 1940

CHAIRMAN CHANT: I have a summary of the attendance at yesterday afternoon's session. There were 101 persons registered at our session yesterday afternoon. Of that number 67 were members of the Paper and Pulp Section; the other one-third, 34 in all, were visitors. We were very glad to have those visitors with us, and I take this opportunity to also welcome the visitors with us today.

The distribution of the membership that attended yesterday might also be of interest to you. From the State of Illinois there were

6 members; from the State of Wisconsin 28; from the State of Maine 2; from Louisiana 2; from South Carolina 1; from North Carolina 2; from Pennsylvania 3; from Massachusetts 2; from Ohio 5; from Michigan 2; from Tennessee 1; from New York State 6; from Minnesota 2; from West Virginia 1; from Kansas 1; from Newfoundland 1; from Canada 2.

MEMBER: There were four from Tennessee present here yesterday.

CHAIRMAN CHANT: This is a summary of the registrations which were turned

in yesterday. If you know of four Tennesseans who were here yesterday, all I can say is that only one of them registered.

I take much pleasure in presenting to you now a former General Chairman of our sec-

tion, Mr. Earl Grant, who will give us the first of two papers on the general subject, "Practical Uses of Accident Cost Data in the Safety Program."

Practical Uses of Accident Cost Data in the Safety Program

By EARL E. GRANT

President, The Crystal Tissue Co., Middletown, Ohio

Personal experience has taught me that accidents are costly to the injured and the company, to the extent that I have always believed in rising accident costs as a barometer in addition to severity and frequency rates.

Accident statistics or cost data really start with the departmental accident report and include the report to the State Industrial Commission with the medical, hospital and compensation awards and finally end with the settlement sheet.

The direct costs can be used for cost data, but we cannot get an accurate cost for damage to machinery, effect on fellow workers, suffering to the injured employee, or the cost assumed by his family.

I want to deviate from the cost angle and read you a paragraph from monthly accident statistics' report for Ohio compiled by the Department of Hygiene for the month of May:

"The 16,259 injury and occupational disease claims filed with the Industrial Commission in May, an increase of 988 over the preceding month, reflect a gradual increase in employment as shown by research reports, especially in the heavy industries. The 81 fatal claims filed are a decrease of 18 over April."

This was the first time that I had been forcibly struck with the fact that accidents were being used as barometers or indicators of employment.

Some of you may treasure an old family Bible with births and deaths recorded in it, but I have an old black book in my desk which is almost bursting with statistics gathered in the last twenty years. These statistics cover tonnage, hours worked, payroll, cumulative accident reports, bowling and baseball schedules, etc., and are very important and interesting to me.

It sometimes pays to check up in the old book and find out what we did ten or twenty years ago and check with today's record. We occasionally get in a rut or have a complacent feeling that we are going fine and a check-up on past performance may show that after all there was a time when conditions were even better.

During the last twelve years we have run from a low of 354,946 to a high of 648,554 man hours worked with an average of 509,145 hours and a total of 72 lost-time accidents. Our two first years in the Paper & Pulp Section Contest saw us pile up 26 or 13 lost-time accidents per year; which were followed by a no-accident year.

The lost-time accidents are costly, of course, but they are the ones you naturally guard against.

Our total accident awards for the 12 years amount to \$35,619.22 and our accident costs total \$43,275.92.

Accident costs are a tax on industry just the same as excess profits tax, social security or real estate taxes, but are levied by the careless employer and the untrained or thoughtless employee.

Our accident costs have averaged .007 per hour or \$7.08 per 1,000 hours worked during the last twelve years; and the compensation, medical and hospital fees have averaged .0058 per hour or \$5.83 per 1,000 man hours worked.

The premium in our manual group under the Industrial Commission of Ohio amounts to \$2.00 per \$100 of payroll and will increase or decrease according to the attention given it by the representatives of the mills in the group. We had an increase from \$1.60 to \$2.00 about five years ago, and tagged it there when we had a meeting and decided to pay more attention to the hazards in the mills affected.

Frankly, I am ashamed to admit that our net cost per ton of product has been as high as .67½¢ in 1931 and as low as .31¼¢ in 1928 with an average of .45¢ per ton for the twelve-year period.

Costs and personnel have always been two of the most interesting phases in business to me and I cannot think of accidents without immediately tying in the cost and personnel angles.

Accident cost data interest us in keeping costs down as our business is very competitive and from a personnel viewpoint we are more deeply interested as most of our employees have been with us for more than ten years.

In conclusion I'd like to refer you to the

CHAIRMAN CHANT: I am sure that after the next paper has been read, which has to do with the other half of this same subject, there is going to be considerable discussion centering around your very excellent paper.

While Mr. Grant was speaking I could not help but think that in a good many organizations in our industry the safety man or the safety director or the safety supervisor is, to some extent at least, regarded throughout the organization as a sort of generally useless cuss who isn't much good at any other kind of work. But we have here a living example of the fact that occasionally a safety man, without losing his

Managing Director's Page of the July issue of "National Safety News" and to the article by our good friend Bill Cameron entitled "Who Directs Your Safety Program?" The article deals with the various department heads who may be charged with the Safety Program. He points out that a Safety Program delegated to the treasurer or auditor will be treated from a cost angle, the sales manager will try to sell from posters, signs, literature, etc., the plant engineer from planning safety through equipment design and layout, materials and maintenance schedules, etc.

A full time safety director is preferable, as Mr. Cameron concludes the article, but the most important question in my mind is "Who Controls the Safety Director?"

interest in safety, can either because of that interest or in spite of that interest rise to greater heights. Mr. Grant is an example to us of one who has risen out of the safety department into the position of senior executive.

The second paper on this subject, the use of accident cost data in our work, was assigned to a fellow-Canadian in the person of Julius Draper, Safety Director of the Consolidated Paper Corporation, Grand Mere, Quebec, Canada.

I am very sorry that Julius cannot be here to deliver his paper in person. I have it here and with your permission will read it for him.

Practical Uses of Accident Cost Data in the Safety Program

By J. A. DRAPER

Director of Safety, Consolidated Paper Corporation, Ltd., Montreal, Canada

Some time ago I made "Accident Costs" the subject of an address before one of our mill safety meetings; there were a few foremen present and one or two superintendents, but most of the men were from the ranks. I told them how much our accidents had cost the Workmen's Compensation Commission the previous year—how much we paid the Commission in assessments—and explained that as our accident experience improved so would our assessment be lowered. The less money the company paid in accident insurance, the more there would

be to spend on plant improvements, wages, etc.

I thought I had made it fairly interesting, but during my visit to that mill the following week, the secretary of the Safety Committee said to me, "You know, Mr. Draper, your talks are usually pretty good, but you sure pulled a 'lemon' last week! Those boys don't give a tinker's hoot how much our accidents cost the company. All they want to know is, 'Has the company enough money to pay our wages and will we receive Compensation if we are hurt?'" I believe that

the secretary was making too broad a statement, but he was, to a great extent, quite right.

If you are going to use your accident costs to further your safety program, take them to the men who are most vitally interested in costs, your managers, superintendents and foremen.

By and large, if there is one man in a mill who is as keen or keener to prevent accidents and show an improvement in accident experience than the safety man, that man is the mill manager.

All managers are vitally concerned with costs. There is at least one type of meeting where the manager takes charge and keeps the initiative—where the superintendents know that he means business. I refer to cost meetings. It is indeed a happy concern where cost meetings are jovial, carefree affairs!

I am going to describe now how we have formed our accident cost figures into an accident prevention tool, and how that tool is placed in the hands of our division managers.

Placing a tool in a man's hand is one thing, but whether or not he uses that tool and the efficiency with which he uses it, are other matters. However, the following scheme is used by some of our managers at some of their cost meetings. It may or may not be a novel idea. Some of you, no doubt, have other and perhaps better ways of using accident costs.

Early each month our safety inspectors receive the accident cost statements for their respective mills from the insurance department. This statement shows the money paid out by the Workmen's Compensation Commission during the preceding month for each individual accident case. From this sheet the safety inspector prepares a statement showing the accident costs by departments and this is sent to the division accountant, who incorporates the accident costs by departments as a footnote to the departmental cost sheets. The footnotes show the accident costs for the month and the cumulative total for the year to-date, for each individual department.

These figures are discussed between the manager and superintendents at the monthly cost meetings.

The manager makes appropriate remarks when reviewing the costs of the departments

that show very little or no cost for accidents. In the case of the other departments, it is pointed out that accident costs are by no means a small item. The manager wants to know what caused that accident, or those accidents; what has been done about it? Has that floor been fixed? Are there any more such bad spots in the floors about the plant? Have those truck handles been altered so that we will have no more broken toes? Are you encouraging your men to wear safety shoes? Are you insisting that your men obey our safety rules? Do you show to the whole personnel by your words and actions that you are right behind our safety work, and are determined to do your utmost to prevent accidents? These are some of the points that can be brought before the supervision of a plant by the manager at a cost meeting.

Cost meetings are to discuss ways and means of reducing costs. Accidents are a needless waste and therefore are a legitimate subject at such meetings. The personnel at cost meetings are also the very men who, in many cases are, and in all cases should be, among the most enthusiastic safety workers in a plant.

The money cost of accidents is far from the most important reason for installing guards on machinery; it is probably the least important. Nevertheless, a safety director can use the proved savings of guards in one instance to help sell the idea of installing guards or making improvements in other places.

Many years ago the winders for our newsprint machines at two of our mills were not equipped with guards for the in-running nip between the winding roll of paper and the drum. Accidents were fairly frequent, and nearly always serious. They ranged from pinched fingers to fatalities, but usually resulted in mangled arms. The cost of these accidents was very high, sometimes ranging into thousands of dollars per year per mill. Again let me emphasize that this money cost is small compared to the loss in human values. I never want it said, that "This man tries to prevent accidents chiefly because they cost money."

To get back to our winders:—Some years ago the winders were equipped with simple guards, the cost was in the neighborhood of \$100 per winder. Total cost for the two mills certainly not over \$1,600. The spend-

ing of this sum has virtually eliminated our nip point accidents at those winders. Based on our experience before installing guards we can say that they are saving at least 100 per cent of their cost per year.

Many of you can cite similar instances. If your management hesitates to install guards, or make other improvements designed to increase safety, *because of the cost*, be prepared to point out that they cannot afford *not* to do the work! If they talk cost, you talk savings, and have some such example as I have cited to back up your argument.

A safety director naturally would know the rate his company is paying for accident insurance. He should also know how much this amounts to in a year. He should know what rate was paid in previous years; how much money is being saved because of an improving accident experience; and he should be able to compare the insurance costs in his state or province with the costs that prevail in neighboring states or provinces.

He should be "cost conscious," and be able to prove, in conversation, that he has a

larger grasp of his job than that necessary to install guards, address safety meetings, and compile accident statistics. Men are far readier to listen to a man and take his advice when that man can show that he knows his job, can point to the savings that have been made in the past because of accident prevention, and holds out the prospect of further savings, provided further improvement in accident experience is attained.

To sum up:—

1. Accident costs can be formed into a useful accident prevention tool, and wielded most efficiently by managers at cost meetings.

2. A safety director should be able to cite concrete examples where money spent on accident prevention has brought in handsome returns, and be able to use such cases as an argument to secure further improvements.

3. He should know his company's present accident costs, be able to compare such costs with previous years, and with comparable industries in other parts of the country.

General Discussion

CHAIRMAN CHANT: Now we are ready for discussion on those two papers on accident cost.

CLAYTON O. BRAATZ (Marathon Paper Mills Co., Rothchild, Wis.): I wonder how many men here keep their accident costs, as referred to by Earl, on a cost per one-hundred-dollar-of-payroll basis, which is the cost generally used in compiling insurance rates? I would like to compare our costs, for example, with other mills. (Several hands raised.)

ERNEST AUGUSTUS (The Mead Corp., Chillicothe, O.): Mr. Chairman, Earl commented on the compensation and treatment costs shown in the Industrial Commission records. I wonder whether those costs are kept and charged back to the particular years when the accidents occurred or whether they are charged out currently as they are paid?

For example, we have one case of an accident which occurred to one of our workmen about 15 years ago, and we are still paying that man compensation and will continue to do so until he dies. Of course, that shows up on the Industrial Commission's

records as compensation paid each year, but for our records we are charging it back to that year in which the accident happened. It makes a whole lot of difference in the final comparison wherein you want to show whether your records are improving or not.

MR. GRANT: Ours are all charged back to the year in which the accident happened. That is the reason we have been able to compile an average cost by year for comparative purposes.

CHAIRMAN CHANT: I am familiar with a few firms where the costs are kept both ways.

R. W. CROUCHER (Minnesota & Ontario Paper Co., International Falls, Minn.): Do these costs of accidents include the hidden cost or merely the dollars and cents paid out?

MR. GRANT: In our company, they do not include the hidden cost; I mean, that cost which you just arrive at more or less by guess work. There are a lot of accidents which are costly but it is difficult in most cases to tell what the costs are. All the actual costs, of course, are compiled and kept.

There is another thing we have always done in our accident program (and I think

probably a good idea with us on this): cost of a guarding any money we spend the good of the effort that is good for our company; so factoring cost at program in any way.

MR. CROUCH include hidden cost of course, is the hundred dollars or

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probably a good one) with us on this cost of a guard: any money we save by the good of the guard that is good for our company; subtracting cost of the program in any

MR. CROUCHER: I include hidden costs, of course, is the cost of a guard of one hundred dollars.

CHAIRMAN CHANT: The actual cost per year is the amount of the industrial commission you may get. I would, however, think that a much better setup in the private United States is to have a group of firms in your cost of that represents the cost of carrying for the provided your average: or, on paid to the Commission your cost of carrying you for I think that better.

I would like to see a sentence that I read in your paper, where it says a little for having a group of men in mills, a group composed of in men or supervisory there. In my good deal of from the various have found, men in the mill costs.

Perhaps Mr. Grant's logical one: that knowing whether continuing paying are hurt, they compensation, but believe that the pulp and paper thing that relates of his company.

dollars and cents go into our state headquarters. When you take time to explain the thing to them, they see a different picture.

E. A. PAGE (Kimberly-Clark Corp., Neenah, Wis.): Do most of these accident cost figures include the cost of first-aid dressings and that sort of thing or just the cost of compensable accidents? How do the insurance companies run those things?

CHAIRMAN CHANT: Most companies, so far as I know, in most industrial compensation setups have the cost of the first-aid treatment in the plant borne by the employer. I don't know whether that is correct in your jurisdiction or not, but it is true in Canada. However, there are many cases in which no lost time is involved—that is, no time lost beyond the day of the accident—which are not really counted as lost-time accidents—but in which there is some cost borne by the Commission. Any service rendered by a doctor or by a hospital, regardless of whether the man himself is disabled long enough to get compensation, is still paid for by the Commission under our Acts in Canada, and I think that most of your states have the same or a similar type of coverage.

MR. PAGE: Were they included in Mr. Grant's figures?

MR. GRANT: As regards our first-aid equipment, it is charged out currently as it comes in. It is a mill expense item.

MR. PAGE: How about the salaries of nurses, etc.?

MR. GRANT: We don't have any nurses. We have two first-aid men in our organization. Their salaries are charged against the mill and all supplies are charged out currently as they are received.

M. D. KOSSORIS (U. S. Department of Labor, Washington, D. C.): I have been greatly interested in this discussion. It seems to me that safety men who may have to justify their programs in terms of savings are not putting their best foot forward when they are counting their savings in terms of insurance premiums or compensation actually paid out. When accidents do occur you have, in addition to the premium paid out, these medical, first-aid expenses, spoiled materials, possible damage to equipment, stoppage of machines, etc., all of which things cost money.

Why not include these costs, why not

charge them to the accidents to which they belong? Keep separately, if you wish, the compensation cost and the insurance cost, but in addition to that keep, on the other hand, these other costs. I won't call them hidden costs—I think they are not hidden costs but rather indirect costs, if you want to call them that. I believe you will find that these indirect costs will be about four times as large as your direct outlays. When you have to make out your case for safety programs or the guarding of equipment or the teaching of safety habits, etc., and when you want to show what the savings have been as a result of those programs, I think you are perfectly justified in including not only what is actually paid out in terms of compensation and insurance but also in these other costs that you haven't been able to prevent.

CHAIRMAN CHANT: I think you are perfectly right. But it is a difficult thing in most instances to accurately determine the indirect costs of some of these things. I have taken a number of individual cases and spent a great deal of effort trying to get at those indirect costs. I have one case on record where the indirect costs, which we could definitely put a finger on and measure, were 27 times as much as the direct cost; whereas I have many other cases where I couldn't find that it even equalled the direct cost. In general and on the average I think you are absolutely right. If there is any way by which we can record definitely and directly the indirect costs, then we certainly should have such a record; but if we can't do that, then I think we are quite safe in claiming that they amount to four or five times as much as the direct costs while letting the other fellow try to prove that it isn't so.

MR. GRANT: I would like to take exception to the remarks made by the gentleman from the Department of Labor. I personally maintain that if you are going to charge the costs for your machinery into your direct accident costs, you will find that you can charge about 50 per cent of those costs against the management for lack of proper and sufficient guarding, which has no part in your accident program, instead of against accidents.

CHAIRMAN GRANT: I agree with you there.

MR. PAGE: To make the argument a

bit more sound, as regards the savings on and the cost of accidents, do any of the firms represented here keep an account of the cost of meetings, accident prevention programs, educational programs and the like? Are those things charged in?

CHAIRMAN CHANT: I know of several instances where such accounts are kept, yes! I am familiar with a number of cost departments where those figures are kept accurately, where the time allowed to safety committees in their monthly inspections, to safety meetings and all other measurable items of the cost of safety programs, is accurately recorded. However, I don't know of any firm where any great use is made of such records, other than to include them in their detailed cost sheet.

MR. PAGE: Is that added to the cost of accidents?

CHAIRMAN CHANT: It is itemized and kept separately so that they can tell how much the operation of the safety committee has cost in dollars and cents for the past year or for the past five years. By means of such a record the manager from time to time is made aware of what these things cost and he has some knowledge of whether they are unduly increasing in cost or decreasing, which might indicate a lack of attention or perhaps a falling off in the number of meetings or in the number of inspections or something of that sort.

MR. PAGE: You don't know the comparison between the cost of safeguarding and the cost of accidents in your organization?

CHAIRMAN CHANT: I don't know

where that is being done, although perhaps it is being done somewhere. In all fairness to the men who prepared these two excellent papers on this subject (I should have stated this before) it ought to be said that in both instances it was suggested to them that they do not attempt to go into a discussion of detailed accident costs at a meeting of this kind. The reason for that was not that there was any hesitancy about making known the cost of accidents in any given plant, but rather because of the very great difficulty in making anything like an accurate comparison between plants located in different compensation jurisdictions. I know that we have had a difficult time for years trying to compare compensation costs in Ontario with those in other provinces of Canada and with other jurisdictions in the United States. That is a very difficult thing to do because of the differences in the Acts.

It is easy and simple to obtain the assessment rates. You may know that the cost per one hundred dollars of payroll is lower, but you first have to know what you get for the dollar of assessment that you pay, and there is so much that is included in what is being paid for under the Act: the period during which compensation is paid, the waiting period, the percentage of wages, and all these other things which make it a tremendously difficult task to obtain anything like an equalization of the figures. For that reason the Executive Committee, when suggesting that this item be put on the program, thought that we might better discuss it from the point of view of the general use of figures rather than the actual cost figures themselves.

JOINT SESSION WITH WOOD PRODUCTS SECTION

October 9, 1940

The meeting convened with J. C. Wilson, Vice-President, Lumbermens Mutual Casualty Company, Chicago, and General Chairman, Wood Products Section, National Safety Council, presiding.

CHAIRMAN WILSON: In our Wood Products Section meeting Monday afternoon the Illinois Department of Labor sent us over a picture which was presented by Deputy Cannon, and it met with such a fine

response and so many people did not see it that we urged them to show that picture again this afternoon.

After that picture has been presented, we will have shown to us a British Columbia picture that has to do with heavy logging and that was sent to us by our friend Jenkins. We also have a picture from the Western Pine Association, all of which will tie into a part of this discussion.

The American Standards Committee is rewriting the code on logging and sawmill activities and I know that some of the points that will be brought out in the discussion and some of the things that will be emphasized in these pictures are going to tie in to this suggested code.

(The motion picture was presented.)

WILL D. JENKINS (British Columbia Lumber Manufacturers Assn.): On my way up here somebody was asking me about strains. Along about the fall of the year a lot of the men seem to get lumbago when they want to lay off for a while and receive compensation for it. Well, with these power saws we find that we are not eliminating any labor but we are making it easier for the men to work.

Heretofore we have always hired a bunch of men with strong backs and weak brains to fell timber. But now we are trying to conserve some of the timber and to teach some of the boys whom we get out of university how to fell this timber, because there isn't very much to it, you see. Besides, it is the only mechanical device to be introduced that didn't eliminate somebody from a job, and we are kind of hot on this thing up there in British Columbia, you know.

These saws which you noticed on the screen are the big ones; those are the ones that fell the timber. But we have fellows who go around with something like an Even-rude engine on their backs that has a flexible shaft which they run along a tree in order to clean these knots off and all that sort of thing—there is nothing to it, you see—and we don't knock anybody out of a job.

QUESTION: Can two men do any more work with that saw than one man?

MR. JENKINS: No, the power saw does not increase the production. But they can work a power saw all day long, as our boys do out there, and then they can come in after quitting time and play tennis or volley ball, if they want to. Before we usually hired a man only for about thirty days, after which he was so worn out that he wasn't able to work any more. Besides, we paid him for eight hours' work and only got six hours' work out of him.

QUESTION: Have you had any accidents with that saw?

MR. JENKINS: We have had fewer accidents with them for the reason that the men who operate these saws are of a some-

what superior mentality—if you get what I mean. They are not so broad in the back.

QUESTION: How much does that outfit weigh?

MR. JENKINS: About 125 pounds altogether.

QUESTION: Dragging it from one place to another, is there any possibility of coming in front of it?

MR. JENKINS: In walking through the forest you have always that hazard of not knowing where you are going to step. You are likely to step on top of something or into it. That's where we get our worst and greatest number of accidents, from falling down, slipping, tripping, etc. They are about the greatest hazards that you have in this kind of work.

QUESTION: What is the approximate cost of one of those power saws?

MR. JENKINS: I don't know exactly, but I imagine that they cost around \$400 a unit.

QUESTION: Those saws help you save considerable timber, do they not?

MR. JENKINS: I don't know that they do. We never figure that we are saving any timber on the end of the log.

QUESTION: How often do you have to sharpen that saw?

MR. JENKINS: Oh, about as often as you would a chain saw.

QUESTION: How long would you say the chain would last—a day, a week or how long—before it would have to be resharpened or replaced?

MR. JENKINS: In felling timber you could probably run the saw all day long, but if you are bucking timber—that is what we call cutting the logs off—and if it happens to fall and gets a bunch of rocks into it, it might not last fifteen minutes.

FRED H. STAFFORD (Chapman & Dewey Lumber Co., Marked Tree, Ark.): How do you guard it?

MR. JENKINS: We have never had any trouble in that respect.

CHAIRMAN WILSON: The frame over which it runs is very substantial, I suppose?

MR. JENKINS: Well, there doesn't seem to be much danger in the use of this saw in that respect because we haven't had

any accidents reported from that particular hazard.

I would like to add this: We had a big camp in which there occurred a whole lot of head injuries. Out of 60 fatal accidents that we had in our woods operations in British Columbia, we had 50 fatal accidents that resulted in fractures of the skull. I am hoping that the *National Safety News* will publish a picture which shows 18 hats in one camp in logging work that are crushed in, each one of which might have been a fatal injury.

Twenty years ago when I advised the use of these hard hats in the mines of British Columbia, one of the superintendents told me that he wouldn't let a man put one of these hard hats on, that he wouldn't think of asking anybody to do it; but today no man can ask him for a job unless he wears one of these hats.

CHAIRMAN WILSON: All right, now let's have the showing of the next picture.

(The talking film sponsored by the Western Pine Association was shown.)

CHAIRMAN WILSON: Before introducing the experts in our Panel Discussion, I would like to introduce Mr. John A. Dickinson, Secretary of Logging & Saw Mill Sectional Committee, National Bureau of Standards, Washington, D. C. I would like to have him say just a few words concerning the new code, because the code, I think, will answer a lot of these questions officially.

Comments on the Code

JOHN A. DICKINSON: Gentlemen, those of you who are at the pulp and paper end of the fence will probably remember that logging and the bringing of logs to the mill is referred to in the logging and saw mill code. Now that code was published back in 1923. At that time we thought we did a fairly complete job. Twice since then we have asked for criticism—whether it needed revision—and up until 1937 the answer was negative.

In the last few years in the Western pine forests in the mechanization of logging there has developed the use of tractors, of large truck units of about 50 or 60 ton capacity. Those are some trucks, mind you. And it is evident that we have to revise the section on logging very materially by adding several new chapters.

Our small tool section is also going to be amplified, and we are going to put in perhaps, if necessary, a section on the special handling of pulp wood from the woods to the mill.

One of the questions that came up for a vote yesterday was this: Shall we divorce the logging from the saw mill section of the code? The vote yesterday of the sectional committee was to this effect: we will publish separately two sections, one on logging and one on the milling operations, but we will also provide a combination bound volume in much the same way as certain other codes are handled, such as the A.S.M.E. boiler code, which takes in power boilers, miniatures in dry cleaning plants, locomotives, etc., which can be obtained in separate pamphlets or all together. If we get that flexibility it was the opinion that it would be more desirable to do that through one sectional committee rather than two, because the latest figures we have available show that about 50 per cent of the logging is done by companies which actually do the milling. It is about a fifty-fifty split between independent contract loggers and companies which log and mill their products.

However, I am not going to enter into a lengthy discussion of that topic because we are going to have a very interesting panel meeting here this afternoon. If any of you folks disagree with any of our conclusions or if you have any ideas to suggest, we would like to hear from you. We are going to split the thing up into sections. We are going to have a group up in New England, another group out on the West coast, another group in the Northern section, etc., and then we will form skeleton outlines of this new material and from that build the thing up. If you have any criticisms of our plan of procedure, if you have any suggestions to send in on the revision of the code, either as regards the logging or saw mill ends, we shall be very happy to receive them. You can address them either to me at the National Bureau of Standards or to Robert McA. Keown, Chief Engineer and Secretary of the Industrial Commission of Wisconsin.

CHAIRMAN WILSON: I will now briefly introduce to you the members of our panel, to whom questions on our active work operations and their hazards will be presented:

J. E. Cantin, Safety Director, Quebec North Shore Paper Company, Baie Comeau, Quebec, Canada.

Harris Flaherty, Field Officer, New Brunswick Accident Prevention Association, Dalhousie, New Brunswick, Canada.

F. H. Stafford, Safety Director, Chapman

and Dewey Lumber Company, Marked Tree, Ark.

G. R. Vaughan-Evans, Employment Supervisor, Anglo-Newfoundland Development Company, Ltd., Grand Falls, Newfoundland, Canada.

C. E. Wilds, Superintendent, Wood Operations, The Brown Paper Mill Company, Inc., Monroe, La.

Safety from Woods to Mill

Panel Discussion

CHAIRMAN WILSON: The first question is this: "Can we improve in any way on our camp facilities from a safety standpoint?" Which one of you gentlemen is the biggest camp operator?

C. E. WILDS: We have about 1,500 men in our camps and they cut nothing but pulp wood, of course, running from 9 to 12 inches through.

CHAIRMAN WILSON: The size of the cut doesn't make any difference, does it?

MR. WILDS: It makes a whole lot of difference in safety operations.

I think we can improve our camp facilities very much. To be perfectly frank with you, the pulp operations in the South follow a safety program only to a remote degree. After you get outside of the mills, why, there is nothing except the nigger, ax and saw and it is telling on our contractors. That is why I wanted to come here today and see if we couldn't get someone interested in our problems in the South. We have a safety director and he is very efficient in our plant, but when we get beyond the railroad yards of our plant, why, there is absolutely nothing doing. It is costing our contractors a good deal of money and, of course, that reflects back on our wood payroll.

CHAIRMAN WILSON: There is no question about that. Taking advantage of the Chairman's privilege, I might suggest that you get some definite legislation down there on safety codes pretty soon, because good-nature knows you need them.

MR. WILDS: We sure do.

CHAIRMAN WILSON: The solution to safety in a great many places rests entirely on legislation and enforcement. It has taken us here in Illinois a good many years to get to the place where we now are, and we still have a long way to go; but we have a Department of Labor and this deputy who was here today with his movie film is an example of the present-day Department of Labor inspector in this state. They are trying to do an honest job. Still, we haven't a complete set of safety codes. As for you folks down there, you need it and need it very badly, not only for the logging industry but for almost everything else down there.

New Brunswick Regulations

HARRIS FLAHERTY: We have recently had some legislation passed in our province on the way in which a camp should be constructed and where it should be located in relation to sanitation and health. I quote:

"Camps should be located and constructed with due regard to sanitation and health, located at least 100 feet from any lake, stream or other body of water, with floors one foot from the ground which shall be properly drained and with smooth surface so as to permit of washing. The walls must be at least eight feet in height above the floor.

"As regards lighting, there shall be one square foot of window area for every 20 square feet of floor area. All windows shall be constructed so that they may be opened or closed at all times. Roof windows shall not be located over bunks.

"Ventilation—at least 300 cubic feet of air space for every occupant and a separate ventilating system in the roof.

"Bunks to be either single or double deck at least 18 inches above floor. Field beds are deemed unsanitary. Straw ticks or mattresses to be in good condition and blankets kept clean and sanitary.

"Wash room space where men may bathe and wash clothes. Provision made for exclusion of flies from dining room, kitchen or other places where food is stored, prepared or eaten.

"Latrines or privy pits shall be provided so as not to be a source of danger to any water supply. They should be at a reasonable distance from the camps and kept in sanitary condition."

Now, gentlemen, the camps in the section where I come from have been built any old way and there has been no legislation until recently as regards the manner in which they were to be built. However, through the legislation which we have been working on this past year, we hope to get better living quarters for the men working in our lumber camps.

MR. DICKINSON: Do you have any prohibition about the storing of dynamite in the bunk house? That sounds like a fool question, but I have seen many a bunk house in Wisconsin and Michigan where dynamite was kept under the shooter's bed to keep it from freezing. I have seen two or three tons of it stored away in a hut in the middle of a village, and the mill owners were very wrathful when I suggested to them that the stuff be moved out into a bulletproof magazine about a thousand feet away from the camp boundary. That was a common occurrence not many years ago.

MR. FLAHERTY: Dynamite in our camps is usually stored in a storage house outside the camp.

J. E. CANTIN: We employ about 5,000 men in the woods during the cutting season and so we have a good many camps. Up in Baie Comeau we had about 35 camps last year, contractors' camps. We have had regulations concerning the construction of lumber camps in the provinces of Quebec and Ontario for a number of years. The regulations are very strict as to the way we can build a camp—how far away from or close to the water it must be—as to the number of square feet per man that you can put up,

etc. I don't see, so far as Quebec is concerned and possibly Ontario, just how we can improve our camp facilities.

CHAIRMAN WILSON: I would like to say that about ten years ago every province in Canada took over the idea of compensation insurance. Don't let these Canadians get away with the idea that they have always had this type of camp, because they haven't. We were tickled to death to have the provinces take over some of the camps that we insured 100 miles from anywhere, and God knows they were plenty tough.

To our friend here from Louisiana I would like to say that there is your answer: legislation—definitely. They won't do it unless they are forced to do it. And the next job they have to do is to force these bohunks to use the facilities that they have had to provide for them.

Our second question is this: "What facilities can be provided for first aid (a) in the camp, (b) in the field, and (c) during transportation?" Who is a good first aid man in this group of experts? Who does a real job on that?

Facilities for First Aid

MR. CANTIN: We do not allow a contractor to go into the woods for the execution of his contract before he has met the safety director or the first aid man, at which time he is handed a first aid kit which we think covers the requirements. These first aid kits are supposed to cover the requirements for a camp of 25 men. If the camp has 50 or 75 men, we give him two kits or three kits, as the case may be.

The company gives him the kit free of charge, but he has to refill the kit as he goes along, as it is used up. We have a safety inspector, a safety director or a scaler who acts as an inspector, and as he goes around to the different camps, he checks on the safety supplies.

CHAIRMAN WILSON: Who renders first aid in these isolated locations?

MR. CANTIN: That's another question. Each contractor has to have a clerk, because we have a forestry commission which is very strict as to what we must do in the way of keeping proper records of the wages earned by the employees in the bush, whether cutting by cord or working by the day or the month.

For the last two years we have made it a rule that this clerk must be a first aid man. This rule has been a little hard to enforce because it is hard to get these clerks a week or two or three in advance in order to give them some first aid training. However, we have sold the contractor on the idea of having a good first aid man in his camp and so when seeking to hire a clerk he looks for a man who has had some first aid knowledge and experience.

The course which we give to our employees and to these clerks is the St. John's Ambulance Course, which is something like your Red Cross here. It takes about three weeks to give this course. As a matter of fact, there are four different courses to follow. They can take them inside of three years, after which time, if they pass their last course, they receive an instructor's certificate.

In my company we have about 55 or 60 first aid men who work in woods operations during the season and we have found that it was good money invested, because many times in previous years we had men with bad wounds come in from the forest with a dirty old sock wrapped around it and that's how they were taken to the doctor. You all know what results from infection. We have succeeded in reducing the cost of our accidents because we have been able to give good first aid, and we are certainly sold on this idea of a good first aid man in every camp during the season.

We are working now on the problem of giving the man in the field a first aid kit. We already have two or three of the first aid companies interested in this idea. One thing we pointed out to these companies is that the first aid kits which you buy in a drug store usually have these straight-edged boxes, so they are actually selling you a hazard. We told them flatly that unless they supplied us with a rolled edge box, it was no dice, and they are working on the problem now.

MR. DICKINSON: I'll say "Amen" to that. I got myself a first aid kit, and when I came upon somebody who had been hurt in an automobile wreck and went to offer a bit of first aid, I cut my thumb when I tried to open the box.

MEMBER: One other thing you didn't mention, in connection with your first aid outfit; it seems to me that one of the most

important items to carry in it is a tourniquet.

MR. CANTIN: I am glad to say that we use the American Army tourniquet in every one of our boxes.

Safety Consciousness

CHAIRMAN WILSON: Let us go on to our next question: "Since as in other industries the majority of accidents in logging and lumbering have human failure as their basic cause, what steps can be taken to promote safety consciousness among the actual workers in these operations?" Would you like to say something about that, Mr. Stafford?

F. H. STAFFORD: Well, you can't put mechanical safeguards around the men in the field, and so you must depend entirely on the strength of supervision. Personally, I believe that that is about the only way, through a process of education and safety supervision, that you can make them safety conscious.

CHAIRMAN WILSON: Here is something which may interest those of you living in Arkansas and everywhere else. The Canal Zone today is working at least several thousand Jamaica negroes, who perhaps are of a much higher caliber than those fellows you have down in the hillbilly country. These men are being educated to do every form of work by visual education, by means of movies. They are trying to show them how to use a saw properly from underneath. They can't be taught to use a handsaw on the top of a stick; they saw only from underneath. But they are shown every operation, even as to how to use a shovel and how to use a hammer and how to set a board or make any kind of a trim. The contractors have taken along with them 10 key men, and these key men manage 700 or 800 or perhaps 1,000 of these negroes, and they are taught every job they are supposed to do by means of visual education. It seems to me that you folks down in Louisiana might very well take a leaf out of that book.

Educational Programs

MR. CANTIN: The suggestion is very good. I believe that what is needed in the pulp wood logging operation is an educational program; we have to educate the workmen on how to work safely. It is a big

job in our kind of operation because of the large turnover of workmen. We have these men for about four to five months in the year, and from one year to another I would say that about 75 per cent of them are new workmen who come in. You have no sooner started a program of education to teach these men how to work safely in the woods than you find that the operation is finished, so you have to begin all over again the following season doing the same thing.

With this in mind my company has published a monthly magazine, a little house organ, which is entirely for the woods operation end of our business. Our pulp and paper mill has nothing to do with it. Everything in this little magazine concerns the forest worker. We have a page for the cooks, we have a page for the teamsters, we have a page for the tractor operators, and we have two or three pages which contain items of local interest. We have three plants and this little magazine is sent to the workmen in all three. It is issued once a month.

We also have three or four pages showing these men how to do a certain job, how to avoid an accident when doing a certain task, and, incidentally, we have a page that deals with the subject of first aid. This year we published 2,000 copies of this magazine each month. We can't very well give a copy to each individual man but we try to give each camp a copy for every two men in that camp and they pass it around to one another.

I have found that this manner of educating the workmen is bearing fruit because they have a radio nowadays in the camps at night and lots of the men like to read. We supply them with newspapers as much as we can. This little magazine is interesting also because we try to make sketches to show in picture form what we are attempting to convey in words. We have found this to be a good way of educating the woodcutter.

Another good way is by means of safety posters. I am sorry to say that I have yet to see a safety poster issued by any association which covers woods operations specifically. We are beginning to get some. Local safety associations have started to put them out, but they are somewhat limited, due to the fact that they are state-subsidized institutions. In Quebec it is called the Workmen's Compensation Commission; in On-

tario it is called the Workmen's Compensation Board. These associations depend for their activities on grants received from the Commission or the Board, and they haven't received enough money to go very far into the problem. That is why we are looking to the National Safety Council to help us in this work.

Promote the News Letter

CHAS. E. JONES: I think this man has brought up something that is close to me. We have a "News Letter" in the Wood Products Section that supposedly includes logging and lumbering, and I know that you fellows in the woods operations are let out of that thing because you don't use it.

In being an editor one must also be a sort of clearing house, and in answer to the gentleman's question regarding posters I would like to say that that can easily be arranged provided we know just what it is that we want. I can't sit here in Chicago and draw a picture of a fountain, for instance, and send it up to the north woods and expect those men up there to think of it as a safety poster. I have been requesting them to send us ideas and pictures for more than a year, and yet I still have to receive one. You probably have cameras in the woods. Why don't you work it out a little bit? Maybe the information you have is the very thing the other fellow wants, and we have to arrange some place where it can all be put together.

As regards this movie business, we all saw a swell movie here today sponsored by the Western Pine Association. I would like to give you my opinion of that movie, which is this: They are selling western pine wood and that's the object of their picture, and I know that that isn't what you fellows want. You can't take a picture like that up into your camps. What does it have to say? Nothing more nor less than the fact that western pine is a darn fine wood, and we probably all know that already.

If you are going to use any movies at all, then I believe that the thing for you to do is to let us know about it. We are not asking you to donate any film. We only want you to let us know that you have it. After that, by means of a little cooperation, we may be able to get some of these pictures in such a form that they will not only be shown here but may be loaned out. Let us

try and find pictures on logging operations that aren't trying to sell something besides this thing that we are all vitally interested in, namely, safety.

I am very much disturbed about this thing, fellows, from this angle: You elect a man to a job as a "News Letter" editor and you say, "Well, we hope he does a good job." How can he? You lick him at every turn he makes. My friend up there in the chair answered one of my letters last year and said, "Sure, I'll help you out," and then he sent me one little article and I sure put it in the "News Letter." After that he just forgot about its existence, it seems. I know Jim is a busy man, and every one of you fellows has had the same alibi.

Now I hope that some of you fellows will just pick out one of these subjects that are listed here on this sheet and write me your opinion on it in an article containing not more than fifty words. If we could only get ten such opinions on various topics and print those in the "News Letter," it would be most interesting and help a lot, because then you would all be able to sit down and digest that information at your leisure when you are not at these meetings.

MR. CANTIN: I agree one hundred percent with what Mr. Jones has said about motion picture films. As a matter of fact, my company has been working on the project of making a film of woods operations, their hazards and how they can be avoided. We already have a scenario prepared.

CHAIRMAN WILSON: You will find that you will get a lot of support from the other associations if you will get something worth while.

MR. JONES: Why don't you put the Wood Products' "News Letter" on your mailing list?

MR. FLAHERTY: As regards this matter of education and the development of safety consciousness in the lumber woods, there is something we have got to put over and we are trying hard to put it over in order to cut down accidents.

You not only have to talk to the men but you also have to get the foremen safety-minded. The companies must get after the foremen and see that they go around to the men so that they can keep after them and see that they are doing the work safely.

MEMBER: Who reads those magazines

you put out? After all, some of these negroes down South can't read.

MR. CANTIN: It just happens that up our way the workmen can read them. There is no fancy stuff in them. They are written in the language which these men use when they speak. Whenever they use any word incorrectly or whenever they use a slang word, we try to educate them by putting the correct usage or the correct spelling of the word in brackets.

MEMBER: Would it be possible to train all your men in first aid, do you think?

CHAIRMAN WILSON: That is a difficult problem, because of the length of time required in which to give a man an intelligent first aid course. Take the case of the Western Electric Company out here at Hawthorne, for example, where they taught something like 4,800 men, all of them key men, over a period of one year. Then the following year they taught the group of men second in command, so that in the course of the last few years they have probably trained about 5,000 men who are capable of being first aid instructors, all of whom they now have on their working staff. But it's just wonderful, the reaction which some of these fellows receive, the minute they get into a first aid training school or class, because they immediately become conscious of safety procedures.

O. C. BOILEAU (R C A Manufacturing Co., Camden, N. J.): What we did was to start a class of about 30 fellows, giving them 100 hours of training. That included the standard Red Cross course of 20 hours, and an advanced course of 10 hours, and the standard instructor's course of 37 hours with a little thrown in for good measure. Then we broke them down and gave each of those instructors a certain group of men to teach. Thus far we have put through about 1,000 people, and the same sort of thing is spreading all over our local county.

Mechanization Problems

CHAIRMAN WILSON: All right, let's go on with the next question: "Has the mechanization of woods operation any effect on accident experience? If favorable effect has been noticeable, how far can mechanization be efficiently carried?"

S. W. HOMAN (U. S. Labor Dept., Washington, D. C.): We have just com-

pleted a study of the accident experience in various parts of the country. One of the things we wanted to find out also was the accident experience in those sections that are highly mechanized compared to the accident experience in those sections where mechanization hasn't been carried quite so far.

CHAIRMAN WILSON: What was the result of your findings? Has it increased or decreased?

MR. HOMAN: It has increased materially. In the Washington and California areas where they have a great deal of mechanization, both their frequency and severity rates were higher than they were in the South; and in the South they were somewhat higher than were those in the central section of the country, which included such states as Michigan and Wisconsin.

CHAIRMAN WILSON: What is the answer? Selection and training and supervision?

MR. HOMAN: I don't think so. I think more than anything else this mechanization has increased so rapidly, and the type of machines that they use are so powerful, that it has simply gone ahead a great deal more rapidly than any safety program of training which should have accompanied it.

CHAIRMAN WILSON: I think you have to select the men who are going to handle any kind of machinery. Take this long chain saw, for example, which we saw in the picture—you certainly must have a properly selected, properly trained, properly supervised crew to handle that sort of equipment.

M. C. GOODSPEED (General Electric Co., Erie, Pa.): I would like to ask this question: You compared the mechanization of the West with that of the South and with that of the central section. Did you compare the mechanization of the West with the hand operators of the West and the mechanization of the South with the hand operators of the South, because the products are so different that you can't even compare the two industries?

MR. HOMAN: The answer to that, so far as we are concerned, is no. We base this entirely on getting together as large groups as possible. In other words, we were not doing this for individual companies. We were making comparisons of a section where a certain type of logging was being carried on with another section. We purposely didn't

want to bring in the experience of any individual company. This study was not based, I believe, on pulp wood. Pulp wood was excluded. It was only based on commercial logging.

CHAIRMAN WILSON: Have any of you gentlemen ever had any actual experience in a relative measure between mechanized and hand labor?

MR. FLAHERTY: I have found that in the mechanization of woods operations, particularly in the sawmill operation of handling of heavy hardwood, almost every year there has been something new going on. All sorts of tractors and trucks have been operated night and day in order to get lumber out of the woods in as short a time as possible.

CHAIRMAN WILSON: And that has increased accidents.

MR. FLAHERTY: There have been many more severe accidents as a result of the mechanization of woods operations.

CHAIRMAN WILSON: A lot of the men have been killed as a result of such mechanization, haven't they?

MR. FLAHERTY: Yes, especially in the case of those companies handling heavy lumber, such as yellow birch. Take some fellow who perhaps has only driven a truck around a farm or a bit of freight on the highway and put him on a lumber truck, expecting him to propel the vehicle through the woods on poorly constructed roads with huge loads of heavy timber. Of course a lot of accidents are going to take place as a result of that practice.

CHAIRMAN WILSON: All right, let's go ahead to the next question: "Is it ever safe for one man to work alone in the woods?"

The answer is definitely no. I don't think we need to discuss that at all. That is one of the things we must do in this country: we must have some regulations prohibiting that from ever happening. I'm sure we all agree on that.

Here's the next question: "Since the accident rate for large operations seems to be lower than that for smaller ones, what measures could be taken to control the operations of smaller operators for the benefit of all?"

Every safety man here knows that that is a problem today not in the paper and pulp woods operations alone or in any other one

particular operation; it is a universal problem. Safety for the small operator is the big problem before us today.

Large or Small Operations

MR. HOMAN: Mr. Chairman, may I interrupt for a moment? On the basis of this study that we have just made, strange as it may seem, the larger operators have had considerably the worse safety record.

CHAIRMAN WILSON: You haven't got the story correct. You are not getting the reports from these fellows who are gypping you. The contract cutter, whether he is cutting logs or pulp wood or what not—running sawmills in Minnesota or Wisconsin or down in Arkansas—just doesn't furnish you with the correct figures.

MR. HOMAN: I agree with what you say. It was always my impression, too, that the small operator should expect to have the worst experience. But strange as it may seem, so far as we have gone with this thing, it seems to be just the reverse of that. The very large operator employing 1,000 or more men has had a worse experience than the operator employing, say, 500 men; and as you come down the line to the small operator employing up to 25 persons, you find that the latter's experience is still better.

Now, there is no question about the fact that in taking a national sample you don't get the small fellows at all, but you do get practically all the large ones and practically all the medium-sized ones.

CHAIRMAN WILSON: You also get an accident report from the first aid room or from the first aid man in the camp. You may get dressing reports in many of the states which state that these are not accidents, but I say that they are. When you get these reports, the higher degree of intelligence that is displayed in their handling, the more accidents actually have taken place. I say that your picture is somewhat clouded.

MR. HOMAN: We could get a great deal better and more accurate reports than those we do get. I stated a little while ago that the higher the mechanization, the greater the accident rate. Maybe that is reflected over into the fact that the larger the company, in all probability the greater its mechanization has been.

MR. DICKINSON: Mr. Chairman, I

think I have a little sidelight on something that has been brought out here. The gentleman a few moments ago said something about the small contract logger. In many cases it is made up of a partnership of two or three or maybe as many as twenty-five men, all of whom share equally in the profits, if there are any. Because they are all owners of the business, they do not come under the jurisdiction of the compensation law, and if one of them is hurt or killed in the woods, it's just too bad. He is a partner and he is just out.

Another point is that that type of individual probably is a man who has had 10 or 15 years of woods experience, and he has saved up a little stake, and he gets together with Harry and Bill and they start a little logging cooperative, and they probably are the pick of the woodsmen. That's just another slant on the point that was mentioned.

CHAIRMAN WILSON: Would you be good enough to take the chair for a few minutes, Mr. Dickinson?

(Mr. Dickinson took the chair.)

Felling and Cleaning

CHAIRMAN DICKINSON: Our next question comes under the heading of felling and cleaning: "What are the greatest hazards involved in felling and what means can be taken to control them?" Would you like to say anything on that, Mr. Vaughan-Evans?

G. R. VAUGHAN-EVANS: We don't have a great number of hazards in connection with felling. I would rather "pass the buck" on to somebody else who can probably answer that question better than I can.

MR. FLAHERTY: Our chief hazards, as I see them, in felling operations are to be found in old stumps, in limbs falling down and cracking the men on the back of the head or on the shoulders, and in kickbacks of trees over stumps. The only thing we can do is to have our foremen instruct their men as they go into the woods to watch out for those hazards. Undercutting and clearing the ground sometimes will have a great deal to do with offsetting those hazards.

CHAIRMAN DICKINSON: There is one other angle that hasn't been mentioned in addition to your kickbacks, I had a good deal of experience in the insurance field many years ago. We had a lot of accidents

of what we called the "bear-trap" type wherein a tree after being cut will hang at a 45 or 60 degree angle on a couple of small trees. What are you going to do in such cases? How are you going to get the tree down safely besides not spoiling the supporting trees? That, of course, is a very hazardous operation. It is more or less akin to the rock pillars in a coal mine.

MEMBER: I have worked in the woods quite a bit myself and I know that the best of sawyers will hang up a tree and oftentimes they have gotten out by having another tree thrown across it. But if you are careful in seeing that your road is fairly clear so that they can make a quick getaway when the tree begins to fall, there won't be any chance of getting caught in it.

CHAIRMAN DICKINSON: It would seem where you have tractors and trucks that a cable or chain around your small tree could straighten that situation out.

MR. STAFFORD: We have instructions to the effect that the workmen should not cut down trees when there is a high wind.

CHAIRMAN DICKINSON: There, again, your supervision is responsible. When you have men working on a contract cord basis, they are probably going to keep on cutting and take chances under unfavorable conditions sometimes.

Our next question is this: "Is any preparation of the ground feasible?"

MR. CANTIN: In our kind of an operation I don't believe we can prepare the ground. We are cutting in a very hilly country and the wood is small, running on an average of about 20 cords to the acre. I never found it practicable to prepare the ground in our kind of business.

CHAIRMAN DICKINSON: I shall read these questions through and then if anybody wants to discuss any particular one he can do so. "What precautions should be taken in regard to the tools used in felling?" That is one thing which the logging committee is definitely going to cover. We have appointed a committee on small hand tools, and we hope to have the forest service and three or four sectional groups figure out some definite operating rules on the handling, carrying, sharpening and using of tools which the men handle.

Question: "Can any considerable amount of clearing or cleaning be done before felling?" That is tied in with the question hav-

ing to do with the preparation of the ground. The answer seems to be no except on the big stumps.

Question: "Can any safety training methods be used to promote safe felling? If so, what?" Does anybody want to discuss that?

R. W. LAUGHLIN (Liberty Mutual Insurance Co., Portland, Me.): One thing has been done that would line up with what has been done by the gentleman from Ontario and Quebec. We have made up some booklets with pictures on every operation in the woods which we distribute to the men in the camps. They contain illustrations of typical jobs in the woods and can be studied by the men.

CHAIRMAN DICKINSON: Will you send some of those copies to me at the National Bureau of Standards or to the State Industrial Commission at Madison, Wisconsin?

MR. LAUGHLIN: I shall be glad to do so.

CHAIRMAN DICKINSON: Our next subdivision has to do with swamping. The first question is this: "What types of equipment can be used for safe swamping from the stump to the loading point?" Here, again, you could write a book on this subject, quite obviously.

Question: "What is the general opinion of the use of 'Go Devils' or sleds supporting one end of the sticks?" Well, that is a common method of logging up in the north woods of Michigan and Wisconsin and elsewhere in this Midwestern area, and it has been in use for a hundred years or more.

Question No. 3: "Should any attempt at cutting sticks to uniform lengths be made before swamping?" Well, that again is a function of the terrain and depends on your method of handling logs or the purpose for which you are going to use those logs.

Our next group of questions comes under the heading of loading, transportation and unloading. Question No. 1 is this: "What is the most efficient size range both as to diameter and length for safe handling of pulp from woods to mill?"

MR. STAFFORD: Mr. Chairman, we cut a 12 or 14-foot log in preference to a 16-foot with two knots, if the 12 and 14 is clear, for the lumber value.

CHAIRMAN DICKINSON: On the

other hand, your cypress is cut entirely full log because they float them on rafts and boats and it is much easier to handle them in the mill in full lengths.

Question: "Is there any particular type of sling which particularly lends itself to safe handling with cranes?"

MR. FLAHERTY: The safest sling I have seen is a double steel chain with a ring at each end and a bar between the chains.

Safety Shoes

CHAIRMAN DICKINSON: Question: "What methods can be used to promote the use of safety shoes by wood handlers?" Does anybody here use special shoes?

MR. CANTIN: We have spent a good deal of money trying to get our workmen in the woods to use safety shoes. We had a boot made with a safety cap and the best calf leather which would sell ordinarily at retail for \$15 or \$16, and we offered this shoe to the workmen at cost price, which was \$7.10. Well, I think I still have 25 pairs of them left, having sold the balance to hunters. These woodsmen don't want them, they don't like them. They prefer a boot or this rubber boot with a leather top.

Now I found that one of the exhibitors here has a rubber boot with a safety toe cap and in the soles he has some strips of metal, and I was very much interested in it because I think this may be the solution of our problem, as it is the kind of a boot that the men up our way want. If we can get them into Canada, the men will buy them because they are buying the other kind.

MR. FLAHERTY: I have asked the men why they didn't use the safety shoes and their answer was that they found them too cold, particularly up in the north section where I come from.

CHAIRMAN DICKINSON: Of course, the answer to that is to get them two sizes bigger and wear two pairs of wool socks.

MR. CHANT: Have you had any experience with gum rubber boots with hard toe caps?

CHAIRMAN DICKINSON: That is the common type used now.

MR. CHANT: What sort of a boot were you talking about, Mr. Cantin?

MR. CANTIN: The shoe I had in mind has a rubber sole on it. I have had a manufacturer in Montreal make me a few pairs

of those and put a safety toe cap on them.

MR. CHANT: A steel toe cap? Have you had any experience with the regular rubber footwear that had a hard rubber toe cap in it?

MR. CANTIN: No, I haven't.

MR. CHANT: Those are made in Canada. They only cost 25 cents a pair more than the regular ones.

CHAIRMAN DICKINSON: Question: "Is there any particular type of toggle which reduces the hazard in releasing a load?" One of the most hazardous occupations in the whole field is that of unloading logs, whether they are heavy logs or medium-weight saw logs or pulp wood. There are more men hurt in that type of occupation than almost any other. As far as your sawmill accident statistics are concerned, I know that 20 years ago that was the primary cause of serious accidents, the highest rate.

On the West coast, strangely enough, you didn't have so much trouble because your logs were so big that they had to be unloaded by power. In the East to unload cars they would cut out the wires and chop out the stakes, and then take a peavey and roll off the logs which didn't roll off the flat car when the stakes were chopped.

On the West coast they use mechanical unloaders which consist either of a jib crane arrangement over a poke or pusher, which is a parallel bar mounted on very heavy timbers, perhaps 18 inches square, used as pivots, and they simply place those alongside a car, release the chains or stakes, and start the locomotive, and as it pulls this parallel bar sweeps across the car and pushes the load off. I know of only one mill in the East where they have put in equipment of a similar type.

Safe Loading Methods

Question: "What is the safest method of loading on (a) wagons or sleds? (b) trucks? (c) railroad cars? and (d) ships?" As for wagons, and sleds, the usual method is to establish a woods deck about the height of your body, bring your wagon or sled up to it, and roll the logs onto it with a peavey or jib pole.

MR. CANTIN: As far as pulp wood is concerned, they are thrown on to the wagon or sled by hand.

CHAIRMAN DICKINSON: When loading on railroad cars, of course, that is generally a power operation, although not necessarily so with small logs. Has anybody any ideas to offer on how to cut down your loading hazards on railroad cars? The conventional method for years has been to load from one deck about six inches higher than your car platform.

How about ships? Quite a lot of bad accidents have happened in loading logs onto ships. In many cases the pulp wood is rafted down to the big booms and then it is picked up with a conveyor and dumped into the hold, after which the crew down there picks the logs up and stacks the cord wood as the stuff comes down. Apparently that is a rather hazardous undertaking.

MR. CANTIN: There is some hazard in loading a ship but I think we have controlled that very well because we don't allow anyone on the ship when the wood is coming down from the chute into the hold.

They work in a second hold a little farther on and then they move in when there is enough wood dropped down into the first hold and they stack the wood. The accidents which we have had are mainly due to the pickaroons when the pick slips along the log and the man usually catches it on the ankle or on the calf of his leg. If we could find a leg guard and an ankle guard that would be practical, that would answer the problem, but we haven't got any so far.

CHAIRMAN DICKINSON: Did you ever try a football shin guard?

MR. CANTIN: No, it's too stiff.

CHAIRMAN DICKINSON: Question: "Referring back to the question on mechanization, what mechanical loading equipment is available which can be efficiently carried into the woods?" Of course, we saw pictures today of a truck-type crane which was loading a truck in the woods and that is as portable as the truck it feeds.

THURSDAY AFTERNOON SESSION

October 10, 1940

CHAIRMAN CHANT: The first thing on our program this afternoon will be the presentation of the contest awards by Mr. J. E. Long, Superintendent of Safety, The

Delaware & Hudson Railroad Corp., Albany, New York, and Past President of the National Safety Council.

Presentation of National Safety Council Awards in the Paper and Pulp Section Safety Contest

Enrollment in the 1939-40 Paper Industry Annual Safety Contest set a new high mark. 146 paper and pulp mill units and 29 paper and board re-manufacturing plants—a total of 175 contestants, employing 77,128 employees, working 164,620,962 man-hours—reported a total of 2,197 lost-time injuries in the 12 months, July 1, 1939 to June 30, 1940.

Frequency rates of identical contestants averaged 2 per cent above the rates in the 1938-39 competition. Rates increased 2 per cent in paper and pulp mills and 6 per cent in re-manufacturing plants. Two groups, C and D, consisting of the smaller paper and

pulp mills, were successful in improving their rates.

Large mills had the lowest frequency rates, averaging 11.52 in Group A and 13.43 in Group B. There were 10 perfect scores in all: one in Group C, eight in Group D, and one in the Re-manufacturing Division.

It is with great pleasure that I present, in the name of the National Safety Council, the following awards of bronze trophies to the winner of first place in each division of the contest, and Certificates of Merit to those companies which placed second and third in each division:

Division I Group A

1. Price Brothers & Company Limited, Kenogami Paper Mills, 2,258,785 hours, 1 injury.

2. Anglo-Canadian Pulp & Paper Mills, Ltd., Limouloi, Quebec, Canada, 1,712,994 hours, 1 injury.

3. Hollingsworth & Whitney Company, Waterville, Maine, 3,365,605 hours, 9 injuries.

Group B

1. Hoberg Paper Mills, Inc., Division "A," Green Bay, Wis., 1,008,543 hours, 1 injury.

2. St. Croix Paper Company, Woodland, Maine, 846,377 hours, 1 injury.

3. P. H. Glatfelter Co., Spring Grove, Pa., 1,079,752 hours, 2 injuries.

Group C

1. Strathmore Paper Company, Woronoco Mills, 338,231 hours, 0 injury.

2. Southern Kraft Corp., Continental Div., York Haven, Pa., 691,229 hours, 1 injury.

3. Escanaba Paper Company, Escanaba, Mich., 706,464 hours, 2 injuries.

CHAIRMAN CHANT: There remains the presentation of one more trophy award, and it is unnecessary for me to tell you

Presentation of the Edward Benton Fritz Memorial Trophy

A SCOTT DOWD (President and General Manager, Fritz Publications, Inc., Chicago): The close of this sixteenth national competition in safety among members of the Paper and Pulp Section, National Safety Council, again brings the associates of Edward Benton Fritz (affectionately known to us as "Dad") to this annual meeting for the purpose of awarding the major trophy of this contest.

"Dad," as the most of you know, was a pioneer of safety in the pulp and paper mills of North America. Through the medium of his magazine, *The Paper Industry and Paper World*, and the inauguration and sponsorship of these annual contests, his efforts were expressed in promoting safety in this industry.

Since his passing in the spring of 1939, the staff of Fritz Publications, Inc., Chi-

Group D

1. Sylva Paperboard Company, Sylva, N. C., 337,656 hours, 0 injury.

1. Spaulding Fibre Company, Inc., Milton, N. H., 190,367 hours, 0 injury.

1. United States Gypsum Company, North Kansas City, Mo., 183,742 hours, 0 injury.

1. International Paper Co., Livermore Falls, Me., 170,199 hours, 0 injury.

1. The Mead Corporation, Nashville, Tenn., 169,686 hours, 0 injury.

1. Hollingsworth & Whitney Company, Madison, Me., 128,572 hours, 0 injury.

1. International Paper Co., Riley, Me., 116,074 hours, 0 injury.

1. Spaulding Fibre Company, Inc., Hayes, N. H., 82,061 hours, 0 injury.

Division II

1. Bay West Paper Co., Green Bay, Wis., 97,663 hours, 0 injury.

2. Gaylord Container Corporation, St. Louis Container Plant, 1,038,307 hours, 2 injuries.

3. Kimberly-Clark Corporation, Atlas Mill, 329,545 hours, 1 injury.

what it is. I shall call upon our good friend Scott Dowd to again deal with that award.

cago, has conceived the idea of perpetuating his memory in this safety work by naming our annual award the "Edward Benton Fritz Memorial Trophy," bearing his likeness.

It was our pleasure to make the first award of this type at the Congress of last year.

Now, we have the honor again to name the winner, which in the opinion of the judges provided for in our rules, has established the best record based upon frequency, man-hours worked, physical conditions, and other contributing factors.

We were honored last year in having with us the treasurer of our company, the widow of our founder, our mother, Mrs. Edward B. Fritz. She presented the trophy with that loving thought that is the spirit in which it is given by our company.

She is honoring us again in the making of this award to the mill member which I shall now announce is the Strathmore Paper Company, Woronoco, Mass., the winner of Group C with the highest number of

man-hours without a lost-time accident in the duration of the contest.

Friends, it is an honor, indeed, for me to present Mrs. Fritz.

MRS. EDWARD BENTON FRITZ: Gentlemen and Ladies: It is with profound pleasure and with profound gratitude that I greet you today. I am grateful because of the great progress that all of you have made in safety, and I am glad that I know you are not working for a trophy, that you are working for something to hang on your wall so that you may later point to it with pride and say, "We did the best job of all." You have all done this out of the goodness of your hearts for the safety of life and limb, for the safety of men who would be injured in accidents and perhaps be crippled for the remainder of their lives. You have done all this because you want to be able to lie down at night with a good clear conscience, feeling that you have done the best you could in your mill today for the safety of humanity.

It is for that reason that I am grateful today, and I am so happy to be able to pre-

CHAIRMAN CHANT: Gentlemen, we will get on with the rest of our program.

I am going to introduce to you now R. W. Laughlin, Safety Engineer, Liberty Mutual Insurance Company, Portland, Maine. Mr. Laughlin has very kindly consented to give us a talk and a demonstration this afternoon. Some of you may have had an opportunity of seeing and listening

sent this trophy to Mr. Charles E. Higgins of the Strathmore Paper Company.

CHARLES E. HIGGINS (Assistant to Treasurer, Strathmore Paper Co., Woronoco, Mass.): Mrs. Fritz, it is indeed a great pleasure for me to accept this trophy, especially from your hands, in memory of your husband, Edward Benton Fritz, and on behalf of the employees and the management of the Strathmore Paper Company we thank you sincerely.

We want you to know that when we get back home, this trophy will occupy a position of prominence in our mills as a continuous inspiration to those employees who established this type of safety record.

CHAIRMAN CHANT: May I thank you, too, Mrs. Fritz, and attempt to express to you the pleasure that all of us have had today in your company.

(A brief recess was taken.)

to this "act" before. I have not seen it but from what I have heard about it I am looking forward to it with a great deal of anticipation.

(Mr. R. W. Laughlin then gave a demonstration lecture which he called "A Bag of Safety Tricks," which, unfortunately, cannot be reproduced in these records because it was chiefly a demonstration by pantomime.)

General Round Table

CHAIRMAN CHANT: According to the program, the next item consists of remarks by the General Chairman Elect. With your permission I am going to jump that. However, I do want to say that I deeply and sincerely appreciate the confidence which you have shown by giving me another chance to make good as your General Chairman. I shall certainly try to the utmost of my ability to work in your interest and in the interest of the general cause of safety.

I want to thank you all for the cooperation which I have received from you during the last term and I hope to deserve a continuation of it during the ensuing twelve months.

Now, we have on our program a round table discussion of certain subjects, but we have no table and it isn't round. With those slight differences, I think we can proceed with our round table discussion. The first subject listed is that of "Safety Contest in the Plant." I think that is intended to

mean interdepartmental contests or general contests as applied to the one plant rather than as between groups or numbers of plants. Is there any discussion to be had on that subject at this time?

Plant Safety Contests

ERNEST AUGUSTUS (Mead Paper Company, Chillicothe, O.): Mr. Chairman, I believe I have mentioned at various times something about a plan that we have in our group of mills. First of all, we have an interplant contest based somewhat on the same set of rules as those used in our paper industry contests. We give a trophy at the end of the year to that plant which has made the lowest and best safety record based on the combination of frequency and severity.

Some of you gentlemen may have been at the round table discussion meeting this morning and, if so, you will recall having heard some argument as to how important severity is. I maintain that severity should be taken into consideration when determining the winner of any kind of a contest. And so we give frequency rating 8 points and severity 2 points.

Every three months, in addition to the big bronze plaque awarded at the end of the year, we award a quarterly first place banner and a quarterly second place banner. It is based on the same system of scoring but it creates a little added incentive if every three months somebody has a chance to win something, even though they may not have a chance to win the big prize at the end of the year.

I have some figures which prove that the contest idea is all right. Over a period of 6 years, among 11 plants in our group that were participating in these contests, we showed an 11 per cent reduction last year over the previous five-year average in the number of accidents—a 24 per cent reduction in time lost—a 21 per cent reduction in frequency—a 33 per cent reduction in severity—and a 30 per cent reduction in compensation, or a reduction in cost per \$100 payroll of 26 per cent.

I can show you some of the results that have been obtained in individual plants. For instance, in our plant at Chillicothe last year we showed a reduction of 65 per cent in the number of accidents and 93 per cent in

amount of time lost, a 68 per cent reduction of frequency, a 93 per cent reduction in severity and a 66 per cent reduction in costs, or a 70 per cent reduction in cost per \$100 payroll. I am absolutely certain that a large part of that reduction was due to the fact that our boys are trying so strenuously to get one of these bronze plaques. We have never won one of them yet, whereas some of the other mills have won them several times, and our boys want one of those plaques.

Now, in addition to this interplant contest, in our plant we have a safety sweepstake plan. Every month on the pay day prior to the beginning of the month we give to every hourly-paid employee, at the pay office window, a card which has a serial number printed at the top. On this card the worker writes his name and department, then tears the stub off, puts it in a box, and later these stubs are collected. He must retain his portion of the card if he wishes to win a prize.

At the end of the month all employees in departments in which no lost-time accidents have occurred during that period are eligible to win one of five cash awards if his number should happen to be pulled out of the box. However, if in any department there has been a lost-time accident during the month everybody in that department is disqualified. The first prize is \$25, the second, \$20, the third, \$15, the fourth, \$10 and the fifth, \$5.00, the total of the five prizes amounting to \$75.

Mind you, the departments really aren't competing against each other; they are simply trying to win these prizes one from another. As a result of this system, every man is watching every other man in his department. I have seen this happen: Some fellow will come along and put a ladder up against a wall and if he has it out a little further than it should be, somebody else in his department will come along and say to him, "Say, you big so-and-so, what's the matter with you? Do you want to keep me from getting that \$25 next month? I intend to win that \$25, so you had better put that ladder up at the proper angle." Each fellow is looking out for the other and, incidentally, he is looking out for his own interest, of course, because each man feels that he is going to be the lucky winner.

At the end of the year we put \$175 into

a big pot and all these departments are given an opportunity, regardless of whether they have had an accident or not, to take these numbers for the last month and draw them out, and somebody wins \$100, another person \$50 and another \$25. We did that for the boys in some departments who perhaps month after month had a bad record and so began to feel that they just didn't have a chance to ever win any of that money.

In addition to that, every three months we have a drawing for the foremen of these departments on exactly the same basis, where we give prizes of \$15, \$10 and \$5, and every foreman is eligible in whose department no accidents have occurred during that three-month period. If he has had an accident in his department, then he and all the other foremen in that department are out automatically; they can't draw a prize.

In my opinion, it is as a result of these two things more than anything else that our accident record for the last five or six years has consistently shown an improvement, and we have gotten the boys interested so that they are working for themselves, they are working for each other, and the plants are competing with each other in trying to develop a better safety record. And we send out every month to these mills a list of figures which are posted on the bulletin board showing just where each one stands, also containing a short description of each accident that has been reported—who is to blame, how much time is lost, what it costs, etc.

CHAIRMAN CHANT: Will that make us eligible for prizes next month?

MR. AUGUSTUS: There is one additional thing that I might say. When we first started a year ago we gave about 40 prizes. There was the same amount of money involved but we had a \$15 prize, a \$10 prize, fifteen \$2 prizes and thirty \$1 prizes, so that more people got some of the money. But when we put the matter up to the employees themselves, they said that they would rather have fewer prizes and more money for each prize.

CHAIRMAN CHANT: There are a number of variations in use on that basic sweepstake idea. Mr. Long of the Bay West Paper Company of Green Bay, Wisconsin described to us on Monday a somewhat similar type of sweepstake. I personally

know of a number of others in use in different plants, just variations on the basic idea.

I would like to ask Mr. Augustus, as regards this matter of data to be put up on the bulletin board in the different plants, whether such information is only posted each month or whether something is put up immediately following an accident in one of the departments, telling just what happened?

MR. AUGUSTUS: As soon as an accident occurs, an investigation is made and the findings posted on a bulletin board by the safety man in that particular plant.

MEMBER: Do you mention the man's name and present all the details of the case?

MR. AUGUSTUS: Absolutely. We give the man's name and if the supervision was to blame for the accident, we say so. We give the whole story and we have never had any kickbacks from it yet.

SAME MEMBER: I have been toying with that idea and was wondering how many kickbacks one would get. In addition to the posting of that information, have you ever tried posting photographs showing the unsafe condition or possibly the gruesome aftermath?

CHARLES H. ABEL (Kimberly Clark Corp., Appleton, Wisconsin): Kimberly Clark for the past few years has taken pictures immediately after the occurrence of the accident and in some cases has gone through the actual procedure of showing how the accident occurred—making a series of pictures and displaying them on the bulletin board with a full report.

SAME MEMBER: Any kickbacks?

MR. ABEL: No, they were very well received. In fact, I think the reception on that type of material has proved much better than on just a plain mimeographed report.

CHAIRMAN CHANT: I call to mind a certain plant where this sweepstake idea has recently been applied. Previously they had quite an elaborate setup wherein a rather large safety committee always made a very thorough investigation of every lost-time accident, and the procedure took up quite a lot of time. They used to arrive at some very laudable conclusions and did a thorough job of investigation, the completed report sometimes extending over on

the second page of the bulletin that went up on the board.

However, since they have adopted the sweepstake idea they have changed that method of publicity with good results. They now put up on the board, if possible, within 24 hours of the occurrence of a lost-time accident, a notification of that accident and this automatically wipes that particular department out of being a participant in the sweepstake for that month. They put up just the bare facts of what happened, without taking the trouble immediately to find out who was responsible for it and all the details involved. Merely a note saying, "Sorry, boys, but no sweepstake for your department this month. John Jones tripped over a truck handle and injured himself." That may be a thought which some of you may want to use.

MR. CREIG: We are wondering whether that tends to create a let-down for the balance of the month for that particular department? From what Mr. Augustus has said it seems that the reverse of that is true, namely, that there was no let down in his plant.

CHAIRMAN CHANT: There is a way around that. In the plant I have just mentioned they do not use a calendar month basis so far as the sweepstake is concerned. Each department will have a sweepstake every time they go along for 30 days without a lost-time accident. So if they have an accident today, they start their thirty-day period over again tomorrow. Whenever they have hit thirty days clear, then they have a sweepstake. There is no period during which they can say, "Oh, well, we're washed up anyway, so what's the use of trying to be so careful?"

MR. CRIEG: Mr. Augustus, how many men do you have in your mill?

MR. AUGUSTUS: We have about 1,250 hourly paid men who get these tickets. Incidentally, I might say that those departments are divided into 21 different groups. You may have departments of 7 or 8 men and we put several of those departments together and call them one group.

PHIL STARBUCK (Meredith Publishing Co., Des Moines, Ia.): I have a bit of a problem here. We wanted to start a contest but we have a great difference in the probability of accidents in our various departments. I wonder if anybody has come up

against that and, if so, how they overcame it?

MR. AUGUSTUS: We had that argument at one time and we still have it once in a while, but I am convinced that it is just something which we think is true but which really isn't. For instance, when we first started out with our paper machines, the men who worked them said, "Why, we can't get by for even a single month without having an accident, let alone for a longer period of time." Well, we have now 11 paper machines—some of them are pretty big and quite fast—and yet the men haven't had an accident on those paper machines for more than a year; yet they used to have one about every two or three weeks. It has been proved that working on those machines is not any more hazardous than working elsewhere if you have a group of safety-minded men in there.

For example, we have 27 men in our electrical department, and last August we had a record of going along for fifteen years in that department without a single lost-time accident; and yet your maintenance and electrical departments are normally considered very hazardous departments. It so happens, however, that we have a foreman in there who is safety-minded, and he has simply trained his men in such a manner that they just don't have any accidents. We have had more accidents in our storage department than our electrical department has ever had.

R. W. CROUCHER (Minnesota & Ontario Paper Co.): Mr. Augustus, did you mean to say that if your one plant goes along without a lost-time accident you pay out \$1,200?

MR. AUGUSTUS: No, no, we pay \$75 per month in this one plant of ours at Chillicothe.

There is one thing I would like to mention. Here is something that a great many of our employees prize very highly (*holds up sample certificate*), a certificate that costs us less than a penny apiece to print which says that such-and-such a person of a division, in recognition of a 100 per cent safety record during a period of five years, is awarded this certificate. On the bottom it bears the signatures of the president of our company, of our division manager, and of the superintendent of that particular plant at which the man is employed.

At the end of five years the worker receives that type of certificate, which comes in a frame. At the end of ten years he receives a gold certificate like this. (*Shows sample.*) At the end of fifteen years he receives still another type of certificate. You can go into the home of any one of these employees who has received such an award (and I have done so many times) and you will find that little frame hanging up on the front room wall in a spot where everybody who comes in can see it. Also, I know of a number of instances where employees who have left our company in order to apply for a job elsewhere have taken that certificate along with them as a means of convincing the employment manager that they were good, safe workmen so that they might more easily get the job.

W. S. BREWSTER (Masonite Corp., Laurel, Mississippi): Sometime ago we tried to get a little competition among our foremen. Naturally, the hazards are different all over the mill. Some foremen have many men and others not so many men. Finally I arrived at a system something like this: I got the foremen divided into groups; in other words, a foreman with 50 men and over, a foreman with 25 to 50 men, and a foreman with 10 men and under.

Here is the way I count the accidents: I count each minor accident one point, each submajor accident 9 points, and each major accident 25 points. That is the ratio. At the end of the first week, let us say, if a foreman has a submajor and a minor accident in his department, that is 10 points against his department, and I divide that by the number of men he has working under him. At the end of the second week, if he has not had any more accidents, then I divide the figure by 120 because he has had that many men working under him during those two weeks. I keep this record of each foreman on a sheet showing his last week's record and his record to date.

I don't know just how fair that system is. It seems to be working out quite well. The foremen are interested in it and the men are becoming interested in it as well. In other words, copies of it go to all superintendents and to the general manager, and they put copies on the bulletin boards, and the foreman gets a copy. My theory is that eventually he is going to get tired of seeing his

name on the bottom of the list. Of course, it doesn't count severity. I am wondering if any other plants have used such a plan and, if so, how it has worked out there?

CHAIRMAN CHANT: Will you define a submajor accident for us?

MR. BREWSTER: We count a submajor accident as one that is not lost time but which requires a man to be sent to the clinic (we have our own company clinic), after which he will come back to work. In other words, it is a little bit more serious than a minor accident, so that it requires not just first aid but a doctor's care.

MR. RICHARDSON: I don't see how we can control severity. We are interested in preventing accidents. Whether it's a bad accident or a minor accident depends upon various conditions.

For instance, if you have a slipping hazard in the mill, one man might slip on that and fall down and light on his "fanny" and get up and walk off again without any more ado; whereas another fellow might fall down and receive a serious bruise; and a third person might come along and slip and break an arm or a leg. So I don't see how we can involve severity in that and be fair about it.

CHAIRMAN CHANT: I think that is something you have to work out for your own plant. You are perfectly right in saying that in general, by and large, we have very little control over severity. About all we can do to control it is to make sure of adequate first aid, proper medical attention, etc., so that we don't aggravate an injury needlessly. Aside from that, there is little else we can do.

I am sure that we are all agreed that there is a great potentiality in a safety contest within the plant. It doesn't matter so much how you work the thing out or what rules you have, there is a value there that we can obtain by using a suitable type of scheme.

I mentioned a few minutes ago something about the proper type of publicity for an accident that was almost completely solved by this sweepstake idea. Just arrange it any way you want. Instead of asking everybody to read a long report and to expect them to agree that the committee found the right solution to the accident after it happened, just put up the bare

facts and then let the arguing be done by those who read them. State nothing unless it is absolutely definite. The minute you say, "John tripped over a truck handle" and then add, "while not watching where he was going," you have the basis for trouble.

MR. CANTIN: I have known the sweep-stake idea as applied in the camps and one company in my group has used it with good effect. However, they don't give a cash prize. They give a prize (which amounts to the same thing) once or twice each year for any camp that has gone along without a lost-time accident for a certain period of time. There is a drawing in the same way as that already described here, and the prize is usually a purchase order which is good for a certain value in the company store. A man can get himself a \$5 pair of shoes or an \$8 mackinaw or something of that sort. As mills usually do not give a worker any time off with pay, sometimes the prize is a certain amount of time off with pay, which in some plants in certain locations works better than the money itself.

Plant Housekeeping

CHAIRMAN CHANT: Our next subject has to do with the methods of maintaining plant tidiness and good order.

W. E. STRONG (Marathon Paper Mill, Co., Menasha, Wis.): By way of explanation, while we are more in the converting business than in that of paper manufacturing—that is, our division does printing and waxing and finishing and converting of that sort—we had a lot of headaches maintaining a clean plant; and as we look back at it now, it seems as though we did a lot of fumbling for several years.

One of our problems was the starch spray problem, and while you might refer to it optimistically as clean dirt, nevertheless the department in which it was used always looked very messy. Then we had a waxing problem caused by a wax spray and wax splashing, as a result of which our press-rooms were hard to keep clean. Our little paper mill unit is a very old unit and that also offered a problem.

We kicked this thing around and argued about it a long time and we are definitely of the opinion that the answer to cleaning up is not additional janitor service. You

can hire 150 janitors, but those janitors still won't be able to keep the place clean.

I might also add that we have an all union shop—we have contracts with five unions—and of course all of you know that in the standard union contract there is a clause pertaining to the cleanliness of the mill. After a long time we really got some cooperation from the boys and it came mostly from certain individual members. We could hardly hold the representative committees responsible for the cleanliness of several hundred employees.

Then we started a contest, which, although young, is working out fairly well thus far. We hope to be able to improve on it by correcting some of the mistakes which now exist in the contest rules.

We had a planned inspection, and we got the general manager to be one of an inspecting committee of three, and we announced the date of our first inspection. We thought it only fair that everybody know when the first inspection would be made. I was also a member of that inspection committee. Our plant never looked so clean as it did that day. We couldn't believe it ourselves and yet we were in it all the time. Honestly, there were departments where you could have held a dance had the machinery been shut down.

We were pretty much hepped about it. We finished about noon, and we decided that we would break the departments up for prizes in the afternoon, and that is when our troubles started. There were twelve departments set up and our task was a very difficult one.

I would like to tell you what the prize-were and still are. We are located about 35 miles from Green Bay and everybody living within a hundred miles of Green Bay is very much interested in the Green Bay Packers football team. So we offered as prizes tickets for seats located on the fifty-yard line to all the home games. Just what we are going to do when the football season is ended we don't know yet.

The second inspection was unannounced, and here is the interesting part of the whole thing: the department that was in third place at the time the first announcement was made fell down, I believe, to sixth place, the department that was in sixth place at the time of the first inspection

came up to second place, etc. There is keen rivalry not only between the foremen but among the men themselves. We found out after our first inspection trip that there was a committee of fellows, self-appointed from the pressmen's union, who inspected the mill the day before we did, and we also discovered that two or three of the foremen got together and made interdepartmental inspections.

To summarize the advantages of this program: They are becoming cleanliness conscious, and if it takes \$15 or \$20 or \$30's worth of football tickets to do it, it is money well spent, we think. The reaction of certain individuals in the mill has been interesting. The day I was an inspector I walked into the finishing department and found a certain chap who fed the gluing machine clean shaven, and I had always known him to be one of these fellows who liked to go around with a black beard and hated to have and only did so on Saturdays. There was an element of personal cleanliness which entered into this thing without any advertising or hullabaloo.

We are proud of the transformation. The foremen, who I think were more responsible for the old condition than anybody else, are now building up a competitive spirit between themselves. The morning after our first inspection I kept on getting continuous calls from the various men wanting to know why their individual departments weren't in first place. It got so bad that I called the plant manager and said to him, "We've got to have a meeting." I told him why, and he answered, "Let them go out and look for the faults themselves." "But that isn't the answer," I replied. "They won't accept it." "All right, then, suppose you call all the interested parties together at eleven o'clock and we'll meet with them." The three of us who had made the inspection met with those fellows and we got the damndest "haircut" you ever saw or heard of from those foremen who didn't win first place.

Obviously the cost factor has to be taken into consideration in this matter. Some departments are hard to clean because of the process and type of building they are in; others are easy to clean. The nature of the product in some departments has a very direct influence. As we have gone along and worked on this thing, we have definitely decided to set up a scheme whereby the cost

factor will play an important part. Incidentally, one of the two departments that shared first place just before we left for this convention, managed to do so without one dime of expenditure over and above the normal amount of money allotted in the budget for clean-up work.

CHAIRMAN CHANT: Does anybody want to say anything about home-made bulletin board material?

J. F. BERRY: Mr. Chairman, I have a few sample prints here. They were made by one of our trucker's helpers, a fairly good artist, and I have brought them with me in case you fellows care to see them. They will give you an indication of what we have been doing along this line.

CHAIRMAN CHANT: It had been hoped that we might have an exhibit in this room of home-made poster material, but a number of things cropped up to prevent that from being done this year.

I still hope that by the time the next congress comes around we will have been able to work out some method for having a display of our poster material on bulletin boards right in our own meeting room, aside from any displays which the Council might have in the outside exhibition hall. I am sure that in our own group many firms, because they have been fortunate enough perhaps in having an artist on their staff, have been able to work out some splendid poster ideas.

The particular problem that some of the member firms run into up in the province of Quebec, Canada—and in other localities—is that of obtaining suitable safety poster material with the wording in a language other than English. Mr. Cantin, I see, has in his hand a number of posters which he has had developed and then translated into the French language for use in his locality.

MR. CANTIN: We haven't much as far as woods operations are concerned in suitable posters. Occasionally we have found that the Safety Council has issued posters that applied to some extent to woods operations. Then it was our difficult task to translate them into the French language. You may have slogans in English made up of three or four words, but when you translate those into French sometimes a whole line of words is required to give the same meaning.

I am no artist but I can copy pretty well. Some safety posters issued by the Council I have reproduced and then had mimeographed in two colors, naturally with French wording.

CHAIRMAN CHANT: I am familiar with some of the difficulties that Mr. Cantin and his associates in the province of Quebec have had in obtaining suitable poster material. I am much interested in what he has accomplished. I know that pressure has been put on our section poster committee or Visual Education Committee for several years back so that we might, through them, reach the Council poster department with the view of getting posters put out by the Council worded in French. But we run up against the fact that the demand for such material is limited and the Council can't afford to make up such material in small quantities.

The answer seems to lie in the fact, as shown by Mr. Cantin, that the company itself has to do much of this sort of thing. In time we may be able to do something about this through the Council. At least I hope so. The first requirement toward that end, of course, is to get more members—more Council members and more section members—from those localities where such

posters are required. If we can get to the point where we can say to the Council, "We need 1,500 or 2,000 of these French posters every month," then they may be able to supply them without too much expense, but when it is only a matter of supplying 25 or 50 such posters, then the Council naturally informs us that it cannot afford to do so.

Is there anything else, gentlemen? If not, may I again thank you all for coming here and express to you my appreciation for the very free and worthwhile discussions that we have had at these meetings? You have all taken a splendid part in them and I am sure we will go home with some new ideas to make use of in our own work, as well as with some very happy recollections of this congress.

MR. STRONG: Gentlemen: I think that this group should express to Doug Chant a vote of thanks for his continuous efforts in holding this group together and building a program and giving us the fine meetings which we have had. Suppose we give him a rising vote of thanks.

(The audience arose and enthusiastically applauded.)

CHAIRMAN CHANT: Thank you very much, gentlemen. It is undeserved but appreciated nonetheless.

ADJOURNMENT

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MONDAY AFTERNOON SESSION

October 7, 1940

The opening session was called to order by Vice-Chairman Charles A. Miller, Assistant to the Manager of Personnel, The Texas Company, Houston, Texas, who presided. This session had been devoted largely to annual reports by Standing Committees of the Section, the following being scheduled:

Production: Vice-Chairman Charles A. Miller.

Production: H. T. Markee, Supervisor of Safety, Phillips Petroleum Co., Bartlesville, Okla.

Manufacturing: J. Howard Myers, Supervisor of Safety and Fire Protection Division, The Atlantic Refining Co., Philadelphia.

Marketing: F. R. McLean, Safety and Insurance Departments, White Star-Ohio Division, Socony-Vacuum Oil Co., Detroit.

Cleaning Gasoline Storage Tanks Used for Leaded Gasoline

By OSCAR B. LEWIS

Manager Safety Department, Ethyl Gasoline Corporation, New York City

For a number of years the medical department of the Ethyl Gasoline Corporation has been studying the hazards connected with the cleaning of tanks that have contained leaded gasoline. With the cooperation of the petroleum industry data have been obtained which in our opinion show that a definite hazard exists.

Serious cases of lead poisoning—several fatal—have occurred from exposure in tanks that have contained leaded gasoline, but these have occurred only when such tanks were cleaned without following our recommended safeguards.

To aid the petroleum industry in establishing safe practices in cleaning gasoline tanks that have contained leaded gasoline, we are summarizing briefly the results of a recent analytical study of samples of sludge, scale and water bottoms for such tanks:

An appreciable number of samples of sludge had an inorganic lead content sufficiently high to be considered dangerous, but practically all such samples came from refinery tanks into which litharge had been introduced. No significant difference in organic lead content was found to exist between sludge of tanks used for mixing leaded gasoline and sludge of storage tanks. Both types of tanks may contain dangerous amounts of organic lead compounds.

Neither the organic nor the inorganic lead

content of the sludge was significantly affected by size of tank, frequency of cleaning, geographical location, length of service or by steaming. Any tank that has contained leaded fuel may offer serious danger of lead exposure. This danger is due to volatile organic lead compounds in the sludge, and to the presence of these compounds in the scale as well. There may be additional danger from inorganic lead compounds in the water bottoms and sludge, as the result of the use of lead compounds other than tetraethyl lead, in the treatment of gasoline.

It is apparent, therefore, that no tank used for leaded gasoline may be assumed to be free from a lead hazard. This applies with equal force in the case of refinery, terminal, bulk, truckside or any other tank which is entered for cleaning or repair.

One of the most discussed phases of tank cleaning is steaming, and the part it plays in the process of freeing tanks from gases which might cause fire of explosion, or asphyxiation. In the latest A.P.I. manual dated August, 1931, the following appears on this subject:

1. "After all lines are blanked, the bottom manheads are opened as the first step in ventilating the tank. If steam is used to heat the tank preparatory to ventilation, the top manheads are usually left closed and the steam is introduced through a swing line or other bottom connection.

2. "The effectiveness of the use of steam in the ventilation of tanks depends upon the temperature to which the tank may be raised and this in turn depends upon the quantity of steam available, the size of the tank, atmospheric conditions, and the sludge and sediment in the tank.

3. "It appears that to make a combustible mixture safe, it should be steamed to a temperature of at least 166 degrees, or say in round figures 170 degrees, which corresponds to a saturation of about 40 per cent of steam by volume. This applies to a gasoline-air mixture of just the right proportions for complete combustion, about 2 1/4 to 3 1/4 per cent of gasoline vapor by volume. Where the mixture is richer or leaner than this, less steam will be required; 20 per cent or a temperature of 140 degrees, may be enough to give protection to a large percentage of tanks; but to be safe under any conditions, the higher saturation of around 40 per cent is necessary."

The second paragraph of this quotation seems to cover the main purpose of steaming, namely, to volatilize the product and cause ventilation.

It might be observed that by following the procedure in (1) and removing manheads, combustible mixtures are formed where the too rich mixture in the tank meets the too lean mixture (air) outside the tank. Thus, one of the greatest sources of hazard in all tank cleaning operations (flammable mixtures in and around tank) has not been eliminated.

The purpose of (3) is to make a combustible mixture safe, but when manheads are first removed, this is like locking the stable after the horse is stolen. And, since it is generally not feasible to steam to 40 per cent saturation of steam, the fireproofing of the mixture is only one of degree. That is, the fire resistance of combustible mixtures (2 1/4-3 1/4 per cent) of gasoline vapor in air is proportional to such saturation. This appears to leave matters in a somewhat dubious state.

Ventilation, apparently, is the thing desired—fresh air and a diminution of hazard, whether from fire or asphyxiation, or toxic source, and, this is the point that should be emphasized and understood.

Steaming has usually been done on a basis of time (so many hours being judged ample for a certain tank). With the volume of

steam varying from a trickle of hot water all the way really to adequate volumes, there would seem to be little rational basis for predicting safety from the number of hours this operation is allowed to continue. If 170 degrees F. is the safe temperature, probably details should be developed as to where and how the temperature should be taken. Many persons in the industry feel it practically impossible to secure such a high temperature in large tanks under usual operating conditions. Regardless of whether steam "saturates" or acts as a diluent to gases found in tanks, or whether due to heat and convection currents it displaces gases, its universal acceptance would seem to indicate that it performs a useful service. But it is expensive, not available in sufficient quantity in marketing areas, and may have other unfavorable aspects.

In a recent case a water terminal tank had to be cleaned because of leaks in the bottom. After 48 hours of steaming by a harbor tugboat, an inspection showed the tank to be gas free (maybe one hour would have sufficed, but 48 hours was a company rule). As soon as workmen entered, however, the tank again was found to be gassy, presumably because of vapors emanating both from sludge and through cracks in the bottom of the tank. By reason of the disappearance of the original source of steam, and because of the company's rigid safety rules which demanded another steaming, the operation was shut down for several days and at considerable expense. Finally, the U. S. Navy came to the rescue and steam was supplied from a destroyer. If the steaming really was necessary, the destroyer story has color; if other simpler devices will accomplish the same end, it would appear a large part of the petroleum industry is subjecting itself to useless expense.

The advantages of steam are:

1. It volatilizes a group of hydrocarbons from parts of tank which can be reached and brought up to a high temperature.
2. When effectively used, it can volatilize thin layers of gasoline.
3. It retards combustion to the degree that it saturates the combustion mixture.

The disadvantages are:

1. The production of a fire and explosion hazard; Combustible mixtures are present at the vents, as in all tank ventilation pro-

cedures, and static sparks may arise from steam nozzles at high temperatures.

2. The cost of supplying steam in adequate quantity: Large quantities are needed for effective work and in many places this is too expensive to be feasible.

3. High temperatures within tanks: If entered at elevated temperatures, the hazards of exposure to volatile hydrocarbons and organic lead compounds which remain in the tank are increased, and the high temperature itself may be hazardous to workmen.

4. Loss of time: Workmen must often wait for a long time until steaming has been completed and the tank has been permitted to cool. Unless sludge and scale are first washed out, work in a dirty tank stirs up gases and gas freeing (steaming) must be repeated.

It has been shown by a recent observation that the temperature of sludge may be only slightly affected by steaming. Apparently it is necessary to introduce the steam within or beneath the sludge to heat it effectively. If this is generally or even frequently true, the introduction of steam serves no useful purpose in heating sludge and water on the bottom of a tank. The importance of this matter justifies a detailed account of the experiment.

The tank, 115 x 50 feet (135,000 barrels) had been for some time in leaded gasoline service and contained about 9 inches of sludge. A 2 inch steam line was connected to the wing line, which was 8 inches in diameter, and the tank was steamed in the manner described for 154 hours continuously, with a full stream of steam. At the end of this period, the surface of the sludge was warm but at 1/2 inch below the surface there was no noticeable increase in temperature. That the steaming operation did not drive off vapors from the sludge was demonstrated by the fact that the moment the sludge was disturbed by a hose stream, gases were released and within 15 minutes, the gas indicator reading of the interior atmosphere was tripled.

It would appear that the steaming operation may be more usefully applied if jets are inserted well below the surface of the sludge in a tangential direction, so that the sludge will be directly cooked and, at the same time, agitated by the steam jet. In this way the sludge itself can be heated to somewhere between 175 and 185 degrees F. Un-

der these conditions, considerable quantities of gas are driven off. In the tank mentioned, this operation was carried out for 10 hours and it was evident that large amounts of volatile vapors were being removed from the bottom. This method of steaming also heats the empty portion of the tank and produces similar effects to those when steam is introduced above the sludge. Presumably when the temperature can be raised some of the volatile lead compounds will be driven off but this cannot be counted upon to be complete, and is therefore of no avail, since a small volume left in a tank may be almost as dangerous as a large amount, if enough is present to saturate the air within the tank, or to produce dangerous concentrations.

It may be of interest to show the effect of temperature change on the volatility of one organic lead compound, namely, tetraethyl lead, which may be present in tanks under suitable conditions.

Temp. ° F.	Volume % TEL in vapor space	Grams of TEL per cu. ft. of vapor
32	.0062	.0254
41	.0096	.0385
50	.0145	.0572
59	.0224	.0867
68	.0329	.1255
77	.0487	.183
86	.0711	.261
95	.103	.372
104	.146	.520
113	.205	.720
122	.271	.940
131	.396	1.35
140	.535	1.80
149	.720	2.38
158	.970	3.16

It will be noted that the volume percentage of tetraethyl lead in the form of vapor has increased from .0062 at 32 degrees F. to .970 at 158 degrees F., or 156 times. All parts of the tank may not experience a rise in temperature and the increase in organic lead vapors may be expected only from the material containing tetraethyl lead which actually is raised in temperature.

While one would not be justified in concluding that the lead hazard has actually been enlarged by steaming, it is apparent that it has not been effectively reduced, since it has been established that recent accidents

have all been in tanks which had been steamed in preparation for cleaning.

Certain procedures suggest themselves as possible improvements upon steaming as means of removing hazardous vapors from tanks. Inasmuch as the chief effect of steam is the resultant introduction of fresh air by chimney effect and convection, it is obvious that any device which will increase this ventilating effect will accelerate the removal of gas. This is the purpose of various mechanical ventilating devices now being developed.

The theory of freeing tanks of explosive mixtures is the same with mechanical air movers as with steam. With approximately the same hazard to be guarded against when opening the tank, the use of mechanical ventilation improves conditions immediately and, after passing through the explosive range, keeps conditions safe so far as fire and explosion are concerned. There are a number of efficient air movers on the market. Some of these operate on the venturi principle, generally with an annular nozzle, operating with either steam or air, in the throat of the device. The venturi type air movers are nearly always used as exhausters. Other equipment is of the positive displacement blower type which may be used either as exhausters or as positive pressure blowers.

The quantity of steam to operate an air mover of any type is small compared to that required for raising an entire tank to a high temperature. Steaming through a 2 inch line may consume 11,000 pounds of steam per hour. One exhauster type air mover on which data are available, is capable of moving 300,000 feet of air per hour with 900 pounds of steam. When an exhauster type of air mover is used, the atmosphere within the tank moves positively and the movement can be measured if necessary. Use on large tanks has not been too successful, but it is felt that with study of tank design and improved air mover design, results can be obtained similar to those recorded in recent tests on a 5,000 barrel tank.

On this tank, 35 feet in diameter, a steam operated exhauster was placed on the roof manhole, creating a slight vacuum on the entire tank, which was continuously relieved by a stream of fresh air entering through the open lower manhole. The velocities within the tank ranged as high as 750 feet a minute as tested with an anemometer and

there was measurable turbulence in all parts of the tank, at breathing levels, except for a space of about 6 inches around the periphery of the entrance manhole. The tank was tested and found to be free of gas within one hour after the gasoline had been removed and the exhauster placed in operation. Gas indicators can be used to show when a tank is safe where air movers are used but steaming on the other hand may continue needlessly, long after the safe point is reached.

There are various procedures for moving atmosphere from tanks. A combination of steam followed by mechanical ventilation might be the ideal method. When the disadvantages of steam make its exclusive use undesirable or impossible, the following procedure has frequently been used:

First, wash out sludge and scale with high pressure hose from outside the tank. Here again care must be exercised to avoid any static build up. (Borrow hose equipment from the local fire department if necessary.) Steam jets to "cook" heavy deposits have been used with success. Wash to drain. This removes the chief source of vapors. Place a blower on top manhead of the tank. Mobility as to direction would seem to be a desirable development, and it is suggested this could be accomplished with a movable cell within the upper manhole. Make tight connection. A steam or air operated eductor at the bottom manhead would accelerate movement of tank atmosphere. Operate and at intervals take gas indicator readings from tank. When gas free, take off the bottom eductor. Keep a top exhauster moving air out of tank continuously, as long as men are in tank. If men must weld or work in questionable atmosphere, continuous operation of the eductor will move fresh air past the workmen, resulting in safer working conditions. Air may be supplied by blowers and exhaust fans, which do the same general work as eductor type air movers, but have limitations from the standpoint of expense or portability.

Although theoretically there may be "channelling" of air from the top manhead to the bottom, preliminary tests have indicated that some movement of air occurs in every part of the tank. Occasional accidents from the accumulation of gas from unsuspected sources, such as a leak in the bottom of a tank, might well be avoided by the continuing operation of a ventilating device.

Mechanical ventilation will not eliminate the necessity of testing for combustible gases, but used in conjunction with such tests, it gives double protection. Thus, the chance of an accident from asphyxiation or explosion should be greatly reduced.

In an uncleaned tank, full protective equipment for workmen (including airline masks) should be insisted upon. But in the best of regulated companies, a hose or mask may leak, a coupling may become undone, or something unforeseen may start a chain of circumstances that may lead to exposure. One of the most common causes of accidents is the removal of protective equipment before a tank has been thoroughly cleaned and conditions are safe. In all such instances ventilation will result in the reduction of hazard.

In a thoroughly clean tank—one that can be entered without protective equipment—ventilation is still desirable and good insurance. To determine if a tank is thoroughly clean, we should require that all loose scale be knocked off side walls and appurtenances of tank, that all bottom sludge be disposed of in a pit outside the tank, and that seams and rivet heads are free of more than slight deposits of sludge or scale. All places where liquid might accumulate should upon inspection be determined to be dry. No fitting, sump, or low place in the tank should be overlooked. Sawdust is good for the finishing touches of this drying job. The sawdust should be swept out and buried in the pit with the sludge which was previously removed. Those parts of a tank which will be subjected to hot work or welding should be cleaned down to clean metal.

The question may now arise, after the tank has been cleaned, using mechanical ventilation, should we continue to operate such equipment as long as men are in the tank? Well—why not? Probably the equipment is still in place on the tank and the steam or air necessary to run the eductor or venturi would be negligible. In various types of tank work considerable dust is raised. Air currents help carry this out. Certain work such as burning, consumes oxygen and gives rise to combustion products—a fresh air current maintains the normal oxygen content of the atmosphere and dilutes the combustion products; burning also may volatilize lead from paint, litharge or scale that otherwise is harmless, while

ventilation may serve to eliminate or greatly reduce danger from this source.

The advantages of mechanically moving the air from tanks, as against steaming would appear to be:

1. It is cheaper and quicker.
2. The equipment is mobile.
3. Lower temperatures result within tanks.
4. Continuous ventilation is possible.
5. It is an added safeguard and operates to reduce most of the hazards.

The actual extent to which the advantages will materialize and expand in practice will have to be determined by critical study of operations. Certainly we would not advise any relaxation of present precautions in the use of airline masks for workmen in tanks through substitution of ventilating procedures. However, we believe that certain of these procedures will be advantageous, and we expect to subject them to experimental test.

A great deal might be done were it possible to re-design existing tanks. Tanks so constructed that workmen need not enter them would be ideal. While this is not immediately feasible, certain improvements may be suggested.

First of all, larger oval manheads, or manheads of at least twenty inches in diameter, should be employed. There should be at least two of these on all vertical tanks and as many more as are necessary to give reasonable natural ventilation and high flow. Some bottom opening for sludge disposal on small horizontal tanks might permit hosing from the outside, and thus remove the necessity for entry. Dropping into tanks or using ladders is hazardous. On large tanks the ratio of one manhead to each 20,000 barrels of capacity would help. But, of course, this means more expense and more opportunity for leaks.

Another suggestion is that in building new tanks, the bottoms be cone shaped or sloped toward the draw off. Most tanks settle and then slope away from the pipe lines connecting the tank, and unless there is a draw off on the opposite side, a difficult cleaning operation results. In such a tank it is conceivable that liquid lead compounds may remain trapped for years beneath a water bottom.

High pressure nozzles through the tank shell and a trough type or draw off sump near a manhead are other suggestions.

Floating roof tanks are a large subject unto themselves, and present problems from the standpoint of safety in cleaning that would occupy more space than we have here available. The use of underground storage tanks seems probable in the near future, and will present many new problems to the petroleum safety engineer. Ventilation and cleaning will be major problems. Certainly improved design may be considered one of the major objectives of a long range program.

Again referring to the present problem of the tanks now in use, it is our opinion that many of these have been entered and cleaned

unnecessarily. Some companies have a set program for cleaning tanks at intervals of two or three years. Probably such a schedule was set up when "water white" was important, but today with most gasoline colored, off color in gasoline does not show or affect its use unless it is extreme. Probably there are very good reasons why tanks should be inspected at intervals, but a widening of the gap between tank openings and cleanings would be a trend in the right direction. Each potential hazard avoided is a gain in safety.

When and Where, and If So, What Fire Regulations Are Needed for Producing Fields?

By GEO. F. PRUSSING

Safety Engineer, Union Oil Company of California, Los Angeles, Calif.

The past ten years have added tremendously to the known oil resources of the United States and have added gray hairs to the heads of the oil industry in about the same proportion. The flood of oil made available by better geologizing and deeper and more rapid drilling has not been an unmitigated blessing. Ruinous prices and the disruption of the "solid" as well as the "liquid" fuel market has followed in due course. Finally, as though that were not enough, attempts at self help within the industry have brought down on it the wrath of the federal government.

Oil producing unlike oil marketing, has suffered little from legal restriction aimed specifically at its fire hazard. The record of the producing fields clearly tells why—fire losses have been small and conflagrations practically unknown. The occasional well that has taken fire during drilling or production has been a local two- or three-days' wonder but has done little more harm than inspire a few bad movies. Normal well-spacing has provided the greatest safeguard against spread of fire. Unlike the burning hay barn, lumber mill or even the humble dwelling, oil fires seldom have spread far beyond their point of origin.

With the increase in production, however, has come the occasional drilling of town-lot areas, both urban and suburban; areas of small, widely held ownerships, often in closely built-up residential and commercial

neighborhoods. In almost every such case, the lure of sudden wealth has forced the local authorities to throw up their hands and to make little or no effort to enforce orderly drilling. The economic evils of town-lot drilling are known to all oil men—the waste involved in drilling 20 wells where one would serve. The aesthetic results of town-lot drilling, viewed from the community standpoint, are often appalling. Derricks, boilers, separators, tanks, pumps and sumpholes sprout like mushrooms between existing structures. Roads and streets designed for light traffic become quagmires as the heavy loads of pipe and machinery break through their fragile surfaces. Occasionally a well is brought in unexpectedly and out of control, to paint the landscape with black gold.

The possibility of fire in such a field is a serious and ever present hazard. Only the introduction of the steel derrick and the belated drafting of fire regulations have kept losses down, in those areas of town-lot drilling and producing in California with which I am most familiar. These regulations have been developed over a period of years by the fire prevention bureaus of Los Angeles county and city and by the municipalities of Long Beach and Signal Hill. They have been guided by the fire protection engineers of several major oil companies.

It may be safely said that where drilling

and producing derricks are spaced less than 100 feet apart, serious hazard exists. Where they are less than 600 feet apart, some form of regulation is justified and will not be opposed by conscientious operators.

Experience has shown that regulation must start before drilling, if it is to be thoroughly successful. It must be predicated on the police power of the county or municipality, not on conservation. It can well take the form of an explicit prohibition of any act of drilling for, producing, storing, or transporting crude petroleum, unless a permit has first been obtained and has neither lapsed nor been revoked. The permit should only be given if certain specific requirements are complied with and should be renewed each year. A bond guaranteeing a forfeit for failure to comply has been used with success. A drilling permit fee and an annual fee for inspection and permit renewal makes the system self-supporting and if not abused, is cheap insurance for every operator in the field.

In spite of all regulation, fires will occasionally start in every drilling and producing field. Their extinguishment and control in town-lot areas is best and most economically accomplished by training the local municipal or county fire service in the special arts involved. The cost of the special apparatus and chemicals required is far less than the oil fields pay in ordinary property taxes for their share of maintaining the fire service. I know of one small community where the local city fathers required each operator to provide his own foam chemicals and apparatus. As a result, no one had enough for a serious fire, while as a whole, there was enough in the community to have put out a hundred fires. That was absurd and helped no one but the foam-peddlers.

Even in the absence of state regulations on well-spacing, local authorities can make some effort in that direction. One such method is to permit no drilling on a site less than one acre or at a point less than 100 feet from the nearest street or property line. Such a regulation must be backed up with other rules that will not permit the isolation of small tracts without payment of royalty by contiguous owners. Otherwise the owner of a lot might well find himself cut off from any revenue and without recourse.

Another vital regulation is one that is usually imposed by state bodies, requiring

the use of adequate blowout prevention devices. These can also be included as part of the fire code, for their absence has been the largest single cause of derrick and well fires during the drilling process. As in most regulations of this sort, the essential things are those that any prudent operator would do for his own protection and would want his neighbor to do.

Keep vapors away from fires—keep fires away from vapors! That is the basis for all fire protection in the oil industry. One hundred feet, where possible, never less than 25 feet between derricks and other structures, such as boilers or pump houses, where sources of ignition are assumed to be present. The same regulation should apply to run-tanks and shipping tanks. Boilers should be protected against oil flow by low dikes, where indicated; and tanks, where their rupture or boil-over would endanger other property, should be diked, or the flow diverted to safe areas. Where boilers are close to drilling wells, water or steam lines, run into the fire box make simple "snuffers" in case of trouble. Valves on such service lines should be adjacent to master fuel valves and plainly marked.

Diking around tanks to take care of spills and pipe line breaks is essential in congested areas but the amount of pondage required for safety is relatively small. Experience indicates that a dike should provide capacity for 100 per cent of the tank enclosed, if there be but one; however, if more than one tank is within the same dike, the capacity need be only 100 per cent of the larger tank plus 10 per cent of the second or all others. That formula has been adopted and is in successful use in a number of places. Dikes designed to impound boil-overs must be provided with flare backs.

Good housekeeping is as trite an expression as "safety first." Yet any kind of housekeeping was a rare sight in some of the earlier town-lot fields. The condition of such properties can be compared only to the proverbial wild sow's nest. When a fire starts in a densely drilled field, it is bad housekeeping that makes fire fighting practically impossible. To control that situation, requires good regulation from the beginning and tough fire prevention inspectors armed with plenty of red tags. Prevention of bad conditions is only possible if regulation comes ahead of drilling.

One of the currently used regulations in California, is that which requires all tanks for crude oil to meet API specifications for bolted, welded or riveted tanks. Bolted tanks are limited as to size and number. The old galvanized iron tank with the soldered joints has been ruled out.

Speaking of tanks, next only in importance to a standard specification for the construction of tanks is the recognition of tank venting as a factor in fire protection and control. Small tanks, if not vented adequately, will distort and sometimes rupture in exposure fires. Larger tanks, as a rule, can relieve themselves through the weak seam between the shell and roof. Recent fire codes have recognized this fact and have provided safeguards. The formulae used are not wholly approved by the API but the theory is sound and should be part of every fire code. Adequate venting and the use of automatic palate type breather valves is al-

most sure protection against most types of tank fires.

I have touched on the highlights of oil field regulation as seen from the viewpoint of the county and municipal fire-marshall. I have obviously omitted many items that might be included in a manual of fire protection. Generally speaking, the oil fields are pretty safe. The fire loss ratio is such as would pay good dividends on a premium rate of twenty-five cents a year per hundred dollars of value. Such large losses as have occurred have been in the town-plot fields and these can be controlled, by the enforcement of a few simple principles, by men with ample authority.

The fire departments of Los Angeles and Long Beach point with pride to the fact that in the last few years the Wilmington field of 700 high-pressure wells has been drilled and is still yielding an average of more than 100 barrels a day per well, and all without a serious fire.

TUESDAY AFTERNOON SESSION

October 8, 1940

The opening feature of this session was entitled, "Photography as a Visual Means of Education in Accident Prevention," presented by T. S. Maffitt, Jr., Safety Manager, Houston Oil Company of Texas, Houston, Texas; and demonstrating by the use of a film strip how pictures taken on the job can

be used for safety meetings. Seventy-five pictures of boilers and boiler operations were shown. The film strip had been prepared by J. H. Cathrell, Humble Oil and Refining Company. The speaker pointed out the features of each picture for discussion by committee members.

Enlisting Employees in the Accident Prevention Program

Panel Discussion

Panel Leader—Joe L. Risinger, Safety Supervisor, Socony-Vacuum Oil Co., Inc., New York City.

Panel Members—John W. Welch, Safety Engineer, Cities Service Oil Company, East Braintree, Mass., representing the northeast.

W. W. Weldon, Director of Safety, Standard Oil Co. of Louisiana, Baton Rouge, La., representing the southwest.

J. Howard Myers, Supervisor Safety and Fire Protection Division, The Atlantic Refining Company, Philadelphia, representing the east.

George F. Prussing, Safety Engineer, Union Oil Company, Los Angeles, California, representing the west.

The panel leader introduced the subject by presenting the members of the panel as representing the four corners of the petroleum industry area, and with the following remarks:

Three elements are involved in accident prevention: materials such as machines, tools, equipment, the unsafe conditions of which, or the operating methods of which are conducive to accidents and possible injury; protective equipment that shields the employee against inherent hazards of a particular machine or procedure and possible error that may be present in the particular procedure involved; and the enlisting of the employee, mind, body and heart, in correct operating procedure and activities that involve materials and the accomplishment of results without mishap that may injure him or his fellow worker or destroy property.

It is essential that the term employee be defined. In its broad meaning, the employee is anyone who works for a company, from company executives to laborers. However, emphasis should be placed in this discussion upon the enlisting of employees from division and district executives to laborers. Since the steps taken by chief executives govern the procedure and results of efforts in enlisting the employees in accident prevention, we have accepted a sufficient number of questions pertaining to chief executives, to provide continuity and to lay a foundation or set a premise upon which conclusions may be based.

The essence of enlistment in this case could be given in four words—objectives, policies, procedures and responsibilities. If everyone in the organization understands the objectives, the sound policies that are to support the objectives, the procedures that help to carry out the policies, and the assignment of responsibilities, and then carries out the procedures which support the policies which obtain the objectives and fulfill the responsibilities, all will be enlisted in effective accident prevention.

Question—*a*. Assuming that a company has taken the first step only toward the institution of a safety program, and a safety supervisor has been placed on the job, what can the chief executives of the company do to make the enlistment of employees in the program easier?

Answer: With the assistance of the safety supervisor determine the policy and objec-

tives of the program, and announce this policy and these objectives and place responsibility upon those down the line for the success of the program. Each supervisor should have placed upon him the same responsibilities for accident prevention as for the performance of his regular operating duties, this responsibility to be in proportion to authority and jurisdiction delegated by the company to the supervisor.

Question—*b*. Assuming that the program has been under way for a period of years, and chief executives have not taken the step given in answer to Question A, what can they do to remedy what they did not do at the beginning of the program?

Answer: Determine policy and objectives in some manner and promulgate in the same manner as though the program is just being instituted.

Management Interest

Question—*a*. What importance should chief executives attach to an accident prevention program?

Answer: Accident prevention should receive the same administrative attention as every other operating problem because:

(a) Accident prevention not only prevents accidents from a humanitarian standpoint, but is part of the efficiency program as well.

(b) It is an important part of a company's public relations policy, for if a plant has a number of accidents, this information is not retained in the plant. It gets out—and makes it extremely hard to secure workers, and also results in loss of sales because of the "bad taste" accidents leave with the public.

Question—*b*. How often should chief executives re-declare themselves on safety to obtain the best results in enlisting employees in the accident prevention program?

Answer: Any accident prevention program worthy of the name must be consistent and progressive, continuing from month to month and year to year. Management must continuously declare themselves for accident prevention.

Question—*a*. What do you consider to be the most important procedure of the safety supervisor toward enlisting employees in the accident prevention program at the beginning of a systematized program of a company?

Answer: In any safety program the safety supervisor occupies the position of the central coordinating agency, and it would be well for him to keep this in mind from the very first day that safety work is started. Accepting the above statement as a self-evident axiom, we may derive the following corollaries relative to starting a safety program:

Coordinating the Program

1. The more the safety engineer gets other people to say about the safety movement and the less he says himself, the better off he will be.

2. It should be the safety engineer's goal to incorporate the safety idea into every fabric involved in his organization. The logical place for him to start is with the supervisory group, and get them to accept the responsibility for the observance of safe practices.

3. A meeting might be held at which the higher management would impress upon the supervisors the necessity of observing safe practices, and cooperating with the newly formed Safety Department. At the beginning and throughout the program the prestige of the Safety Department will depend upon the active support of the Management, not only in words but more particularly in deed.

4. As a coordinator the safety supervisor will deal with the supervisory group and the management on one hand and directly with the employees on the other. His contact with the employees may be by means of committees, or group meetings of various kinds. In such group meetings the safety supervisor should not assume a hard-boiled attitude, but be ever willing to help employees with their problems.

In the above outline stress is laid upon getting the supervisory group to do the safety work rather than depending upon the safety engineer to personally see that rules and regulations are enforced. The attitude of the men will be the exact reflection of the attitude of their foremen on safety matters. As an established leader the foreman in a plant is in a position not only to inaugurate new rules and regulations, but to influence the personal attitude that the individuals will take toward a new safety program.

If I were limited to just three words with which to answer this question I believe I would choose these: sincerity of purpose. When a safety supervisor builds his entire program on a foundation of sincerity and makes a real and determined effort to cause the prevention of accidents he will, without even being conscious of the fact, have the wholehearted support of the majority of the men he is endeavoring to protect. When he gets the influence of the majority with him he can then devote a lot of sweat to that minority group that still remains to be enlisted. Before too long the very men who caused him the most concern are demanding the protective devices and regulations that a short while ago they refused to accept.

Question—b. Assuming that he did not properly take this procedure at the beginning of the program, what can be done after the program has been in for several years, to correct his failure to use the procedure at the beginning?

Answer: The true position of a safety supervisor is that of a coordinator; if he fails to assume this position at the start of his safety program it would be well for him to get rid of any direct responsibility for safe working conditions and practices, and saddle the responsibility upon the men directly in charge of the work. Of course, these men will not accept this responsibility without the urging of the higher management; but here again, as a coordinator, the safety supervisor is in a position to bring whatever pressure that may be necessary to bear.

"Safety is a part of the job" is an excellent slogan for day by day accident prevention. The safety supervisor should keep his eyes firmly upon the goal of having a smooth working organization cooperating toward maintaining a safe plant. To achieve this goal he must be willing to meet the various agencies half way, to compromise when necessary, to play fair and be equally careful with his praise and reprimands. He should not rely too much on the big stick; neither should he place the success of the safety movement entirely in the hands of the employees either directly or through committees.

Question—a. In brief, who should be enlisted in the accident prevention program?

Answer: Each and every employee from the top executive to the newest workman should be enlisted in this army. Any person not definitely "in," is definitely "out," and each person "out," is a real menace to his own safety and to the safety of all others with whom he comes in contact. Accident prevention is a comprehensive program covering the lives of everyone—at work, at home and on the street—24 hours of the day, seven days a week.

Question—b. When should enlistment take place?

Answer: Enlistment should take place at once for those already at work. As others are hired, accident prevention should be brought forcefully to their attention. In many companies the applicant for a job is interviewed, given a physical examination, qualifications are checked and then he is taken aside and is given a safety rule book, and is talked to concerning the outstanding hazards of his new position and the precautions his company has taken to safeguard his working hours. He should know the hazards of his job and how to avoid them. It is not necessary to scare a man half to death, but the impression made should be the beginning of his safety education.

Question—c. How long should the enlistment last?

Answer: Definitely "for the duration" of his employment. For years we have scratched the surface; any accident prevention program must be workable, consistent and progressive, continuing from month to month and year to year. An accident prevention program must be planned, diversified, interesting and instructive. The employee must be sold on the program and he must be kept convinced during the term of his employment.

Question: How can operating managers best be enlisted in the accident prevention program?

Answer: Operating manager could appoint an Accident Prevention Committee consisting of a superintendent or supervisor of each department in the plant, with the manager as chairman.

The committee should meet at least once every month to discuss any outstanding hazards of the plant and any lost time injuries which might have occurred during the

past month. Any other subjects pertaining to safety should be taken up at these meetings. The meetings should not be of a routine nature as this may tend to cause the meetings to become uninteresting. They should be of a round table discussion type with the chairman holding interest by changing his method of attack from time to time.

The safety engineer should see that the operating managers are invited to attend safety conferences (whether they be local or national) every so often. In this way the busy operating manager can get first hand information and possibly a better line on safety activities as conducted in other plants and industries. It would also help him to keep abreast of up-to-date safety equipment which should be used by his workmen. This would not only enlist the manager's interest, but would make him more conversant with safety ideas and ready to cooperate when the safety engineer would ask for new equipment.

Employee Committees

Question: What do you think of "Employee Safety Committees" and what should be the scope of their activities?

Answer: Employee Safety Committees bring the employee into the program as a vital part of it. Their prerogative should extend to presentation of hazards discovered and checking through until such hazards are corrected or an answer received as to why the suggestion concerning the hazard cannot be complied with. We think that the discipline for failure to comply with rules and regulations or to otherwise fulfill responsibility in accident and fire prevention should be a prerogative of regular operating supervision incurred in by the committee.

Question: How can we build the will to win among the employee group in our accident prevention program?

Answer: I raised this question hoping the chairman would put it to some other member of the panel, for I am at a loss to answer it in less than 10,000 words. This question has often occurred to me in my own organization when men who had incurred painful, though not serious, injuries, would insist that they be allowed to return to their regular jobs and not be sent home

I can only summarize my beliefs by saying that this spirit of "the will to win" in accident prevention is just another manifestation of one's loyalty to the company for which he works.

This enthusiastic sense of loyalty doesn't only show itself after an injury has occurred, but it is everywhere evident in the efforts of men to prevent injuries to themselves and their fellow workers and damage to company property; and this thing we call "will to win" isn't built in a year. It comes about ever so gradually and only as an outgrowth of fair dealing on the part of management through many years in all their relations with the men down the line. When the rank and file *know* that management is sincere and fair in its dealing with them, when they see all about them management's interest in their welfare not only in protecting them from physical injuries while on the job but also when they are sick or injured off the job, the "will to win" is firmly taking root. When management shows by action and deed that the standard of living, comfort, convenience, health and old age security of the personnel is equally important as quality of product and manufacturing schedules, the "will to win" is being cultivated and is growing in the group. When men say "my company is the finest outfit in the world to work for" (and I've heard that and like expressions from many men, many times) you may know that a fine sense of loyalty toward the company exists. And this "will to win," whether it be evident in the accident prevention program or turning out a superior product or reducing the manufacturing cost of the product, is simply the result of management's fairness in dealing with its employees. And you can't buy it with dollars; you've got to build it through the years.

Question: Are departmental safety meetings necessary to stimulate workers' interest in the safety program? If so, should safety meetings for the rank and file be conducted by members of that group, supervisors, or safety men?

Answer: Properly conducted departmental safety meetings are excellent for stimulating the workers' interest in the safety program. These meetings should be held at first by the department supervisor, and after a few meetings, they should be conducted by the men in the department. This will give them

the feeling that they have a definite part in the program. As many as possible should be given something to do, and every idea or kink should be given full recognition and credit. The safety man should voluntarily stay in the background of these meetings. They should be handled through the immediate department supervisor. When conducted thus, everyone understands that working safely is part of their regular job. The immediate supervisor knows their problems, talks their language, and his men feel free to discuss their problems with him. If meetings are conducted by a high ranking representative of management or by the safety men, employees feel that he is interceding for them. They feel that they cannot express themselves freely and do not do so, and believe that safety is something apart from their regular work. The supervisor may, and frequently does, lose intimate contact with his men in this manner. Top management may and should attend some of these meetings to show their backing and interest, but should leave before discussion of department problems starts, so they may be discussed freely. These meetings should not be long and should not be held too frequently.

Question: In our program of enlisting employees in accident prevention, should we emphasize safety or operations?

Answer: Both. An accident is an error. If these errors continue to occur, someone will be injured. The solution to the prevention of these errors is correct operations. Safety should be emphasized however, both as a means of the prevention of these errors and as a common ground upon which both employee and supervision can stand; being of benefit and essential both to employees and the company.

Employee Cooperating Plans

Question: What method can best be used to introduce and enlist the new employee in the accident prevention program?

Answer: Our company has adopted a plan whereby the new employee, after having fulfilled the requirements of the personnel and medical departments, is turned over to the safety division, where he is:

(a) Given a Safety Code Book illustrating and describing the safe practices to be followed in performing his job.

(b) Instructed in company policy and procedure in respect to accident prevention.

(c) Instructed in the use of safety equipment available for his protection.

(d) Shown how, when and where to use various types of first aid fire equipment.

(e) Impressed with the necessity for having all injuries treated immediately.

This affords the safety engineer a splendid opportunity to enlist the new employee in his accident prevention campaign. The first actual contact as a company employee is with the safety division. The new employee knows immediately that management is "sold" on the idea, so he is usually glad to do his part.

Question: How can operating managers get workmen to willingly assist in eliminating unsafe practices?

Answer: Workmen must be sold on the safety program. The elimination of unsafe practices must come from within the men themselves. Proper attitudes must be developed to do this. One way is to give everyone a part in the program: appoint the unsafe worker, the chance-taker and the "hard-boiled" guy to the safety committee. Set an example yourself (wear goggles, etc. when rules require them), and above all, make an honest effort to eliminate unsafe conditions which are reported. By your own cooperation in these matters you can gain their confidence by your sincerity, and you will find that they will work together to eliminate unsafe practices.

Question: Of what value are contests, prizes and bonuses in enlisting the employee in the accident prevention program?

Answer: If safety work is made a part of the regular routine work of the plant, contests, prizes and bonuses assume a secondary importance in promoting interest in the safety program.

Such contests, prizes and bonuses may be looked upon as auxiliary aids in promoting interest in safety, and of these the contest is perhaps the most widely applicable and valuable. The advisability of giving prizes and bonuses depends largely upon the constitution of the employee group. If the group is made up largely of unskilled labor which may not be paid as high as other lines of endeavor, prizes and bonuses may have a very definite appeal; however, in other employee groups it might be impos-

sible for the company to make such prizes valuable enough to even ruffle employee interest.

Contests of all types are extremely valuable in safety work, particularly if winning the contest involves some form of recognition of the group or even individuals in the group.

The point to be remembered about contests is that they are of purely secondary importance in safety work, and should not be allowed to detract from driving home the main idea that safety is a part of the job, and that a man gets his safety bonus every month when he receives his wages. "Employees are paid to work safely" and "no job is well done unless it is done safely"—both of these are slogans which express the best approach to safety work. If the company has to pay its employees to work safely, something must be wrong with the safety policy or its administration.

In my plant we have, for many years, distributed cigars to everybody in the organization when 85 days have been worked without somebody incurring a disabling injury. This is not in the manner of a bonus, but merely our way of saying "You've done a good job so let's all smoke a cigar by way of celebrating because not a single person has been struck down by an accident in 85 days."

Maintaining Interest

Question: To what extent must we vary the safety program in order to make an interesting appeal to men in departments doing different types of work?

Answer: Although it is claimed that 85 per cent of industrial accidents occur from causes common to all industry, the program should be varied sufficiently to make it applicable to the other 15 per cent in each case. The program should also be varied for the sake of interest. A successful accident prevention program is never completely organized into routine. The new must be added to the front of the advancing program and the old dropped from the rear of it.

Question—d. How do you acquaint your employees with the safety equipment available for their protection?

Answer: To better familiarize our employees with the available safety equipment,

our company conducts classes made up of from 20 to 30 men and lasting for about 45 minutes, where the safety equipment is discussed, shown, handled, and actually tried on. This has resulted in a broader demand and use of safety equipment because employees now know when, why and how the equipment is to be used.

Question—b. Should employees be penalized or reprimanded for failure to use personal protective equipment provided? Why?

Discipline for Safety

Answer: Yes, employees should be reprimanded or penalized depending upon the occurrence of the failure to wear protective equipment. It is good practice to give warning for the first offense and indicate at the time that if a repetition occurs, penalty will follow. When safety guards are not installed on machinery, the Company is subject to fine and this same token the company should reprimand or penalize the employee who fails to wear the safety equipment provided for his protection.

Question: Should, or should not, an employee who has sustained an injury be called before a group meeting to explain the basic cause of an accident?

Answer: This depends on how accident prevention is handled in your company. If anything occurs which allows the man to feel that he is the "goat" or if he is criticized, he will resent all accident prevention work and will be a stumbling block for your progress. If it can be done in an impersonal manner, and if it would have been investigated in that same manner, if the same unsafe act had not resulted in an injury, then, and then only do I believe that this should be done. We will all agree, I believe, that injuries are not what we should investigate, but that the basic causes of them should be thoroughly investigated with the view of preventing a recurrence. This, however, should be done in such manner that no one has a loss of "face."

Question—d. What prerogative should committees have in regard to determining the cause of an accident and the assessment of penalties or reprimands? Employee Committees?

Answer: It would appear unwise to have employee committees assume too much responsibility in determining the cause of acci-

dents and the assessment of penalties and reprimands, particularly the latter. The administration of discipline is purely a Management function; to try to hide behind the skirts of an employee committee in fulfilling this function may have its advantages occasionally, but it is fundamentally unsound. As regards the investigation of accidents, such committees may serve a very valuable purpose in making the initial investigation and report, but we must remember that the company is responsible for the safety of its employees and therefore must have the final say as to what should be done to prevent recurrence of accidents. For these reasons it would be best for the final report to be made out by the safety supervisor as an agent of the company.

Question—b. Supervisory Committees?

Answer: The supervisory committees should have a part in the accident investigations and assessment of penalties in an amount depending upon the rank of the supervisors. Supervisors below the rank of, say, superintendent, are certainly not in a position to pass final judgment upon either the cause of accidents or the discipline necessary; though their recommendations may be very valuable.

The above remarks apply only to what might be called plant-wide committees; the supervisor directly in charge of the employee who was injured should always be called upon to make recommendations as to how similar accidents can be prevented in the future, and what disciplinary action should be taken. The immediate supervisor working through the department foreman is the agent responsible for the administration of discipline, whether they are penalties or reprimands. It is well for the Safety Department to remain clear of all the disciplinary decisions and their execution as regards violations of safe practices. The safety engineer's part in such action is that of a fact finding agency and an interpreter of the safety rules as applying to the case. A man can only be held responsible for what is actually in the rules when it comes to disciplinary action. The safety engineer will of course give an interpretation of the written rules rather than a personal opinion in such matters.

Question: Is promoting safety similar to advertising and selling a product? If so, what are your selling points?

Answer: The promotion of safety in some of its phases is similar to advertising. We prefer, however, not to call it "selling safety" but rather to exemplify the values and importance of that which they already have, assuming that there is no sales resistance to be broken down.

Question: What can be done to enlist the workman's interest in accident prevention programs?

Answer: Department Committees should be appointed to work on safety problems brought to their attention. These Committees investigate all accidents both minor and major, and make recommendations to eliminate hazards found to exist.

Description of all serious injuries should be placed on Bulletin Boards so that all can read and gain by the accident experience of others. This also keeps the workmen interested in the program.

Safety meetings (conference method) should be held from time to time between the foreman and men working under his direct supervision.

All hazards reported by men should be taken care of in proper manner as quickly as possible. There is no better way to keep the men interested than to let them see that their suggestions are carried out. Posters should be displayed. Home-made, original posters attract more attention than others.

Holding classes to acquaint and instruct the workmen in proper use of safety equipment that can be obtained in the plant has helped to enlist the interest of the workmen.

Teaching of first aid to the injured has, no doubt, helped prevent accidents, and certainly keeps the workmen interested in the safety program.

Meetings at which the re-enactment of serious accidents are held has proved not only a benefit to the group involved, but also helps to keep the interest of the workmen alive.

First Aid Training

Question: What part does first aid training play in enlisting employees in the accident prevention program?

Answer: In considering the question "What part does first aid training play in enlisting employees in the accident prevention program," it may be well to define the

term "first aid training" and what we mean by "Enlisting employees in the accident prevention program."

Suppose we consider the last question first: I believe that what we really mean here is *effective* participation in the accident prevention program, the only true measure of which is the frequency and severity of accidents. Therefore, we may rephrase the question and say "what part does first aid training play in decreasing accidents?"

There are all kinds of first aid training programs; there is the kind that merely gives employees a taste of first aid; there is the fairly effective first aid training program; then there is the permanent and continuous first aid training program employing review courses as well as the regular initial courses. There are three standard first aid courses used in the petroleum industry:

1. The U. S. Bureau of Mines' 15 hour course.
2. The A. P. I. 10 hour course.
3. The American Red Cross course.

It is probable that any one of these courses is just about as good as another if correctly administered, though personally I have only had experience with the U. S. Bureau of Mines' course.

Now, we again rephrase the question and say "Will a good first aid course given in a plant for the first time decrease the accident rate in that plant?"

At this point we shall have to refer to the record. In 1930 approximately 4,000 employees of the S. O. Co. Refinery in Baton Rouge were given the U. S. Bureau of Mines first aid course. This covered approximately 99 per cent of all employees, who took the course during the year. In the preceding year, that is 1929, the refinery had an accident frequency rate of 8.45; in 1930 it dropped to 6.03, and in 1931, after the completion of the first aid course, it dropped to 3.57. All these figures are in terms of disabling injuries for a million man-hours worked. Our experience with decreasing frequency rate with first aid training is not unusual according to the Bureau of Mines, which has collected data showing that if the first aid training is initiated in the plant on a comprehensive scale, the accident frequency promptly declines on an average of several hundred per cent. On

the basis of these statistics we may say that first aid training is effective in decreasing the accident frequency rate.

These figures refer only to the initial training course in first aid and the immediate results obtained. The question may be asked as to whether the accident frequency rate subsequently again increases to its former value. The answer to this is that such indeed may be the case unless the first aid training is on a permanent and continuous basis. It can also be noted that these statistics apply to a comprehensive program including practically all employees of the plant; and also that the program was carried out with the full support of the Management and on what might be called a "high plane." To be most effective any first aid program, no matter how technically correct it may be, must be carried out in such a way as to enlist the interest and support of the employees.

It seems to be the opinion of quite a few safety men that a first aid training program may not only serve as a good opening gun to start off the safety movement in the plant, but may also serve later as a permanent sustaining feature that will help enlist employees in the Accident Prevention Program.

Company Safety Rules

Question: Should a company have safety rules? If so, why?

Answer: Safety rules are essential in some phases of safety. We believe, however, that hard and fast rules should be held to a minimum. Some rules are essential, however, in order to prevent a few from breaking down the morale of the many and belittling the program in general.

Question: Do company safety rules foster or retard the employees' willingness to voluntarily enlist wholeheartedly in the accident prevention program? Give reasons for your answer.

Answer: Safety rules that are clear, concise and easily understood, foster the employees' willingness to support the accident prevention program for these reasons:

1. The rules serve as a guide to him in the performance of his work.
2. They indicate to him that the company is definitely interested that his task be

performed without injury to himself or others.

It is a mistake, however, to issue safety rules pertaining to all phases of plant operation. For instance, there would be no point in supplying a laborer with safety rules relating to the operation of a cracking unit. If such rules are furnished, they are very seldom, if ever, read. Every craft should be given safety rules which pertain specifically to that particular job.

Question: How can safety codes, safe practice manuals, and rules be so developed, and instituted as to cause the greatest amount of results in accident prevention, and voluntary support from the rank and file of employees?

Answer: The trend in modern safety work seems to be toward the formation of a few basic and fundamental safety rules applying to all employees such as rules on eye protection, reporting injuries, etc. These fundamental rules are expanded into safe practice codes covering details of certain operations. For instance, a company may have a general rule on eye protection, and a safe practice code for the use and maintenance of grinding wheels. Of course, there should be no conflict between basic rules and the safe practice codes—they should be compiled by men actually familiar with the work, and may be modified from time to time. In enforcing safe practice codes one should look for observance of the spirit of the law rather than the letter. Sometimes it is possible to follow the letter of the law of the safe practice code and miss the spirit entirely.

As regards the voluntary support of the rank and file of employees, this depends upon the soundness of the safety rules, the attitude of the Management and the sales efforts of the supervisors.

In order to obtain voluntary support from the rank and file of those to be governed by the safety rules or safe practice codes, it is my feeling that we should give them a voice in the formation of such rules. By following this procedure we find the several groups are in a much more receptive frame of mind than when we wrote the rules without giving them the opportunity to express their opinion. Get the majority of any craft in agreement on a set of safe practices for their guidance and the battle is nearly won

for they will see that the recalcitrant few are brought into line in short order.

Question—*a*: What effects do annual certificates of merit have when presented to departments of a plant, foremen and other such groups?

Answer: The plaque offered in contests carries the contest spirit, pride of accomplishment and desire to win. It is usually used in cases of units having similar hazard ratings. It has been our observation that the plaque obtains its greatest results among large groups and has its greatest influence on supervision of such groups, where personalities are not distributed so individually as they are in a small, well defined group, but that the signed certificate is as much or even more appreciated, and does more good in the small, well defined group. The reason for this, we attribute to the fact that the certificate is a personal recognition by those who represent company policy and is a personal communication of current value.

The signatures indicate to the individual that those signing are cognizant of the accomplishment and so recognize it, also would have similar knowledge and interest in a bad record and in remedying the cause.

Question—*b*: What purpose do record boards, or days without accident boards, serve?

Answer: These signs are valuable as a means of informing employees of the shop's or department's records and, as such, are well worthwhile. They also foster pride in the accomplishments in accident prevention. Where these signs are used, the foreman always points to them with pride when he has a good record. Those who do not have such good records are constantly exposed to these signs, reflecting the records of other foremen with whom he works. He may, at first, have an attitude of resentment, but this will soon break down and he and his men will exert a sincere effort to build for themselves a record which they can display.

Question: Are individual employee certificates of merit for long periods of exposure without an industrial accident, worthwhile? If so, at what intervals should they be used?

Answer: The average frequencies built up by the various departments of the petroleum

industry are such that an individual must work from 20 to 50 years with only one accident in order to have a frequency rate himself, equal to that of the departments of the industry. Therefore, we do not think there is a great deal of merit in issuing awards to individuals for not having an industrial accident over a period of a year or five years. We do believe, however, that certificates of merit or cards are very valuable when presented to drivers for not having a motor vehicle accident over a period of a year or years. We also believe that cards or buttons given to foremen, distinguishing him as not having had a disabling injury under his supervision over a period of one or more years, are valuable.

Raising Employee Morale

Question: What can be done to cause the active enlistment of the following in the accident prevention program?

- a. The long service, indifferent employee?
- b. The foreman who is lukewarm?
- c. The fellow, who it seems, just can't keep from getting hurt or causing someone else to get hurt?

Answer:

a. One psychological method of handling the long service, indifferent employee is to place him on a workman's safety committee. In some cases go so far as to make him chairman of that committee.

b. The lukewarm foreman. The same type of handling as applied to the long service employee might be tried on this type individual. If he fails to produce results or if no foreman's safety committee exists, then a little visit "on the carpet" might warm him up a bit to the safety program.

c. The fellow who, it seems, just can't keep from getting hurt or causing someone else to get hurt—the accident prone employee. A careful study of his aptitudes and the selection of a job to which he is best fitted, will help to enlist this type individual in the accident prevention program.

Question: Do you have foremen's meetings? If so, how are they conducted and what type of subjects are discussed?

Answer: Yes, we have foremen's meetings. We conduct bi-weekly meetings on company time for all supervisors under the direction of our Training Department and

we also hold bi-monthly safety meetings of foremen in all departments. In the Foreman Training Program we devote two meetings each year to the general interest of the entire group. Usually with the Safety Engineer in the role of discussion leader, and we stress the point of the supervisor's importance in accident prevention. We also use these meetings to re-state the company's policy in regard to safety in operations, as it applies to both personnel and equipment.

In the departmental meetings all foremen and supervisors are required to attend on company time and the Safety Engineer is present. The department foreman, according to the plan, acts as chairman or discussion leader. Sometimes this is not too satisfactory and to keep the interest from lagging the Safety Engineer takes over and directs the discussion. Any and all safety problems having to do with the particular

craft or topics pertaining to the general safety program are discussed. Worthwhile suggestions or recommendations that are beyond the jurisdiction of the group are handled by the Safety Engineer and he reports on the disposition of these items at the next meeting of the group.

Question: What is the value of the basic causes of accidents in enlisting employees in the accident prevention program?

Answer: The basic causes of accidents are generally those unsafe habits which make a man a poor workman. Most men are proud of the fact that they have been steady workmen for a great number of years. All men are proud when they have done a good job—they take pride in good workmanship. Real cooperation can be obtained in an accident program if men can be sold the motto of my own company's employee organization "Pride of Workmanship—Pride of Service."

WEDNESDAY AFTERNOON SESSION

October 9, 1940

The Effects of Legislative Trends on Safety

By F. R. McLEAN

Manager, Safety & Insurance Department, White Star-Ohio Division,
Socony-Vacuum Oil Company, Inc., Detroit, Mich.

I shall endeavor to ask and answer four pertinent questions regarding the rules made for us by public authorities.

1. Why is safety in the petroleum industry a subject of regulation?

2. What is the force that carries a proposal through a legislative body and makes it a law?

3. What are the sources of the facts and opinions which become the specifications and rules in laws and regulations?

4. What are the effects of present and proposed regulation on safety in the oil industry?

The National Board of Fire Underwriters and the National Fire Protection Association were working in a systematic manner to solve our fire problems some thirty years ago. They had a definite program to reduce fire losses. One of their principal methods

was, and still is, regulation. It was not until ten years later that the oil industry, through such bodies as the American Petroleum Institute and the National Safety Council undertook any comparable organized effort to accomplish the same results through methods of education, research and voluntary standards.

The first Model Ordinance on flammable liquids made its appearance in 1913. It was not until 1919 that the work of the A.P.I. was undertaken. Right to this day, a question which must be met by the industry's safety engineers is whether or not prevention can be kept more effective than regulation.

In the past and today laws regulating safety in our industry, or any other, spring from the fundamental right of constituted authority to impose restrictions or prohibitions where the public safety or welfare is

adversely affected. No one quarrels with this right of society to protect its larger security by placing limitations on those who might endanger it. Our questions usually arise over whether or not any particular operation does endanger that public safety and welfare and whether the "law" proposed is the only and the best protection.

A recent example of legislation by city ordinance to accomplish such public security is found in a large city situated in a river valley subject to floods, where it was found that flammable liquid storage in the flood areas could create a large scale fire hazard when flood damaged tankage permitted gasoline to cover the water surface. The oil industry cooperated in framing regulations for equipment and procedure to minimize this danger.

The answer in brief to the first question then is that public welfare and safety is best served by a safe oil industry and the law makers were first in the field with organized efforts to produce this desirable result. However, because of this historical and ethical reason for laws, we need not look to this simple formula to explain all oil regulations now on the books or currently being proposed.

My second question is: What is the force that carries a proposal through a legislative body and makes it a law?

If we follow the logic of our answer to the first question, the answer would be, "public demand for protection against a real or fancied danger." Please note that I have not said "protection against danger," but rather "against a real or fancied danger." If the public believes they need the protection of a law, I suppose they are entitled to it. The only sane alternatives to regulation in these situations would be to remove or correct the real dangers or to inform the public, and particularly the law makers, if the danger is merely fancied.

It cannot be done by informing the public or the law makers. No matter how well persuaded law makers might be that the danger is imaginary, they must depend on the votes of the public for re-election and must satisfy their constituents. This "informing" is not impractical of accomplishment even as to the public. Usually the community feeling that "there ought to be a law" has a few active vocal exponents. These as well as the legislators can usually

be reached and if correct information is properly presented to sincere persons whose source of information was limited, they are usually willing to broaden their viewpoint as their understanding expands.

We must be most helpful and patient in these situations, for much of what we complain of in regulations arises from the fact that neither those who advocate nor those who legislate ordinarily have the knowledge of the oil industry possessed by those actually devoting their lives to the industry. This is not surprising when we realize how much education is still to be done among personnel of the industry itself and how much the industry and each of us as individuals has learned in the past five or ten years.

We must recognize too the influence of a situation pointed out ten years ago by Robert S. Moulton, Technical Secretary of the National Fire Protection Association, in discussing municipal regulation of oil storage. He observed that small quantities of gasoline misused by the public, as for cleaning in kitchen or garage, was a frequent cause of serious accidents. The public, therefore, tended to regard with proportionate apprehension the large quantities of gasoline handled by the industry and this resulted in misdirected emphasis as to public safety.

Demand for legislation does not arise spontaneously from either the public or the law makers. With the exception of certain officials such as fire chiefs and state fire marshals, others lack the specialized knowledge of our industry needed to detect and correct a potentially dangerous situation. Demand that "there ought to be a law" usually follows suddenly after a fire, explosion, or accident or after a series of them has occurred. The more unusual, dramatic and severe the occurrence, the greater the attention it gets and the greater the demand for a law. Oil fires are peculiarly capable of attracting such attention with their rapid spread in a vapor area, their black smoke and their peculiarities of extinguishment. Their infrequency adds to the notice they get as "news worthy" press items. Hasty legislation arising from public fear following one of these occurrences may be most unfortunate as the public officials having authority to regulate may miss both the true causes and the proper remedy.

In this matter of regulation because of real or fancied danger we will have less but better legislation if we can fully appreciate the responsibilities to the public of those who possess authority and if we make available to them the help of those in our industry who possess expert knowledge in regard to safety.

Where this mutual understanding has been established, well balanced uniform regulation has received strong support of safety authorities in the oil industry in remedying dangerous conditions where co-operation and education had not been successful in producing safe conditions among all elements of the industry without such outside compulsion.

One further observation about regulation growing out of accidents or fires. The more serious the occurrence, the more sweeping is the regulation resulting and the more literal its interpretation and enforcement. This is an outgrowth of the atmosphere in which the regulation is written and the natural sensitiveness of officials to criticism.

This discussion has been based so far on the reason usually advanced, that it is for the public safety and welfare. But we can often detect other forces at work. To insure that any demand for regulation produces either a practical law or no law at all, it is often necessary to determine what these other forces are and to cope with them. I will enumerate a few which I have personally felt were at work in some proposed laws and ordinances:

Competitive economic conditions between different groups within the oil industry is, I am sorry to report, too frequently such a hidden force—the long haul large volume supplier vs. the local plant; the established operator vs. the new-comer.

Competition between promoters of different transportation methods for hauling the industry's liquid loads is another cause.

Sometimes law makers get too enthused over a device or service which seems to solve a problem and we have the so-called "gadget laws." It is not to be inferred that these need have any commercial sponsor urging the passing of the law.

Some so-called "safety regulations" are passed primarily for the purpose of collecting a license fee and thus providing a source of revenue. Our industry certainly

has shown its fruitfulness as a tax source, and we can understand why others attempt to share in the tribute levied. One early ordinance had no provisions except for the payment of license fees for service stations and operators, for "approval" without any standards being set up, and for severe penalties for unlicensed operation. Another such proposed ordinance would have financed a fire prevention bureau to serve all commercial buildings in a certain city by the collection of license and inspection fees on service stations and bulk plants. We are sympathetic with civic fire prevention programs, but not that sympathetic.

Solutions of traffic problems have been sought in ordinances specifying routes for tank trucks.

Parking problems have been attacked by attempting to limit the width of service station drives.

Summarizing our answer to the question as to what the forces are which carry proposals through law making bodies, we must conclude that in most cases it is public demand produced by actual occurrences, but sometimes created or aided by economically interested groups.

If we are to have fewer regulations, we must reduce the fires or accidents which inspire them. If we are to have better regulations, we must, as professional safety men be above economic rivalries which seek advantages through restrictions on competitive operations in the name of public security.

Our third question is: What are the sources of the facts and opinions which become the specifications and rules in laws and regulations?

What goes into the legislative hopper has much to do with the kind of a law a state or community must operate under in years to follow. Legislators cannot be expected to possess the knowledge of experts in the many fields on which they must work. We can rather assume that they approach a new problem with the ideas, right or wrong, generally held by their constituents, the general public. However, they proceed to acquire additional enlightenment on a subject before them for legislative consideration. Most naturally they call on their own staff, e.g., a council on the fire chief, a legislature on the state fire marshal.

I feel that our industry is indebted to these professional fire fighters and preventers and others in comparable public positions for assembling from reliable sources both in our industry and elsewhere much sound information for enactment into law. In some cases these officials are given broad responsibility through enabling legislation to promulgate regulations. In almost all instances they have recognized that those who are best informed on safety for the oil industry are the men in the industry specializing in that work—safety men who know the industry's safety problems and who can call on the engineering and operating specialists of their companies in seeking practical solutions.

Because of the public interests to be served by legislation, however, public or semi-public sources outside the industry may be largely used. Because of their pioneering in this field, "The Suggested Ordinances on Flammable Liquids" of the National Fire Prevention Association and "The Regulations for Containers for Storing and Handling Flammable Liquids" of the National Board of Fire Underwriters are generally accepted "texts." Having a national scope, these possess one great virtue of being an influence for uniformity. However, this uniformity extends in time as well as space. The National Board regulations, in particular, suffer from this defect. For example, there has been no change in the table of distances for tanks from property lines between the edition of 1927 and the edition of 1939. The regulations needed in the age of the wooden roof tank live on in the era of gas-tight steel tanks, floating roof tanks and spheroids.

Couple with this the fact that much of our petroleum regulation has been on the statute books for many years and that repeal or revision is infrequent. As a result, regulations in almost all jurisdictions are a compromise between our best practices of today and our misfortunes and inexperience of twenty to thirty years ago. In fact, yesterday has much the best of it in most cases.

Committees from the oil industry advising on drafting of ordinances have secured provisions in the new regulations which make them not retroactive as to existing plants. Yet into these same regulations have been written restrictions that had their origin in the conditions of plants which were

considered obsolete a decade ago. These restrictions will still be on statute books a decade hence and will be handicapping the designers of new plants from taking advantage of all the improvements made possible by metallurgic, engineering and petroleum science.

In considering sources, the tendency to borrow is probably the most troublesome. One charged with the task of drafting an ordinance or law is inclined to find what others confronted with the same problem have done. A collection of Fire Marshall's regulations or city ordinances is made, they are read, and seemingly appropriate sections are copied. Where this has been done, it has been my observation that the drafting official, naturally desiring the best possible protection for the public of his area, chooses the most severe and restrictive features from several ordinances. Without appreciating the age of the regulations, the particular misfortunes which may have precipitated their enactment, or the "other than safety" motives behind their passage, parts of several ordinances may be transplanted and "inflicted" on the petroleum industry in some community.

In some fields the standards or suggested safe practices of the American Petroleum Institute constitute the nearest approach to both uniformity and up-to-dateness. I note a tendency by legislatures to appreciate this fact and to accept these standards as authoritative. Though written by the very persons to be regulated, they appreciate that no one has a more direct concern in adequate safety standards.

Widespread adoption of American Petroleum Institute standards and safe practices on a voluntary basis frequently makes compulsion by the enactment of law unnecessary.

If some national authority such as the National Fire Prevention Association could adopt modern standards, I am sure the officials charged with regulation would hasten toward uniformity. At present, steps toward up-to-date standards in advance of these national bodies tend to diversity. Fundamentally, the problems of safe handling and storage are the same in all communities and states and both enforcement and compliance would be better with mutual benefit to officials, the public and the industry.

Much of the more recent legislation has been proposed rather than passed. Nevertheless, I know it has had effects. One of the most frequently sought regulations has been the restriction in either size or routes to be used by large truck equipment. These proposals have sprung from many motives, including genuine concern for public safety and competition within the oil industry and within the transportation industry. From a strict safety standpoint, most such proposals are based on a belief that quantity is the measure of danger rather than quality or lack of it, in the equipment itself. Naturally with this premise, the solutions looked toward restricted size rather than toward good engineering and adequate safeguards as recognized for the modern tank truck today. Although neither the restrictions nor the substituted safety specifications were enacted, in cases on which I had contact, there was a stimulating effect on haulers to bring equipment up to safety standards and to prevent accidents.

Another problem which is coming to the fore in the consideration of legislators as well as oil company safety men is that of underground tankage. It has been discussed in connection with other ordinances. I feel it is still a problem of engineering and it would be a matter of regret to have some fixed procedure applied by law originating with a body which is not faced with the responsibility of complying with it or of solving the problem. It might prevent the study needed to find a real solution to the problem.

As to equipment, the too frequent effect of regulation is to fix a standard which becomes both a minimum and a maximum. It substitutes rules for engineering.

As to human behavior, regulation by law, when done by a sufficiently large and potent political area that can both publish and police its regulations, forms a valuable "must" course for employees in the industry. Un-

fortunately, too frequently the rules exist in print only in the city archives or legal volumes and are largely unknown and unobserved. They come to light as factors in negligence suits. We cannot feel that because an outgrown requirement is no longer enforced it is of no further concern.

Regulations do not give the basis for correct action in emergencies. A safety program of education and training based on an understanding of fundamental principles does lay a foundation for proper procedure both routine and emergency.

Let us be entirely fair about this matter of regulation. Unless we as safety men representing operating companies can adopt all reasonable steps to prevent fire and accidents in our companies and can devise ways of getting such wholehearted cooperation from every concern, large or small, engaged in any phase of our industry that they too will take all possible reasonable precautions, then we can expect public authorities to seek through regulation these same results.

Can we prove that our voluntary and adaptable methods are effective and that the public safety and welfare and our own safety and success are so closely dependent on each other that public officials can increasingly trust us without regulation?

To merit full confidence, we must really "know our stuff" and hold belief in principles so high that in no situation would we advocate any unsound safety measure or unnecessary prohibition or restriction.

We must actively campaign to unburden our industry from outmoded restrictions and obsolete safeguards now being forced on us by old laws or new laws compiled from old sources.

We must anticipate new problems and prevent their becoming of public concern so that we and the public may enjoy the good effects of safety without the cost and congealing consequences of rigid requirements

The Problem of Underground Service Station Tanks

By R. M. CADMAN

Superintendent, Engineering Dept., The Schedule Rating Office of New Jersey, Newark, N. J.

During recent years there has been a considerable increase in the number of leaks from underground gasoline tanks and piping. This may be due to the increasing length

of time that tanks have been subjected to the corrosive action of various soils.

It is not necessary to dwell upon the dangers where gasoline vapors are present. These are self-evident.

It might be well, however, to consider the subject of explosive limits. The lower limit of flammability of a combustible gas or vapor, often called the lower explosive limit, represents the leanest and most dilute concentration in air that will propagate flame.

The upper limit of flammability represents the maximum concentration of that gas or vapor in air that will propagate flame.

The explosive range of combustible gas or vapor includes all of the concentrations of that gas in air between these upper and lower explosive limits.

The limits of flammability in air of gasoline vapors are lower limit 1.3 per cent and upper limit 6 per cent.

Malden, Mass.

A modern gasoline filling station with underground tanks of 1,000, 2,000 and 3,000 gallons capacity was opened near the corner of Main and Newhall Streets in Malden, on November 9, 1939.

Two days later the chief of the fire department received a call from the drug store on the corner of Main and Newhall Streets complaining of a strong odor of gasoline in the basement of the store. The chief traced the odor to a sump pit located in the northwest corner of the building.

Feeling that the case was one which could best be investigated by other agencies, he immediately contacted the Rating Bureau as well as the State Department of Public Safety. The subsequent investigation was then carried on jointly by Dr. Joseph T. Walker representing the latter department, Chief Dooling of the Malden Fire Department and Mr. Abbott of the Rating Bureau. All agreed that the odor emanating from the sump pit was unquestionably that of gasoline. Using two types of combustible gas indicator, it was then determined that an explosive mixture was present at this point. It seemed logical that the source of trouble must be the filling station.

Consequently they had a series of holes about two inches in diameter and five feet deep dug around the exterior walls and about one foot away from the building at intervals of about ten feet. Then attaching

the inlet tube of the explosion meter to a long rod they checked the possibility of the atmosphere at the bottom of each of these holes with negative results until they reached a point about midway along the south wall of the building. At this point they again detected the presence of an explosive mixture. They then extended their series of test holes in a direction approaching the underground tanks with the result that the explosibility became increasingly stronger as the distance to the tanks was reduced.

At this point they were informed by the engineer in charge of construction for the oil company that just previous to the opening of the station the attendant was unable to account for approximately 200 gallons of gasoline which was a portion of approximately 2,900 gallons which his records indicated had been pumped into the 3,000-gallon tank.

Even after the most careful checking the 200-gallon shortage could not be accounted for, and it was decided to replace the tank. The original tank was then subjected to a hydrostatic test, but no evidence of a leak developed. It was admitted that while removing the original tank, a leak in the line between the tank and pump was discovered, but this leak according to the engineer was not of sufficient magnitude to account for the sizable loss previously obtained.

As a result of the information furnished by the oil company engineer, it was decided to fill each tank to the top of the fill pipe and then circulate the product by means of the dispensing pump and flexible hose line until the capacity of each tank had passed through the pump and connecting pipe line. While a test conducted in this manner would not be as satisfactory as subjecting each tank and pipe line to a hydrostatic test, it was their opinion that if a leak of any importance was present in the system it would unquestionably be noted.

Moreover in order to test the tanks hydrostatically it would have been necessary in the interests of safety to replace the product in each tank with water in order to eliminate the possibility of an explosive mixture existing within the tank. The results of the test were negative.

In view of the foregoing, it was their opinion that the missing 200 gallons of gasoline had found its way into an unused subterranean drain which apparently extended

from the cellar of the former dwelling where the tanks were located and passed under the mercantile building, thus accounting for the presence of explosive vapors in the sump pit of this latter building. If their assumption was correct and the present tanks and pipe lines of the filling station were tight, these vapors should gradually disappear. The fire chief posted a man at this point to make certain that every precaution was taken to avoid any possible catastrophe. Within a few days all evidence of explosive vapors had completely disappeared which would seem to confirm the correctness of their conclusions.

Paterson, New Jersey

Early in 1938 our attention was called to a dangerous gasoline hazard in the basement of the tenant mercantile building at 247-57 Market Street in Paterson.

Adjoining the east wall of the building is a gasoline filling station pumping from buried tanks. For several weeks there had been a seepage of water and a flammable liquid through this wall to the basement, whence it was pumped by a sump pump into a soil pipe leading to the sanitary sewer.

Samples of the flammable liquid were tested and the flash points were 24 to 39 degrees F. The specific gravity was about .75. The samples were of a reddish color.

It is claimed that ground around the tanks of gasoline service stations in the vicinity has been dug up, but no leaks have been discovered.

A study of the geology and topography of this section indicates that there is an underlying stratum of shale and that there is a natural valley where a stream once flowed underneath the building in question.

There are gasoline service stations along the path of the brook at higher elevations, and also a large plant that reclaims oils.

The owner has dug around the foundation walls of the building and waterproofed them. Since this was done no gasoline or other flammable liquid has seeped through. Tests have been made in the space between the first floor and the unexcavated portion of the basement and there was no indication of an explosive atmosphere.

Since the source of the gasoline has not been found, it is reasonable to expect a recurrence of this condition at some other point in the vicinity.

East Orange, New Jersey

In December, 1938 the attention of Fire Chief McGinley was called to seepage of gasoline into the transformer vault manhole at William and Lincoln Street, East Orange, New Jersey by the Public Service Corporation of New Jersey, owners of the manhole. He and their representative investigated immediately and found about 300 gallons of gasoline. The chief suspected the two service stations on the northwest and southwest corners, but upon testing their gasoline tanks with 10 pounds of air pressure no leaks were found. These tanks were then dug up; still without results.

Chief McGinley consulted with gasoline company representatives to get their views and experience, after which it was decided to test all stations in that vicinity, and all stations within a half mile of that vicinity were tested and no leaks found. The next step was to test all stations within one mile of this manhole, and again no leaks were found. Tests were made on the border line of an adjacent city without results.

During all this time gasoline was continuing to flow into this manhole through the sump outlet at its bottom. The chief next resorted to having tests made by several of the large oil companies. They all agreed that it was gasoline, but were unable to tell what company manufactured it. During this time pure gasoline was being pumped from this manhole at the rate of 335 gallons every two months.

After using every means available they were unable to discover the source of this leak. The Public Service Company decided to abandon this manhole and fill it in. This was done in January, 1940. Chief McGinley, however, was still worried because of not knowing what might happen next, there being a four-story apartment building at the northeast corner of this street intersection fully occupied. It had occurred to him that this gasoline might be diverted into the basement of this building. Fortunately this did not happen. Instead it found its way into a telephone manhole about 30 feet across the street, and the seepage at this time was much lighter than originally and disappeared entirely in March, 1940.

At this time there is every indication that this troublesome and dangerous condition is cleared up, at least temporarily.

Throughout the investigation every possible effort was made to determine the cause or source of the leak, but without the slightest success. It is hard to understand how so much gasoline could get away without its being discovered by the owner.

Newburgh, N. Y.

On December 21, 1937 a complaint of gas odors in the basement of Sacred Heart Church at the southeast corner of Ann Street and South Robinson Avenue, was received at fire department headquarters.

The Pastor of the Church stated that these odors were noticeable during the Spring months of 1937, but seemed to disappear during the summer months.

A check-up of all gasoline stations in the immediate vicinity was started at once. This resulted in the testing of gasoline tanks at eleven gasoline stations within five blocks of the Church. The daily records of these gasoline stations were checked and in no case revealed a gasoline loss. These tests consisted, in most cases, of one half hour air test. Two of these tanks were found to be leaking, but it was found that these two tanks had been out of service for some time and combustible gas indicator readings showed no indications of vapors in them.

In the meantime daily readings were made in the basement of the Sacred Heart Church at points where vapors entered through the footings. These readings varied considerably; sometimes no odors being apparent.

Three test wells were sunk and samples and meter readings were obtained at various times. Daily barometer readings were compared with meter readings, but apparently no connection existed.

Some old maps were obtained showing this area to have been a marsh and pond area; the present grade level resulting from filling in.

A survey was made and the natural water level obtained. A pit was dug below this natural level, inducing a flow of water from this water table into the pit. This flow of water carried on its surface gasoline. This pit was pumped out daily, starting March 3, 1938 and continuing through to June 30, 1938. Approximately 250 gallons of gasoline was skimmed off the flow into the pit.

From time to time the water level would lower to the point where no flow occurred into the pit. The level was then built up

by running water, through a 2½-inch hose line, into the test wells at the Church, thereby flushing the ground, having a tendency to wash any vapor condition away from the Church and towards the pit.

Finally as the flow of water continued for several days, with no indication of gasoline and no further odors in the Church, pumping operations were discontinued.

New York City

On March 22, 1932 there was an explosion in the boiler room at 313-21 West 37th Street, New York City, which severely injured the engineer of the building. When the fire department arrived another explosion occurred which killed a fire department lieutenant and injured nine firemen.

It is believed that the first explosion was caused by the ignition of gasoline vapors that arose from a sump pit and the second explosion by the ignition of both gasoline and city gas, the gas meter having been ruptured by the first explosion.

The gasoline was traced to leaky fill pipes.

Buffalo, N. Y.

The Genesee Motoramp Garage is located in the heart of the downtown district in Buffalo. This is a basement five-story modern fire-resistive sprinklered ramp garage used for the parking and storage of automobiles with the usual gasoline dispensing station. The gasoline equipment consisted, until April, 1939, of four buried 1,000-gallon tanks with the gas displaced by water pressure under a constant head of 15 pounds. This has since been replaced entirely with a modern approved system.

Gasoline seepage was first discovered following a small fire in the boiler room on November 16, 1938. There was fortunately no explosion accompanying this fire. The gasoline reached the boiler room through a drain which fed into a sump from the basement floor of the garage proper. This drain was shortly plugged so that the boiler might be safely operated.

Test holes were dug in the basement below the level of the boiler room sump so that the gasoline would safely drain to this point and could be pumped out. This ground was at first found saturated with gasoline below a depth of three feet. Additional test holes have been made during the year in various locations and regular pumping out of one of these has been going on ever since.

The pumpage of gasoline from June 8, 1939 to June 10, 1940 amounted to 342 gallons.

The source of trouble has since been definitely found to be outside of the Motoramp Garage property. Their four tanks were tested in the spring under both air and water pressure and found satisfactory. However, they have gone ahead and replaced everything. The new installation includes four new 1,060-gallon tanks, new, modern Underwriters approved pumps, and all new piping, the former system having been discarded.

New Britain, Connecticut

On December 13, 1939 the odor of gasoline vapors was very noticeable in the basement at 112-118 Hartford Avenue. It was found that the gasoline had evidently come in on top of the storm water and accumulated in a sump in the basement floor.

The basement floor was dug up to ascertain if possible from what direction the gasoline was originating. It was found that this gasoline was on top of the storm water in rock crevices under the basement floor and apparently was flowing on top of the water to the sump. Samples of this gasoline were taken and analyzed in an endeavor to ascertain what make of gasoline it was. It was definitely found that this gasoline was a comparatively hi-test gasoline without tetra-ethyl or lead. A check was made throughout the area to determine if any gasoline tanks were giving evidence of leakage and one in the proximity of this location was actually dug up, but no leaks were found.

To prevent the accumulation of explosive gasoline vapors in the basement, an explosion proof exhaust fan was installed.

The leakage of gasoline apparently went out with very little change until April of this year without any success in determining its source. A special committee had been formed to determine the steps necessary to find the source of this gasoline and means of preventing it from flowing through the ground. Dye tests were carried on in various tanks, but without any success. It was decided to dig a hole in the sidewalk outside of the basement area in line with the rock formation under the basement floor. When this excavation was completed, it was found that the flow of gasoline was definitely from the outside of the building into it. Samples of this gasoline were taken and they were

found to be of the same quality of gas as taken previously in the sump in the basement.

After many unsuccessful attempts to find the origin of this gasoline, it was decided that the basement area should be sealed with cement. The cleavage in the rock formation in the basement was grouted in and also the cleavage in the rock outside of the basement wall was grouted in. The flow of gasoline had by this time greatly diminished, but as there had been some variation in the quantity of gasoline flowing per day previous, it was felt that this was nothing but one of the low periods, although it continued for some time and it was finally felt that the source had possibly been discovered by the owner of the tank and stopped either by pumping out the tank or depleting the supply within the tank.

Drain tile lines were then installed under the basement floor to a sump from the rock cleavage so that if any gasoline did come in on the storm water, it would immediately be taken out into the store. Also the cleavage in the rock outside in the excavation was filled in with cement and then the hole was filled up.

While it is believed that everything possible has been done to prevent the flow of gasoline into the building, there is no assurance that it will not appear later at some other point.

Princeton, N. J.

About the middle of January, 1940 complaints were made by residents in the vicinity of Leigh Avenue and John Street in Princeton that gasoline fumes were present in their basements.

It seems that a system of underdrains has been installed in that vicinity to intercept the ground water and thus relieve the sanitary sewer of infiltration.

Residents having connections to the underdrain were ordered to plug the connections in the basements so as to prevent the gasoline vapors from entering.

On January 17 a plumber removed the plug from the drain at 54 Leigh Avenue and struck a match. The plumber was hurned about the head and the explosion followed the drain to the street and raised manhole covers to a height of about 30 feet. One manhole cover missed a police officer by a small margin.

Tests were made of all tanks in the vicinity and the one at Leigh Avenue and John Street was found to leak badly. The gasoline was pumped out and the tank removed.

Upon examination it was found that the welding in one end of the tank had failed for a distance of six inches.

No complaint of gasoline fumes has been received recently.

Conclusions

I. Installation of Tanks:

- Tanks should be set on a firm foundation and surrounded with soft earth or sand well tamped in place.
- The back fill should be free from large stones, ashes and other materials that might have a tendency to cause corrosion. Filled in land often has a corrosive action on steel tanks and iron piping.
- It might be well to have an analysis made of the soil before tanks are installed to see whether there is a probability of corrosion; if so, better protection should be provided for the metal.

II. Suggested Methods for Determining the Location of Leaks:

- An accurate account should be kept of the amount of gasoline placed in each tank and the amount pumped out. By so doing, the amount unaccounted for can be determined.
- Fill boxes and piping around pumps should be carefully inspected.
- Test holes should be drilled at ten-foot intervals around garages and service stations.
- Combustible gas indicator tests should be made in holes, manholes, basements, etc. to determine whether there is an explosive mixture present.
- Inquiry should be made as to

whether or not gasoline used for washing automobile parts is being thrown out and allowed to seep into the ground.

f. A flash point test of the liquid found would give an indication as to whether or not it was gasoline.

III. The governing body of the municipality should determine at once who is to be responsible for locating the source of the gasoline.

IV. The city engineer should prepare a gasoline leakage map. This map should show contours, streams, dried up water courses, former water courses now filled in, storm drains, sewers, tank car unloading points, bulk oil storage plants, retail gasoline service stations, locations where gasoline leaks have been found, and locations where soil is known to accelerate corrosion.

V. A careful record should be kept of the methods used in determining the source of leaks.

VI. A record should be kept of weather conditions, during investigations, such as temperature, precipitation, etc.

VII. Tanks and piping should be capable of withstanding a static pressure of 10 pounds per square inch without leaking.

Where tanks and piping may be weakened through age or because of the character of the soil in which they are installed, they should be tested annually preferably at a hydrostatic pressure of 10 pounds per square inch.

VIII. If for any reason a tank is abandoned the gasoline should be entirely pumped out and all piping disconnected and the tank filled to overflowing with water and tightly capped or completely filled with sand, or the tank should be removed from the premises.

Summary of Discussion

1. All underground tanks should be provided with a coating such as paint, galvanizing, asphalt, or the like, to protect them against corrosion.

2. The statement "The governing body of the municipality should determine at once who is to be responsible for locating the

source of the gasoline" should be clarified. Does this mean the police department, the fire department, or some other body?

3. Tanks and piping should be tested to a static pressure of 3 pounds per square inch rather than 10 pounds as suggested in the paper.

4. The statement "Where tanks and piping may be weakened through age or because of the character of the soil in which they are installed, they should be tested annually" is too vague. At what age should the first test be made?

Accident Prevention Through the Eyes of an Insurance Executive

By R. M. MacDONALD

Superintendent, Safety Engineering Department, Zurich General Accident & Liability Insurance Co., Chicago

Most organizations in the oil industry, including drilling, production, refining and marketing, are today doing a mighty fine job of accident prevention. We, in the insurance engineering field, can also report constructive progress. Perhaps a brief description of my own experience in this field might be interesting. I am sure the experience is quite similar to most old-timers' and the same might very well be applied in connection with most insurance company engineering departments.

I have been with my company about 21 years. When I started, our department was correctly known as an inspection department and the men in it were termed "inspectors." For a considerable time we thought that, after going into a plant to make an inspection and following this up by submitting recommendations through the mail for the protection of all possible mechanical and physical exposures, our job had been well done when the recommendations were complied with. Strangely, as we thought then, however, there seemed to be no reduction in the frequency or severity of accidents, so that gradually we came to realize that there was something sadly wrong with our procedure.

Then we slowly enlarged our efforts toward the improvement of supervisory methods, usually through superintendents, foremen and key-men. Quite often all this was done without the active support and sometimes even without the full knowledge of the executive members of the organization. Well, this had some constructive results, so that finally we definitely ceased our so-called back door entrances and it is now our practice to refuse to inaugurate a safety campaign in any of its phases without first calling the executive personnel upon the necessity of their active support and cooperation. In other words, we have at last be-

come safety engineers and salesmen of safety in all of its phases.

The ability of an insurance company engineer to go through an industrial plant, an oil field, or a refinery and detect unsafe conditions and specific accident exposures does not even approach the requirements of his job today. It is necessary that he sell the executive personnel on the necessity for successful accident prevention from the viewpoints of humanity, indirect costs and insurance premiums, and also that successful accident prevention is good business from all angles. The insurance engineer must then also be able to sell the supervisory personnel, from the managers and superintendents down to the key-men. This means that he must be somewhat of a psychologist, and certainly a diplomat. Above all, to be successful, he must have full knowledge of the thought habits peculiar to the men in whatever field he is engaged at the moment.

Nearly all of the foregoing statements apply to a great degree as regards safety men, managers, superintendents and key-men employed throughout insured organizations.

I know one man, my friend, Frank Harrison, safety director of the Pure Oil Company, who has enjoyed great success with his company, and yet during his wide travels through many states in which his company operates, he has very seldom, if ever, issued an order, as such, to any of his organization. His success may be attributed to two things:

First—his personal magnetism and lovable disposition. I have yet to find a man in any capacity who is not a firm admirer of Frank Harrison as an individual, and one who does not respect him greatly.

Second—during his travels through the field his attitude toward all field and plant supervisory personnel is one of never-failing

friendly helpfulness, and constructive suggestions are made regarding unsafe conditions found or unsafe practices observed.

There is one thing sure in your execution of a Safety Campaign; unless the individual is liked, admired and respected, his efforts are sure to be either entirely nullified or ineffective to a great degree.

There is another point which invites some constructive criticism from an insurance man. One of the results of our progress in this field is our ability to convince our insureds that the insurance premiums involved should not become the paramount consideration. Admitting that insurance premiums are worthy of important consideration, nevertheless, oftentimes the indirect losses surrounding an accident may far exceed the costs insured and paid by the insurance company under its contract.

Lost time means lost production. In these days of heavy production, time is an important factor. Maximum protection must be provided for employees in order to avoid time losses which might interfere with the maintenance of schedules. For example, any accident of little severity might occur in the field. The injured man may require the services of a physician who is available perhaps in the nearest town, possibly several miles away. The injured employee must travel or be transported to the doctor and back to the job. Perhaps the injured person may not return to work on the day of the accident, in the meanwhile losing time for his company and not productive of any profits on his labor. The medical bill may be \$2.00, which is paid by the insurance company. The lost time may amount to twice or three times the cost of the medical bill. This is an uninsured but none-the-less real loss.

Another accident may involve dropped or falling material from above. If the men on the ground are wearing hard hats, as they certainly should in your industry, there may not be any injury at all. At the same time, the dropped or falling material might and often does damage property belonging to the employer, or property belonging to others in charge of the employer. Such losses for damaged property under either of these circumstances are not insurable. Therefore, even if the loss ratio of an employer is satisfactory from the standpoint of insurance, the indirect losses to the employer which are

not insured may exceed and often do exceed the losses of the insurance company three or four times. If this is correct, and we are sure it is, the application of a successful accident prevention campaign is more important from the standpoint of uninsured losses than the insurance premiums involved as a first consideration.

My company at present insures a risk for public liability, automobile liability and property damage. This organization operates in some 30 states. Its activities are such that employees of this risk must intermingle continuously with employees of others, both on and about the rigs. The risk came to us as a so-called "debit risk," which means briefly that the experience has been continuously bad over the past several years at least, and the bad experience has resulted chiefly from an adverse accident record involving the specially equipped mobile units in operation. We, of course, assisted the assured in the inauguration of an automobile accident prevention program which, with the cooperation of the assured, has proved decidedly effective.

Suddenly we realize that the frequency of accidents reported under their public liability contract has become excessive. During approximately nine months at least 45 of such accidents had been reported to our claim department. Among these were five fatalities. Careful analysis of all of these files determined that in all except five or six of these accidents there was no legal liability involving our assured and that our assured had reported the accidents whether or not there was any responsibility on the part of our assured, as is customary and desired. The costs for legal defense in some of these cases will have to be charged against the assured's experience although most of them will subsequently be closed without cost to the assured or my company.

The point we want to make is that since the accidents did occur and five or six lives were lost, 45 separate acts of carelessness were committed; most of them no doubt could and should have been avoided. The predominating basic causes for the accidents were the dropping or falling of tools or materials and the falling of men. We have asked our assured hereafter to employ the use of life-lines and to securely tie tools and materials to the derricks insofar as possible. This our assured is now doing. Yet, this

particular problem is to a large extent still unsolved because the drilling contractors presumably will continue to have accidents involving their own employees as well as employees of others engaged about the rigs.

This last Spring I spent an extremely pleasant, as well as profitable, three weeks in Texas. Part of one week we attended the Oil Show, much of the remaining time we journeyed through the oil fields and one of the refineries. I was much surprised and gratified to note the splendid housekeeping throughout several of the production fields and the unquestioned attention which was being given the subject of safe operations in both the production fields and the refinery. With all of this in mind, it is difficult to visualize that such an accident experience as the one above described could occur, especially as because the accidents occurred not in connection with any one risk, but that probably there were thirty or more separate companies or contractors involved, some of them large contractors and a number of them probably much smaller independents.

One important safety measure which we believe all large oil companies advocate and some enforce is the use of hard hats. While

hard hats are being used more and more as time goes on, we can only hope that some time in the not too distant future the use of hard hats will be universal wherever necessary.

You will note we have not referred at all to catastrophe hazards as related to fires and explosions, which are presumed to be inherent and inseparable with many phases of the oil industry. Granting, of course, that these hazards are always present, and must be respected and guarded against constantly, still it is not the catastrophes which we fear especially. Accident frequencies produced by the oil industries are really not much different as to character of accident than those which are produced from operations dealing within the classifications of plumbing, steam fitting, masonry or pulp and paper manufacturing. In other words, basically, the classes of accidents remain much the same, the old common slips and falls, dropping and falling material, handling tools and materials and so forth. If these common classes of accidents can be reduced still further we shall have made definite progress in our work.

THURSDAY LUNCHEON SESSION

October 10, 1940

The Petroleum Section Contest

By H. N. BLAKESLEE

Director, Department of Accident Prevention, American Petroleum Institute, New York, N. Y.

Although in the Petroleum Section Contest there is no umpire who checks with the rules of the game the action of each individual in the contest, the contest report (the box score) may be taken as an index of how well individuals in the participating companies have played the game. The contest report is a collective record of employees' errors within a company which have resulted in industrial injuries. These box scores are governed by the rules of the contest which the Executive Committee of the Petroleum Section promulgates from year to year. Reporting is according to the conscientious dictates of each representative of

competing companies—usually the safety supervisor—who acts as the umpire within his own company. His is the record of those within his company who have put forth the best effort and have achieved the best results in the prevention of industrial injuries.

It has been customary in the past to hold "management" responsible when reports have not been so good. Even some of the papers at this congress attempt to tell management what it should do to improve accident records. Now management is something abstract, a science—the science of coordinating the efforts of both man and money to produce earnings for both. It is

not something human that thinks and acts. Only individuals think and act. Shall we not get better results if we make accident prevention the joint effort of all employees—employees including executives in positions of major responsibility? These executives can think and act and, therefore, should be able to develop information and train all employees in the correct method of doing the job—to the end that mistakes, mishaps, and accidents resulting in damage to persons and property will be obviated.

The safety supervisor also is an employee, an individual who thinks and acts, and he functions as the liaison between executives and workers in less responsible positions. He coordinates the thoughts and suggestions of all employees who contribute to the correction of unsafe conditions and to the improvement of working methods.

Where accident prevention is concerned, there are no class distinctions. Ranking executives as well as other workers are in danger of accident. The vice president of a large oil company some time ago had his arm torn off while it was resting on the window in the door of his car. Individuals are responsible for accidents just the same as they are responsible for efficiency in production.

Aren't those broadsides at management just shadow boxing? Would it not be more resultful to bring the matter down to personal cases, and mention the individual executives who are not wholeheartedly playing the accident-prevention game instead of intimating collectively that executives are not doing their part? The safety supervisor is striving to coordinate the efforts of all employees—executives and those in less responsible positions—for the prevention of industrial accidents. A closer understanding and a closer relationship between all employees should result not only in increased accident prevention, but in better employer-employee relations in all departments.

The companies that participate in the Petroleum Section Contests contribute largely to the Annual Summary of Injuries in the Petroleum Industry. Collectively, these records constitute the accident-frequency and -severity rates for the industry. They establish the favorable reputation which the industry enjoys with the public.

The highlights of the National Safety Council Petroleum Section Contest are as follows:

Department	Frequency
All	Up 4%
Marine	Down 22%
Refining	No change
Production	Up 1%
Drilling	Up 2%
Retail marketing	Up 3%
Oil and gas pipe line	Up 10%
Wholesale marketing	Up 11%
Natural gasoline	Up 44%

A comparison of the petroleum industry contest figures with those of other industries holding contests shows the following:

Industry	Frequency
Rubber	Down 13%
Paper	Up 2%
Petroleum	Up 4%
Metals	Up 4%
Public Utilities	Up 7%
Chemical	Up 9%
Marine	Up 41%

Employment conditions and general conditions throughout the petroleum industry have been fairly constant. The Mid-continent and Gulf areas did have a brief shut-down, but on the other hand, we have had no special boom programs. Some oil companies made better accident records during the past year than ever before; the oil tankers improved their frequency rate 22 per cent; the rubber industry improved its records 13 per cent—yet the petroleum industry frequency, as shown in the contest, went up 4 per cent.

Presentation of National Safety Council Awards in the Petroleum Section Safety Contest

The awards were presented in the name of the National Safety Council by R. T. Solensten, Vice-President, Elliott Service Company, New York City, and Vice-Presi-

dent for Membership of the National Safety Council

The awards consisted of handsome Bronze Trophies showing an eagle in flight

and the Universal Safety Emblem, which were given to winners of first place in the contest; and of Certificates of Merit, each a handsome lettered scroll, which were given to winners of second and third places.

In the lists below, winners of first place are indicated by the numeral (1), and winners of second and third places by the numeral (2) and (3) respectively.

Manufacturing Department Group A

1. Standard Oil Company of Louisiana, Baton Rouge, La., 7,371,365 hours, 6 injuries.

2. Standard Oil Company, Indiana, Chicago, Ill., 12,445,593 hours, 23 injuries.

3. Humble Oil & Refining Company, Houston, Texas, 8,941,060 hours, 24 injuries.

Manufacturing Department Group B

1. The Ohio Oil Company, Findlay, Ohio, 1,339,707 hours, 3 injuries.

2. Pan American Petroleum Corp., New York, N. Y., 400,023 hours, 1 injury.

3. Indian Refining Company, Lawrenceville, Ill., 1,194,977 hours, 3 injuries.

Wholesale Marketing Department Group A

1. Continental Oil Company, Ponca City, Okla., 4,680,606 hours, 8 injuries.

2. General Petroleum Corporation of California, Los Angeles, Cal., 2,032,418 hours, 4 injuries.

3. Standard Oil Company, Indiana, Chicago, Ill., 29,647,376 hours, 88 injuries.

Wholesale Marketing Department Group B

1. Texas Pacific Coal and Oil Co., Fort Worth, Texas, 227,365 hours, no injuries.

1. Globe Oil & Refining Co., Wichita, Kan., 156,756 hours, no injuries.

3. Panhandle Refining Company, Wichita Falls, Texas, 757,464 hours, 2 injuries.

Natural Gasoline Department

1. Shell Oil Co., Inc., Mid-Continent Territory, St. Louis, Mo., 335,645 hours, no injuries.

1. General Petroleum Corporation of California, Los Angeles, Cal., 267,335 hours, no injuries.

1. Hope Construction and Refining Company, Pittsburgh, Pa., 226,417 hours, no injuries.

Oil & Gas Pipe Line Department Group A

1. Stanolind Pipe Line Company, Tulsa, Okla., 3,547,300 hours, 13 injuries.

2. Humble Pipe Line Company, Houston, Texas, 4,348,990 hours, 32 injuries.

3. Magnolia Pipe Line Company, Dallas, Texas, 2,731,114 hours, 23 injuries.

Retail Marketing Department

1. Humble Oil & Refining Company, Houston, Texas, 336,718 hours, no injuries.

Oil & Gas Pipe Line Department Group B

1. Kaw Pipe Line Company, Tulsa, Okla., 266,628 hours, no injuries.

1. Tide Water Pipe Line Co., Ltd., Bradford, Pa., 208,577 hours, no injuries.

1. Sinclair Wyoming Oil Co., Tulsa, Okla., 201,678 hours, no injuries.

1. Charleston Oil Company, Charleston, S. C., 108,120 hours, no injuries.

3. Union Oil Company of California, Los Angeles, Cal., 4,313,872 hours, 28 injuries.

Producing Department Group A

1. Continental Oil Company, Ponca City, Okla., 2,730,567 hours, 12 injuries.

2. Stanolind Oil and Gas Company, Tulsa, Okla., 3,777,851 hours, 23 injuries.

3. Gulf Oil Corp., Gulf Production Div., Houston, Texas, 3,736,734 hours, 25 injuries.

Producing Department Group B

1. The Atlantic Refining Company, Dallas, Texas, 1,140,704 hours, 4 injuries.

2. Hope Construction and Refining Co., Pittsburgh, Pa., 493,797 hours, 2 injuries.

3. Texas Pacific Coal and Oil Company, Fort Worth, Texas, 416,593 hours, 2 injuries.

Drilling Department

1. Standard Oil Company of Louisiana, Shreveport, La., 125,919 hours, 1 injury.

2. Cities Service Gas Company, Bartlesville, Okla., 120,692 hours, 2 injuries.

3. Gulf Oil Corporation, Gulf Production Div., Houston, Texas, 1,162,557 hours, 29 injuries.

Power Press Section

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TUESDAY AFTERNOON SESSION

October 8, 1940

The opening session of the Power Press Section was called to order by General Chairman M. R. Zelder, Personnel Manager, Edison General Electric Appliance Company, Inc., Chicago, who presided. In his opening remarks the Chairman took the

opportunity to review briefly some activities of the Section during the year, and mentioned the work of many Standing Committees. Officers of the Section to serve during the coming year were elected, as listed elsewhere in this record. The Chairman then introduced the first speaker.

The Safeguarding of Fast Punch Presses

By W. A. VOLLMER

Safety Engineer, Employers Mutuals, Wausau, Wis.

Before the most practical methods of punch press guarding can be applied, it is necessary to realize why and how accidents happen.

I understand that about 85 per cent of all accidents that occur are due to either human or mechanical failures. If this is true, then the supervisor and mechanical appliances can be relied upon only to a very limited degree. If methods of die construction and of guarding can be adapted that will reduce the need for supervision and the use of mechanical movements to a minimum, the operations will be more foolproof and there will be a minimum of potential hazards.

In order to accomplish this, it should be the duty of those responsible for designing dies to try and think of some method of die construction that will enable the operator to feed the die and have some method of automatic ejection to unload the finished piece without making it necessary to place the hands at the point of operation at any time during the cycle of the operation. This can be done a large percentage of the time.

After this has been done, a basket enclosure guard can be used. This guard,

when properly made and adjusted, is stationary and surrounds the die on two sides and the front and built high enough to enclose all of the potential hazards from the bolster plate up to above the clamping bolts on the ram. No moving parts being exposed, there is little chance of the operator being injured.

In most cases where basket guards are used on dies constructed as just mentioned, the operator is not only protected against being injured but the speed of the operation is increased.

There are different types of practical ejectors that can be used, such as air ejectors, pick-up ejectors, clearance ejectors and ejecting by bringing the finished piece to the top of the stroke and stripping it from the punch by aid of the knock-out bar in the ram or by stripping it with a plate stripper or stripping fingers.

One method of feeding is to use a gravity chute feed. An apron with side guides is extended to the front of the die. The die is then placed on an inclined press. The piece to be worked on is placed on the apron and slides under the basket guard that surrounds

the die and then automatically locates in the nest and is automatically ejected.

Another method is the use of a hand operated progressive type feed where a retainer, used as a guide, can be placed on the front of the die and the pieces placed in it. They can then be fed by hand, advancing each piece towards the die by pushing the piece farthest from the die, one diameter or length of the piece and ejecting the piece in some practical manner. Another method is to place the piece in the retainer guide and push it forward into the locating nest by use of a hand pusher.

Sometimes a stack loaded with pieces is placed on the front of the retainer guide and automatically feeds one at a time in front of the hand pusher and is pushed into operating position.

Some operations can be performed by placing a piece in the locating nest or sometimes in the die itself mounted on a slide and pushing it to the operating position, then withdrawing the slide and unloading the piece, or, the same procedure can be followed on a die or a locating nest mounted on a swinging shoe, swinging it into the operating position and then withdrawing it to the front to remove the piece. When the amount of production will warrant, a dial feed preferably fed automatically from a stack or from drums can be used, entirely enclosing the dial, punch and ram and also the mechanism that operates the dial.

Many operations that are performed on horn dies can be efficiently guarded with a basket enclosure guard.

When a basket guard is properly made so its adjustment will allow the operator to hold small or large flat pieces under the guard, these pieces can be pierced, trimmed, notched or even have shallow embossings or shallow edges formed on them.

Blanking dies, progressive and compound

dies run on inclined presses can be efficiently guarded with basket enclosure guards.

There are many operations that cannot be run with the use of a basket enclosure guard. But there are several mechanical guards that can be used. The guard to be selected for use on different operations of this kind will vary according to the conditions surrounding the particular operations, but the one giving the most protection, by eliminating the greatest number of chances of having human and mechanical failures, should be used.

One of these is the wrist guard that, when properly maintained and adjusted, has its mechanism connected to the ram and pulls the hands away from the point of operation with the downward movement of the ram.

Another is the gate guard that is connected to the foot pedal. This gate is up when the die is being fed. When the foot pedal is stepped on to trip the clutch, the gate descends and, if properly adjusted, the hands must be out from under it so that the foot pedal can be depressed low enough to trip the clutch, thereby having an enclosure around the die and punch when the operation is being performed.

We also have the two hand trips. The purpose of this guard is to keep both hands occupied by having a hand on each one of the hand levers that are located on both sides of the press while the clutch is being tripped.

Then again there are two button trips, intended to operate on the same plan as the two hand trips.

The sweep guard is another type. It has an arm that is pivoted and connected in some way so when the ram descends, the arm sweeps across the front of the die for the purpose of forcing the hand out of the die if necessary.

where it equals our understanding of other fields of engineering and science.

The first responsibility of management toward safety is the selection and placement of employees who will:

- a. Be relatively free from accident-proneness.
- b. Be placed in jobs where they are well adapted, and adequately motivated and interested in their jobs.

Psychology has developed to the extent that it can furnish valuable techniques in determining in advance certain employees who are highly prone to accidents in specific situations. There are at least two groups of accident-prone employees. First, those who are inclined toward accidents under almost all working conditions. This group includes:

1. Employees who are subject to gaps in consciousness. This includes many employees who may have a brief lapse of consciousness or memory lasting only a few seconds. Many employees do not themselves recognize their difficulties of this nature. Yet it is easy to understand how such employees operating presses and other types of equipment could cause a serious accident during the brief interval in which they were unconscious.

In one plant a press operator would periodically show a high waste record due to damaged material. He insisted that he did not know it happened. His only explanation was that "it just happened." A clinical psychologist, observing him, discovered that at such times he stood motionless and stared blankly ahead for an interval of about four seconds. He did not respond to calling his name during this period. At the close of the period he looked about rather bewilderedly and went ahead as usual with his work. He had no idea of what had happened and would not believe that he had stood motionless during the time specified. He was transferred to different work and was given medical attention.

2. Employees whose reaction time is unusually slow. People differ widely in the speed at which they respond to what they see and hear. In many press operations it is necessary to make rapid and accurate responses. Employees who are slow in getting their hands or feet to respond to stimuli coming by way of eyes or ears are likely to have accidents in jobs where this function is important and frequent.

3. Employees who day dream. It is commonly agreed that employees who do not keep their attention focused upon their work are more accident-prone than those who are highly attentive to their work. We find in industry that there are two major causes for day dreaming while on the job:

- a. Employees who have native endowments which are too high for the work they are doing. Such employees tend to develop bad habits. They may perform the necessary motions with their hands while in their minds they roam into fields of fancy or hobbies which challenge their abilities.

One girl who functioned as a filing clerk carelessly brushed an expensive calculating machine off the table, seriously damaging the machine. To those in the office, it appeared that she deliberately did this. It was later discovered that the girl had had her classes in college, ranked in the very superior group in native intelligence, and she admitted that while carrying on her duties as a filing clerk she had developed the plots for several short stories which she wrote and sold to a magazine.

b. Employees who are highly subjective, moody, and temperamental. A certain amount of fluctuation is common to all employees. Exaggerated tendencies toward moodiness is typically described by the employee as "feeling low" or the blues. Such employees tend to have a great deal of their attention occupied by their own feelings. They neglect their jobs when they feel moody because so much of their attention is centered inwardly upon themselves. Obviously, this contributes to accident-proneness. When called to account for their apparent carelessness, they are likely to feel that they are being "picked on" unfairly. Frequently they derive a great deal of satisfaction in feeling sorry for themselves.

Management should be responsible for selection and placing of such employees in jobs where these tendencies will be at a minimum in increasing accidents. Psychological tests, combined with clinical procedures, can largely eliminate this type of hazard in industry by isolating the employees who possess a high or low degree of these two tendencies and govern placements accordingly.

Management should also give attention to the person who is to head up the safety program. Functioning as consultant in vari-

Management's Responsibility for Safety

By DR. PERRY L. ROHRER

Clinical and Consulting Psychologist, Stevenson, Jordan & Harrison, Chicago

Man's ingenuity has developed a society mingled with devices for transportation and communication to which he is poorly adjusted. We must come more nearly to serene and relaxed living in the midst of all of our

present and future developments. This requires an increased emphasis upon the study of human beings, their behavior, motives and attitudes. In brief, we must bring our understanding of human nature to the point

ous industries, it has frequently been necessary to define the personality traits required in a satisfactory safety engineer.

1. He should be able to think comprehensively with regard to the safety program. He should be able to see how safety relates to other aspects of the company. This implies the ability to take second place at times where safety issues are involved and boost other departments to first place when it is for the good of the company.

2. He should have a sound educational point of view with regard to the methods of getting employees to observe safety rules. He should look upon himself in this regard as an educator who is directing the program of teaching the employees safe habits and ideas.

3. He should be a well balanced person, free from major conflicts or radical ideas. He should be by his peers and hearing, command the respect of his equals and superiors. He should be free from bigotry and extreme ideas.

4. He should have a well developed sense of humor. He should be able to maintain a sense of humor when under pressure such as exists when accidents have happened.

5. He should be able to sell his ideas to key men such as foremen and supervisors. He should enlist their spontaneous cooperation in the safety program without causing them to feel that he is a "nut" or "hipped" on safety.

6. He should be able to speak before groups in an effective and convincing manner.

7. He should be able to administer and receive criticism in an objective manner.

8. He should be above average in creative and imaginative ability as relates to seeing potential improvements and hazards and to formulating programs of correction and improvement.

9. He should be highly analytical in his approach to problems. He should be free from tendencies toward acting upon "hunches" and other unreliable methods of procedure.

So long as safety remains in the realm of just talks, posters, and lectures, permanent and consistent results are very likely to be very meager.

Management should set up regular procedures as a function of the industrial relations or personnel department which will insure the systematic and regular carrying out of the above mentioned procedures.

Such a program should include at least the following:

- a. Writing of a job description.
- b. Defining the personality traits required for the job.
- c. A condensed social history of each employee.
- d. A test of personality adjustment.
- e. An intelligence test.

Correcting Unsafe Practices Through Methods Study

By GUY J. BATES

Supervisor of Methods, Inland Manufacturing Division, General Motors Corporation, Dayton, O.

Recent developments in the methods study field have brought into use a new technique of operation analysis that has broadened the scope and value of the methods engineer. Its potential value to the safety engineer is unlimited.

To understand the nature of this new technique better, let us draw an analogy with a common example. Suppose we have before us a part, and a blueprint of the part. We are asked to check the physical dimensions of the part against the print. The first tool we would request in this case would be a

scale and a pair of micrometers. The new technique of operation analysis is a similar device, a measuring stick, by which the effectiveness of an operation in the shop may be judged with reference either to its use of labor, or its safety devices.

When the methods engineer approaches an operation in the shop for the purpose of measuring the effectiveness of the labor utilization, he uses the new technique of operation analysis and observes the muscular movements of the operator.

Through observation of the muscular movements required by the worker to perform the cycle of the operation, he is able to judge the effectiveness of the workplace layout, the tooling, and the training of the operator. The basic principle underlying the movement concept is simply this: the cycle time of an operation is proportional to the number of muscular movements required by the operator's method, plus the machine time. The effectiveness of any set up may be measured by comparing the number of muscular movements required to perform the operation (the input) to the pieces produced (the output).

To illustrate, take the simplest of all operations, that of walking between two points. We know that the distance separating two points is an important factor in determining the time required to cover the distance. Applying the movement concept, we see that the time required for the cycle of this operation is dependent upon the number of muscular movements, steps, required to cover the distance between the two points. The greater the distance the more steps, consequently the more time required to perform the operation. Suppose a barrier is placed in our path; the additional time required will be proportional to the number of movements required to circumnavigate the barrier. Simple, isn't it, and yet it gives the methods engineer a basically sound approach to operation analysis and improvement.

After observing the muscular movements required to perform an operation the methods engineer applies two basic principles to improve the operation. First he eliminates the unnecessary movements, and second he improves the necessary movements. The result is that the cycle of the operation requires fewer muscular movements in its performance, and for a given period of time, the operator's output is greater. Not because the operator works any harder, but because more effective use has been made of the operator's physical input.

The results of the application of this new technique will be obvious as we proceed to discuss the details of the application of the movement concept in relation to the work of the safety engineer.

First let us observe an unfamiliar piece of equipment standing unattended and try to judge the effectiveness of its safety devices. Take a standard square shear. Some

question may be raised as to a guard to keep the operator's fingers out from under the knife when he steps on the foot treadle. But the real safety hazard is not seen until the operator approaches the equipment to operate it. We see the operator's movements with reference to the equipment as he places a sheet of material under the knife and steps two feet up in the air to stand on the foot treadle. Not until we see him jump several times on the foot treadle to drive the knife through the material do we realize that the greatest hazard in this operation is the potential abdominal rupture that may result from the operator slipping off the foot pedal and falling against the bed of the shear.

It is therefore safe to say in safety engineering, as well as methods engineering, that we are unable to judge the effectiveness of an operation until we have observed the muscular movements required of the worker to perform the cycle of the operation.

In the past too much time has been spent attempting to improve the safety of an operation by observing the equipment and disregarding the movements of the worker. Let us, in the future, observe the muscular movement of the worker required to operate the equipment and see if we do not discover far more satisfactory answers to our safety problems. In short, we are primarily interested in protecting the operator, not the equipment.

The safety engineer has two basic principles for improving the safety of an operation. The first is to eliminate the hazardous movements from the cycle of the operation. The second is to protect the necessary hazardous movements with adequate safety devices. The solution may require the services of a tool engineer or other trained specialist, but the fact still remains, that no progress can be made until the need for a safety device is discovered. The procedure of waiting until after an accident has occurred to recognize hazardous operations is both shortsighted and expensive.

The use of the movement concept therefore, is valuable as an aid to the safety engineer in uncovering potential safety hazards.

Let us check the feasibility of the movement concept on some shop operations. First we will watch the picture of the operation, observing closely the movements of the operator; second, as the movement pattern

becomes clear, pick out those movements that are hazardous; and third, eliminate these hazardous movements or provide adequate safety devices.

The job is a crimping operation. The part is loaded into a nest in the die by the right hand, and the press is tripped with both hands, using hand trips on each side of the press. Next the operator reaches under the die with the left hand to get the crimped part and disposes of it to a tote pan on the floor. Our first impression of the job may be that it is perfectly safe, because the hand trips require both hands to be out from under the die when the press closes. Observe, however, that the left hand must go back under the die to get the finished piece at precisely the instant the die would close if the press should repeat. There is a potential hazard that can only be recognized by observing the movements of the operator with reference to the equipment. There is also some danger in loading the part by hand, but it is not as serious as the disposal of the finished piece.

Let us apply our improvement principles to this operation. Can we eliminate the movements required to get the finished piece in the die and dispose of it to the tote pan? Certainly, by using a mechanical ejector. In this case, an air ejector is used to blow the part out of the die into a chute which carries the finished part into a tote pan. Also, observe that the movements to load the die are improved. Instead of the right hand placing the piece directly into the die, the part is placed on a sheet metal chute outside a die guard by the left hand, and then slid into the nest of the die by a stick held in the right hand. In the improved setup a guard completely encloses the die, neither hand is required to go under the die, and a foot trip has been substituted for hand trips.

This was not an expensive change, the whole improvement cost less than fifty dollars. From methods engineer's point of view several movements were eliminated from the cycle of the operation, which resulted in more effective use of the worker's movements. From the safety engineer's point of view a potential hazard was discovered and eliminated from a seemingly "safe operation." The operation is typical of many jobs where safety and better methods go hand in hand.

The next operation is commonly found in

any plant where screw machine parts are used. The operator is burring a brass plug with a hollow sleeve on the end. Across the end of the sleeve a milling cutter has been passed, cutting a slot in opposite sides of the sleeve. A burr is thrown inside the sleeve on one side, and outside on the opposite side by the milling cutter. To remove these burrs a motor has been placed on the bench top with a burring tool on the end of its shaft. One set of cutters goes inside the sleeve of the part, and one set knocks the burr off the outside circumference. The operator holds the hex head of the plug between the thumb and the first finger, and shoves the part into the end of the burring tool.

The hazard is obvious. The worker's fingers are wrapped in adhesive tape to protect them from the cutters when the plug is deflected by the burring tool instead of sliding in place. The tape is badly torn and the picture clearly shows the jabbing movements required to get the plug into the end of the revolving burring tool.

In this case it is again necessary to improve the movements required to load the burring tool. To do this a carrier for the plug is provided. Instead of placing the part directly into the burring tool a plug is picked up in each hand, and placed simultaneously in two carriers. These carriers line up and guide the two plugs into double burring tools. Here again we remove the operator's hand from the danger area and employ a mechanical device. This makes the job easier and safer.

The third illustration is another condition that is common in plants that use stampings. Scrap trimmed from the part is frequently sent along with the part to the next operation. Sometimes this operation is another punch press job, and sometimes it is an assembly operation. In any case the trimming scrap with the parts is a very definite hazard. Where stock savers are used on blanking operations two triangular pieces of scrap with needle-like points are produced for each part. Considering the die lubricant, and the dirt on the stock every scratch sustained by the operator has an exceedingly high potential infection hazard.

Workers seek to protect themselves from this hazard by wearing leather gloves, but for some types of scrap, gloves are little better than nothing; and in any case the forearms are still unprotected. In getting a

piece from a pan of mixed parts and scrap the operator must direct each movement to the pan with the eyes and carefully separate a part from the scrap. These extra movements will average between 30 and 40 per cent of those required by the operation cycle.

Here is a real hazard and its solution lies in the previous operation. The stock saving feature of the blanking die is removed by widening the stock fed into the die. The skeleton scrap now feeds on through the press as a continuous strip, and the part is blown out the back of the press into a separate pan. True, the material cost has been increased slightly, but this is more than offset by the reduction in handling cost on the following operation. The operator no longer has the mixed scrap and stock condition to contend with and those movements, formerly used to separate scrap and stock, are now available for production work. But most important of all, a very real hazard has been eliminated.

This is but one of many types of scrap separators; each job will require a slightly different solution. The important point, however, is that here is a prevalent hazard that is easily and inexpensively corrected, once the real need is recognized. Your job, as safety engineers, is to spot the need for a safety device. The solution will follow as a matter of course and requires a variety of specialized solutions.

The use of this new technique of operation analysis need not be limited to the safety engineer. Its basic principles are so simple that they may be passed on to safety committees and the supervisory staff for their use in detecting unsafe practices in any plant. The methods engineer has been using motion picture "before and after" shots for years to promote a better understanding of his principles. There is no doubt that similar safety education programs based on the movement concept will better equip the plant personnel to deal

with the safety problems. Such programs would have the far reaching effect of making the whole organization "safety conscious" and alert for potential accident hazards.

Another field where the movement concept will have definite value is that of planning departments. All too frequently a die, a fixture, or piece of special equipment is designed to produce a part, with little or no thought given to the movements of the worker required to operate it. These potential hazards are delivered to the production department and put into operation where some kind of make-shift safety device must be provided to correct a poor design. This incurs the additional cost of designing and building the make-shift safety device, and all too frequently some worker is injured before the hazard is recognized.

Using the movement concept, it is possible for the tool engineers, plant layout men, and other planning engineers to foresee potential hazards and adjust their designs to overcome these difficulties before they become a reality. The methods engineer today is using this same technique to design movement economy into new tooling, with the result that fewer designs are being returned to the tool room for reworking, with consequent losses in production and rebuilding cost.

Practice in this technique of operation analysis will soon convince you that, as a tool, the movement concept has four important uses.

1. It is a simple and effective tool that can be used by all members of your organization.
2. It provides a means of detecting unsafe practices in existing operations.
3. Once the unsafe condition has been detected the movement concept is a definite aid in suggesting a solution to the problem.
4. It can be used by the planning divisions to foretell potential safety hazards.

THURSDAY AFTERNOON SESSION

October 10, 1940

Joint Luncheon and Afternoon Session with the Automotive and Machine Shop Section

The full report of this session will be found on page 313 of this volume

Public Utilities Section

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TUESDAY AFTERNOON SESSION

October 8, 1940

The opening session was called to order by General Chairman H. A. Ptolemy, Safety Supervisor, Public Service Company of Northern Illinois, Chicago, who presided. In his opening remarks the Chairman outlined briefly some activities of the Section during

the past year, and mentioned the work of many Standing Committees.

Officers of the Section for the coming year were formally elected, as found elsewhere in this record. The Chairman then introduced the first speaker.

An Executive Looks at Safety

By K. B. NAGLER

Executive Engineer, The Peoples Gas Light and Coke Company, Chicago

I propose in this discussion to answer several questions—"What is safety?" "Why did this movement arise?" "How did it develop? What has been accomplished?" "Where do we go from here?"

I believe that a recent definition of safety by one of its principal leaders is really our concept of the term and the answer to our first question—"What is safety?" This one goes as follows: "Safety is a way of living which avoids accidental injuries. Such a way of living includes physical surroundings that are orderly and protected, as well as careful action."

This definition, given by Mr. W. H. Cameron in a recent editorial in *National Safety News*, stresses a fundamental of safety, namely, that it is a point of view, an attitude of mind, an outlook in life, expressed in a way of living, and that the dictionary items from safety-belt to safety-zone represent the practical working out of the philosophy of safety.

The Safety Movement

The next questions to be answered are: "Why and how did such a point of view become translated into vigorous organized efforts?" A very brief answer to the why is that early in this century the loss of human life and the maiming of human beings by accidents constituted a challenge to industry, both on humanitarian and economic grounds. This led industry, which prided itself on its ever increasing efficiency and progressiveness, to cooperative effort to avoid this human and economic waste. As to how this all came about we must remember that, as in most enterprises, cooperative ef-

fort was preceded by individual effort in nearly all phases of accident prevention, both industrial and public.

To illustrate the individual efforts that preceded the organized campaigns on the present day scale, I will cite three well known safety fields—the Sane Fourth of July, the Theater Safety Code, and automobile accident statement. For this early information I reviewed pertinent pages of Mark Sullivan's "Our Times," which is practically a high-spot newspaper history of the United States, and in six volumes covers our social, political and industrial history for the quarter century from 1900 to 1925.

On July 4, 1903, James Keeley, then editor of the Chicago Tribune, due to the critical illness of his daughter which demanded quiet, had his attention painfully drawn to the bedlam of that day. He instructed his staff to obtain data on the casualties of that Independence Day and the next day, in the Chicago Tribune, printed a list of the killed and injured from fifty large cities. These totals which ran between five and six thousand, amazed everyone and called for corrective measures.

That August, St. Paul, Minnesota, passed an ordinance prohibiting the use of blank cartridges, bombs, and pistols. The Chicago Tribune was joined by the old magazine "Life" in its agitation for restricted use of fireworks. Further efforts on a national scale were those of Edward Bok in the Ladies' Home Journal, where for a number of years, beginning with 1905, he began his annual Fourth of July campaign in the January issue of the magazine. This systematic

work bore fruit in the passage of fireworks ordinances in many cities, and the list of casualties began to drop year after year.

The Iroquois Theater fire in Chicago, on December 30, 1903, in which 575 persons out of an audience of about 2,000 lost their lives, several times the number that died in the Chicago fire of 1871, led to a new theater safety code in practically every American city. This new code required fire walls, more exits, unobstructed aisles, asbestos stage curtain, non-inflammable scenery and exit doors opening outward, and, with the great increase in the number of theaters due to the advent of motion pictures, undoubtedly saved many lives.

A problem now about forty years old and still with us is the control of automobile accidents. It is interesting to recall that the present day gasoline automobile was not the first horseless carriage to develop. At the first real auto show in New York City in 1900, one-third of the space was taken up by electrics and most of the rest by steamers, with a few gasoline-motored cars. The steam cars dropped out for several reasons, one, the greater expert knowledge required to operate it—and this is important for our story—the need for a steam engineer's license in many states. In this connection it may be noted that in 1900 Cleveland Moffett recommended that since all operators of steam carriages in New York required an engineer's license, examinations and license requirements be extended to drivers of all motor carriages. When we consider how relatively recent the licensing of automobile drivers is, the public inertia and indifference seem astounding.

Except for the isolated efforts of particularly progressive companies prior to 1907, safety in industry received but little attention. The earlier conceptions of safety found expression in what many still think—"there ought to be a law." So in the first decade of the century employer's liability and workmen's compensation laws were enacted which served to call attention to the great number of accidents and to their cost. The Federal Government, which may be considered to have pioneered this field with the establishment of the lighthouse service in 1789, gave the entire safety movement a boost during President Taft's administration by instituting safety measures for large groups of federal employees.

The individual safety efforts of certain industrial concerns were joined when in September 1912, the Safety Committee of the Association of Iron and Steel Engineers paralleled their convention in Milwaukee with a five day session of a Cooperative Safety Congress from which arose plans for a permanent organization devoted entirely to safety—the National Council of Industrial Safety. Development meetings in Pittsburgh and Chicago were followed by the Second Annual Cooperative Safety Congress in New York City in September 1913 with an attendance of 200. Its object was "to promote the conservation of human life and its incidence in the industries of the nation" and, to achieve this objective, established a six-point program as follows:

"(1) Establishment of a central headquarters as a safety information clearing house; (2) encouragement of local councils; (3) annual congresses; (4) practical standardization of safety devices, safe conditions and practices; (5) promotion of industrial safety by publicity; (6) to initiate, promote, cooperate with and obtain the assistance of all activities or agencies calculated to conserve human life in the nation's industries; and to participate in and aid other activities for the welfare of the industrial worker of the country." And I submit that this was a far-sighted and comprehensive program to have been formulated twenty-seven years ago.

In 1914 during the Third Annual Safety Congress in Chicago, the name of the organization was changed to National Safety Council because it was recognized that the field was much broader than industrial safety alone.

National Safety Council

In twenty-seven years the National Safety Council has grown from five to 5,000 members consisting of individuals, industrial concerns, and public agencies. It is a non-profit organization receiving and spending about \$4 million dollars a year. Its principal fields are industrial safety, public safety and home safety, covered by a Council program in three directions—Engineering, Education, and Enforcement, which summarize three steps: First, the necessary mechanical safeguards must be provided; second, the individual must be taught to do things the safe way; third, safety regulations as laid down must be enforced. Since 1915, various

council sections have covered specific industrial and public fields from aeronautics and construction to mining, traffic and utilities.

Since the days of 1913, the objectives of the organization have broadened, as expressed in its present official policy, which is "The elimination of accidents to men, women and children; through education it seeks to demonstrate that the safe way is the right way and is 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."

Even a casual survey of the titles of convention papers or of articles in *National Safety News* will indicate that the Safety Movement is more than an accident prevention campaign. Occupational diseases, first aid, artificial respiration, fire prevention, to mention only a few, are an integral part of it. For example, the use of salt tablets to avoid heat exhaustion, the use of gloves and unguents to avoid skin diseases, respirators to keep lungs clean are not accident prevention in the primary sense but are specific health measures. In this connection, a quotation from an article in *National Safety News* of December 1938 is interesting as reflecting a newer point of view: "The definition of 'accident' has been broadened, the entrance of disease germs into the human system without visible trauma, with resulting sickness or death shown to have probably occurred in employment is held an accident. The poisoning of the body through the effects of toxic substances used in employment is held to be the result of an industrial accident."

Like almost any other human struggle with a large problem, the point of attack in accident prevention has shifted from time to time. The earliest concern was principally with providing moving machinery with guards and, when this alone failed to bring the millennium, the carelessness of the worker was stressed and rules were posted to warn him. Successively the foreman and top management have been held responsible for the careless employee. There has finally come about a balancing of all elements—persuasion, education and training have replaced mandatory rules and regimentation, and shop committees of workers take an equal part with management in promoting safe practices.

Accomplishments

In twenty-five years the death rate for accidents from all causes has been reduced from approximately 80 to 70 per 100,000 population, which is estimated to be represented by a saving of 285,000 lives over the period of a quarter century, surely no minor achievement.

In industry where the concentration on safety was the earliest, the accident rate has been nearly halved in twenty-five years—the figure is 44 per cent. One large group, the steel industry, has decreased its accident costs 90 per cent in thirty years. In 1939, of 93,000 lives lost in accidents, about one-third each occurred in auto accidents or homes, as compared with approximately one-sixth occupational deaths. And of these 15,500 occupational deaths, only 1800 actually occurred in manufacturing plants where safety control is most nearly complete, the remainder in mines, on railroads, and in agriculture.

To consider our group, the electric and gas utilities combined, it is encouraging to observe the data of the annual safety contests. In the thirteen contests from 1928 to 1940, the average frequency (number of injuries per million man hours worked) has been approximately halved (from 19.5 to 9.8) with about 8 per cent of the reporting companies (the smaller ones) attaining perfect no-accident records.

We in the public utility field have a double responsibility—we must prevent accidents both to our employees and to our customers, the public. Because we furnish not only a commodity—energy—but also a service, we are involved in the very human problem of getting our customers to use our product and service safely and efficiently. The number of "I didn't know it was loaded" kind of accidents still suffered by our customers indicate that we still have much educational work to do. And the cultivation of this field is important, for the customer rarely points the finger at himself—it is our relations that suffer.

In the gas industry, a group representing 90 per cent of the manufactured and natural gas business reports its data to the American Gas Association. In eleven years, from 1929 to 1939, the accident frequency rate has dropped from 30.5 to 12.7, a decrease of 58 per cent. The number of deaths and

permanent total disabilities per 100 employees has been reduced by 67 per cent.

The Dollar Side

It is proper that some reference be made to the dollar side of safety. The economic loss due to accidents is very real and very great. For 1939, with 93,000 fatal accidents and 8¼ million non-fatal injuries in accidents, the economic loss is estimated to be \$3,300,000 which even in these days of astronomical government appropriations is a staggering amount.

One answer to the cold blooded question "Does safety pay in dollars?" is found in casualty insurance rates in the construction field. In the case of the 160-mile Penn Turnpike running from Pittsburgh to Harrisburg just completed, which involved tunnel as well as highway work, the contractor with a poor safety record paid \$15 per \$100 of payroll insurance as compared with \$6 for the contractor with a good safety record. Such a differential gives the contractor with a good record an initial advantage of \$3,000 on a \$100,000 bid. The construction industry's annual accident bill represents approximately 5 per cent of the total cost of building.

Last year President Fennell, of the National Safety Council, said that in a sense "safety is actually purchasable—any city, state or industry can determine its own accident rate. Accidents rise in ratio to reduction in money or human effort expended for safety."

The Fabric of Work

One of the earlier thoughts of how to promote safety is fortunately on the way out. This was to hire a very earnest young man and superimpose safety on the rest of the operations like a coat of fresh paint which rubbed off readily. The effect of setting safety as a thing apart was unfortunate—it found its counterpart in prohibition, the most vociferous support of which came from the league for making virtue odious—and thus failed of popular support. There is nothing sissy or effeminate about caution and foresight, about goggles and safety belts, about First Aid and good housekeeping. And there is nothing heroic about foolhardiness. The man who jumps out of a window is not defying the law of gravity, he is illustrating it.

To make safety truly effective requires initiative and whole-hearted support from

management to be matched with whole-hearted cooperation from the employees. And this management support cannot just consist of bland endorsement of good intentions like the backwoods minister who, upon being asked to endorse his first check, wrote on the back "I endorse this check most heartily." Nor can it be negative. The story is told of President Coolidge upon return from church being asked by Mrs. Coolidge what the minister's sermon was about: "Sin." "Well, what did he say about it?" "He was against it."

To make a safety program part and parcel of the daily job requires much more than lip service, more than just endorsing the good and condemning the bad. It requires continuous, detailed and progressive effort—for a successful safety record is something like riding a bicycle—shortly after you've stopped pedaling and have lost momentum, you fall off.

Looking Forward

I think that we should bear in mind that individual life is not a matter of averages; we know that no matter how blameless our personal life may have been in the past, we are likely to be judged by the one fall from grace we suffer if it's conspicuous enough. And so it is with accidents—it is only a few per centum—but to those few individuals or their families it is very real and no amount of statisticking wipes out the individual misfortune.

The figures I quoted earlier show that very substantial progress in accident reduction has been made—as is natural, the most obvious kind of accidents have responded most. From now on, like the last long mile, the going may be harder, for it means changing human habits and this requires that in all of our activities we obey the Greek injunction "In the name of the gods, I beg you to think." If we do that, our working habits will reflect it and safety will become an intrinsic part of every job, not just a postscript to it.

Our attitude for the future should be not merely live and let live but live and help keep alive and whole. To achieve these ends requires that we all do our part. As Kipling said—

"It ain't the individual, nor the army as a whole

But the everlasting teamwork of every blooming soul."

"How It Happened"

By ERLE S. MINER

Engineer, American Telephone and Telegraph Company, New York City

We recognize that the world events of the past year, over which we have no control, have made it more imperative for the American people to get at the root of the safety problem. Our national defense depends upon our personal safety. The conservation of men and materials has become a matter of patriotism. It becomes the patriotic duty of each of us to put forth the added effort required to conserve health and eliminate accidents.

With all our wealth and machinery we have no man power to waste. We cannot spare a skilled craftsman from his job, not even for only a few days as the result of a minor injury. Safety on the job, safety in our cars on the streets and highways, and safety at home will speed the work and will build our defenses more securely, thus safeguarding our determination to retain our freedom and our way of life.

The production of this picture was prompted by a desire to find some way of giving emphasis to the many activities that the Bell System companies have been carrying on in their effort to insure safety on the job. Over a long period these activities have produced a gratifying reduction in accidents. However, current records showed that the great majority, particularly of the more serious types of accidents still occurring, were clearly avoidable. Thus, this picture "How It Happened" was prepared as an effective medium for demonstrating this fact.

Lessons from Safety Experience

By JAMES L. SHORES

Alabama Power Company, Birmingham, Ala.

About noon on June 27, 1934, following an electrical storm, one of our troublemen found that service was interrupted on a 4,000 volt tap line. He inspected the fuse on the 7½ KVA transformer and found it good. Checking further he found the tap line fuse had blown. This was replaced but failed again in about ten minutes. The troubleman, who was in sight of the trans-

former, noticed it smoking badly and on fire. He reported the trouble to headquarters and immediately a line crew was dispatched to the scene to replace the failed transformer. Upon arrival, the crew found that the lid had been blown from the transformer and that dense smoke being emitted made working conditions very unsatisfactory. After the foreman ascertained that the line was

In viewing these 10 accidents in rapid succession it is recognized that one may get the idea that telephone work is hazardous. This would be a mistaken impression as the serious cases shown in the picture represent a large portion of all such accidents which occurred last year among some 85,000 Bell System men scattered all over the United States. The action shown in the picture does not in all cases illustrate recommended practices but rather what actually occurred according to the available reports of the accidents. In showing the pictures to the men of the Bell System, an attempt has been made to point out all the unsafe practices and to make clear the recommended practices.

While there are usually several contributing factors leading up to an accident, and the workman's failure to follow known safe procedures is generally assigned as the direct cause; the part played in accident prevention by supervision and by staff engineering employees cannot be too greatly emphasized. These men have not only the responsibility for seeing that workmen are properly instructed and for setting a proper example by their own actions, but they also often share a direct responsibility for individual accidents. Also, there have been instances of delegation of responsibility to a senior workman, or to an individual working alone, when the hazards of the job were sufficient to require the continued presence of the supervisor.

clear he arranged to replace the transformer.

One lineman climbed up the pole as far as the transformer while another went beyond him and up to the primary cross-arm. The transformer was reported to be very hot. It was decided that the transformer lid could be put loosely into place to prevent some of the dense smoke from hindering the workmen above. A wire rope sling was placed on the transformer and the blocks hung preparatory to lowering the transformer. When the transformer was raised to enable the hangers to clear the cross-arm, burning oil was thrown upward and onto both linemen. They were so badly injured that both died shortly afterwards.

A great many theories have been advanced as to the cause of this accident. The most logical explanation is that a fire was smoldering inside the transformer; or that the tank or coils were red hot and when the oil was shaken up it ignited, causing the explosion and fire. The cause was not electrical; in fact, the line was clear and both the primary and secondary bushings and leads were disengaged from the transformer.

Our recommendations for the prevention of similar accidents are:

1. Treat every new problem as dangerous and proceed cautiously while looking for possible hazards.

2. Where failures have occurred and a transformer or other equipment is smoking, boiling, rumbling, or is exceedingly warm, avoid it for several hours. If service requirements justify, a replacement may be installed nearby to supply temporary service.

Another accident deserving our study also resulted in a fatality. It occurred during the process of unloading a railroad car of poles. The load consisted of 125 poles, 35 feet long, and 25 poles, 30 feet long. The poles were held in place on the car by four stakes on either side, and binding wires. The binding wires ran across the load at the top and the vertical center to opposite stakes.

The unloading procedure consisted of placing skid poles on the unloading side and the removal of stakes and binding wires so that the poles would roll from the car down the skids and onto the ground. The two inside stakes on this same side had been slightly cut or dapped. The idea was to finish breaking them later by pulling on a rope

from a position well in the clear. The binding wires attached to the top of the two end stakes were cut simultaneously by workmen standing on each end of the load. As these two wires were cut, all remaining stakes broke and the poles began to roll off both sides of the car. The two workmen attempted to jump clear of the poles but one was caught and instantly killed.

This method of procedure was unsafe, and there is little trouble in pointing out the hazards. At the same time, I believe many of you have seen poles unloaded by methods which involved risks very similar.

We believe that we have eliminated all possibility of such accidents in the future. We conceived the idea of securely binding the load to the car with stranded wire rope cables so that there would be no danger in removing all stakes from the unloading side. As the stakes are removed from one side they are placed in empty stake pockets on the opposite side to insure against just what happened in this case. We were unable to find an automatic tripping device which would release the cables under tension when the proper time came. We were able to devise such a device. We now release the cables by means of this device with the operator standing a safe distance away.

This method was adopted as our standard about a year and a half ago. We have unloaded hundreds of cars at all types of sidings with very satisfactory results. The question may arise in your mind as to the use of a truck equipped with a winch and cable. We have avoided this method for several reasons, the principal one being that many unloading areas are not so situated as to make the truck and winch method practical.

The third accident experience occurred on a 4,000 volt phase line. The plan of work was to de-energize the line by pulling the fused cutouts. The cutouts were of a type which had the fuse mounted on a hinged door of the cutout. On one of the cutouts, the ring which held the fuse holder to the door was broken off, and the cutout left in this condition. On this last operation, the door opened but the fuse remained engaged and made good contact. This hazard was overlooked by the workmen engaged and another lineman was directed to proceed with his work on the line as though it were de-energized. When he took hold of the live

phase wire he was so severely burned that his left arm was later amputated at the shoulder.

We have constantly endeavored to impress everyone with the importance of making sure that proper line clearance has been obtained. In addition to following through

on this, we saw the need of temporary grounding rules so far reaching in effect that no workman would take hold of a piece of equipment until he knew it to be de-energized and grounded. They cover distribution as well as transmission lines. In short, our working practice now is: "If it isn't grounded, it isn't dead."

Water Utility

By OTTO ADAMS

City Light and Water Utilities, Fort Wayne, Ind.

I want to tell you something of our experience in safety work. Because the city light and water utilities of our city won first place in the passenger car division of the National Fleet Safety Contest of the National Safety Council, it seems that possibly Fort Wayne may have something of interest to relate to other cities with similar safety problems.

I would like to state a very obvious thing. Namely, that the first thing to do when you have a job to do is to put someone in charge of it. It has always been true that everyone's business is no one's business. Fort Wayne had never had a real job of safety promotion done in its two municipally-owned utilities. The first thing we did was to appoint a capable individual, Mr. George Walldrop, to set up such a safety program as we needed and to allow him to devote most of his time to the carrying out of that program.

We were not merely interested in saving human life and limb, and in saving dollars and cents; we were also interested in the matter of safety from the angle of public example. Our particular city administration came into office on a platform which contained better traffic safety as one of its planks. It was not just the usual type of political plank intended to be thrown away after it served its purpose, but one which was to be used. Our mayor really believed in it and a surprising plurality of voters really believed that he believed it.

The thought struck us that if our city administration was to start urging people to obey safety regulations, traffic laws, and in general attempt to bring about better safety conditions in the city as a whole, it was no more than just that our two municipi-

pal utilities, employing many persons and operating many motor vehicles should do their best to set the right example. In other words, we decided that if we were going to preach, we were also going to practice what we preached.

I do not wish to give the impression that our safety program was conceived overnight and put into full operation the next day with everyone of our city officials, our department heads and our employees falling over each other in their zeal to cooperate. It wasn't that easy. Safety work in our municipal utilities was for the most part a new idea, and there is nothing that has fewer friends in political set-ups than a brand new idea.

The idea had to be sold. To some it was sold with a look. To some, it had to be sold with a stern look followed up by stern words; and to others it had to be sold with almost everything we had in the way of persuasion. To set up and develop the program required salesmanship all the way around and from top to bottom. We had to convince employees that we were not merely trying to unroll some more red tape in which they could tangle themselves, but were trying to do something which was just as important to them as it was to us. Eventually, we found that employees generally were getting into the spirit of things even better than we had expected and were even getting ahead of us in their enthusiasm.

The important things in a safety program for utilities are many. There should be a well-outlined program. There should be someone definitely in charge of it, with authority and time to keep it in hand. There should be a very accurate listing of all accidents, even the most minor ones, with a

thorough analysis of what caused them, so that steps can be taken to see that they do not occur again. There of course there should be safety meetings at regular intervals and here again some intelligence is required. Like all meetings, they should have a beginning and an end. They should be well conducted and when the business at hand has been accomplished, they should be adjourned. About the easiest way in the world to break up any organization is to hold frequent meetings, which begin nowhere and end nowhere.

In our two municipal utilities, one supervisor and one employee represent each department at every general safety meeting. Monthly departmental meetings are held and regular inspections are made of both equipment and personnel. Numerous meetings are held at which outside persons interested in safety are invited and at which discussions are held in which everyone present is encouraged to participate. Incidentally, a large number of our employees have been trained in first aid work and have received certificates attesting to their proficiency in this work.

I think municipalities have even a greater obligation to stress safety activities within their own departments than any other kind of organization, simply for the reason that the public is constantly watching them. A municipality whose utilities constantly display obedience for traffic laws and the general precepts of safety is in a much better position to demand law observance and carefulness from all its citizens.

We like to believe that the drivers of our utility cars are ambassadors of motoring good will on the streets of Fort Wayne. I need not remind you that any successful safety program has to utilize the competitive instinct, which is part of all of us, through the sponsorship of contests. We all like to pit our efforts against the efforts of someone else. Fort Wayne competes in the National Fleet Safety Contest, but its utilities also arrange competitive events within themselves. We award careful-driver certificates to drivers who merit them and we recognize employees who go through the year without an accident. We also award trophies to the departments having the best annual records in safety.

In the field of automobile safety, our utilities safety organization has done an excellent job in a great many different ways.

In one very definite way, our interest in traffic safety has resulted in the general public having an enemy of bad driving hazards close to city government which has power to institute reforms. Safety-minded public utility employees are in a position to suggest to traffic officials of a police department that a certain intersection is particularly hazardous and should be made safer by such-and-such change. They are also in a position to recommend at times that such and such streets need selective enforcement against speeding or careless parking of cars. They are quick to spot intersections where vision is obscured by bushes and shrubbery and to report conditions in the street which might cause accidents to the public if not repaired.

Of course, you and I know that it is a job which only succeeds by everyone keeping everlastingly at it. There can't be a let-up now and then or any feeling after a particularly successful year that everyone can now sit back and relax.

One of the very important phases of safety work in municipal utilities such as ours is the possibility of saving money through a reduction of lost man-hours of labor during the year and a reduction of insurance rates. A safety program not only saves money in itself but it promotes the habit of each municipal employee thinking in terms of saving money. In Fort Wayne, we have attracted considerable national attention for economy in local government. I like to believe that part of the motivation for such economy has been encouraged by our safety efforts.

There is another reason why municipalities might do well to foster public safety with all the energy of which they are capable. Safety is the one subject under the sun about which there may be no arguments. It is fool-proof and argument-proof. Persons of all races, all creeds and all ages, irrespective of political affiliations can agree on the need for public safety. It is the common denominator of all divisions of opinion that now and then arise with respect to a municipality's policies, because there is no one who is not in favor of saving life and limb as well as dollars through the reduction of accidents.

Personally, there is another reason why I think the ordinary human being should take a great interest in public safety. We are living in a world full of great problems.

Many of us feel a helplessness in facing them. We feel that individually we can't do a darn thing about them. But the problem of safety, which also is a great problem, is not one of those problems towards which we feel a sense of futility. No matter how unimportant each of us may be, each of us

can do something about furthering the cause of safety in the world. We can save not only our own lives through carefulness, but the lives of many persons. It is one of the few close-at-hand ways that the most humble of us can make the most generous of contributions to the betterment of humanity.

Coal Bunker Case

By H. H. BERMAN

Safety Engineer, Consolidated Gas, Electric Light & Power Co. of Baltimore, Baltimore, Md.

This was a case of employee death in a coal bunker by suffocation. The bunker space was in a boiler room containing six water tube boilers of 700 h.p. firing crushed bituminous coal. The bunker room was reached by means of vertical steel ladders. Fuel was fed from the pockets through chutes to the boilers, flow being controlled by gates in the chutes. In the bunker room there was a steel walkway which ran the full length on the north side of the bunker room. The conveyor belt and tripper were just south of and parallel to the walkway. The bunker room was illuminated by eight lights of 100 watts, spaced regularly above the fuel conveyor belt.

Shortly after 1:00 a. m. the employee, an ashman, left the boiler room and went to the generator house to assist in removing some ash cars from the cellar. According to other employees he seemed in good health, made no complaints and finished his work in the cellar in about ten minutes. He then returned to the boiler room. The fireman saw him enter. The ashman commented on the fact that the flow of coal had slowed up in the east chute from the pocket at No. 9 boiler and stated he would go up to the bunker and see what was wrong. The fireman continued at his duties on the operating floor. About one hour later he realized he had not seen the ashman return from his trip to the bunkers.

He then noticed that the flow of coal from the east chute at No. 9 boiler had stopped completely. Upon investigation he detected the presence of a rubber boot in the chute at the gate opening. He went up into the bunker room and looked around. He saw nothing unusual in the pocket. There seemed

sufficient coal. There was no evidence of the ashman. The fireman reported to the engineer who made an inspection and decided there was a man wedged in the pocket above the gate. A plant alarm was sounded and valiant but fruitless efforts were made to extricate the unfortunate ashman. Finally it was necessary to remove a large quantity of coal from the bunker before the ashman's body was uncovered and removed. He was dead.

The investigation disclosed that the employee had been examined only a short time before the occurrence and had been found in good physical condition without any ailment. The long rod generally used to poke the coal was not in the pocket so it was concluded the employee was not attempting to use it at the time of the accident. The official opinion reached was that the ashman had left the walkway which ran above the bunker space and attempted to view the position of the coal feeding the boiler to determine the cause of the stoppage in the flow of coal. In climbing over the conveyor belt or in walking on a ledge between pockets, he had slipped and fallen into the bunker disturbing the coal, thereby causing a slide which covered him.

Recommendations for the prevention of a recurrence were directed at (1) Revision of practices. (2) Improving physical equipment.

Fuel bunker practices in this plant were studied and radical changes were formulated. The whole subject of fuel handling was carefully investigated and a set of written regulations drafted and put into effect. Under "Boiler Fuel Bunker Practices" the following was prescribed:

"Employees are prohibited from entering a bunker containing boiler fuel until the shift stationary engineer is notified. The shift stationary engineer will accompany the employee to the bunker, inspect the condition of the fuel, and decide on the need for action.

"If it is necessary to send an employee into a boiler fuel bunker he must put on a safety harness with safety rope attached. While the employee is in the boiler fuel bunker a second employee must be on watch at a safe point on the walkway. The second employee shall hold the safety rope after securely fastening the loose end. Remember in this connection that the safety rope must be kept taut.

"In all instances where the shift stationary engineer sends an employee into a boiler fuel bunker the shift supervisor must be notified."

The physical equipment of this plant was made the subject of a safety survey. Recommendations were submitted to the superintendent. The following changes represent

the major alterations made in the bunker room:

1. The lighting was changed. The eight 100-watt lights were abandoned. Eighteen modern fixtures were installed under the direction of a lighting service department engineer. Each fixture was fitted with a 150-watt bulb, thereby substituting 2,700 watts illumination for the previous 800 watts. Whereas it was necessary to climb to replace burnt out bulbs formerly, the new fixtures can be safely reached from a walkway.
2. The existing walkway was equipped with a second handrail on the south side of the walkway, that is the side next to the conveyor belt.
3. A complete, second steel walkway with both sides handrailed was installed to the south of the conveyor belt.
4. Safe means of crossing from one north walkway to the south walkway were installed at both east and west ends of the bunker room.
5. Safety harness and safety rope lines were stored in the bunker room.

Lessons from Safety Experience

By W. A. CORBITT

Safety Supervisor, New Jersey Bell Telephone Company, Newark, N. J.

A lineman-installer climbed a 40 foot Class AA untreated chestnut pole to remove and rearrange drop wires. The pole carried three telephone wires running to the east. Two of these three wires continued to the west to adjacent poles while one terminated at the pole in question. Two drop wires pulled from this pole to subscriber premises to the north and south sides of the streets. All wires were attached to a 10-pin cross arm, 25 feet from the ground.

In addition to the telephone equipment, the pole carried a street light circuit on a 2-pin arm at the top of the pole and a head guy from an adjacent pole, attached eight feet from the ground.

The employee did not make any tests of the pole before he climbed it and as he released the last of the three wires spanning from the east, the pole fell with him to the ground. He was seriously injured.

An inspection after the accident showed

the pole to be completely rotted at the ground line.

Had the injured employee tested this pole, according to standard safety practices, before he climbed it, he would have discovered its condition and arranged to have the pole made safe before doing any work on it.

What We Did About It

While the lessons learned as a result of this accident were important, it was not the first time such an accident had occurred; likewise, it was not the first time we realized that pole falling accidents should be prevented.

All will agree that one of the most serious types of accidents in pole using companies is that involving poles which break and fall while men are working on them. With a man strapped to such a pole by his body belt and safety strap, there is little

he can do to protect himself and he is usually seriously if not fatally injured. I know of some instances where men "rode the pole to the ground" and were uninjured, or only slightly so, but such cases are in the minority.

Following the investigation of this accident and after reviewing the reports and investigations of previous similar accidents, we arrived at the conclusion that it was not sufficient that our people be familiar with the practice of testing poles at the ground line, because a reasonably sound pole might be subjected to so great an unbalance overhead, as to break off. Such failures could be caused by strains resulting either from the weight or movements of the man on the pole or from attachments which he was placing or removing.

Realizing the difficulty in attempting to present our problem in words alone, we concluded to develop model equipment and reproduce pole line conditions as well as accidents involving falling poles, in miniature, for classroom instructions.

After perfecting the Pole Safety Demonstration Unit, in the fall of 1936, we gave demonstration courses of four hours each to all of the 2,000 men in our outside forces. In addition, we included our engineers, all levels of supervision, and any other of our people who might have occasion to climb poles.

These courses were planned on a district basis in company offices and on company time.

The average class was made up of 15 men consisting of a complete line gang, a few installers, repairmen, splicers and plant engineering forces.

This was done, first, to eliminate the necessity of taking too many men from a force at one time and jeopardizing the job; and second, to have each of the groups obtain and understand the viewpoints of other crafts. It also stimulated more discussion among those present.

We feel that the pole safety demonstrations in our company were effective in directing the attention of our employees to the many observations affecting their own safety, which they could make before climbing a pole.

Up to July, 1936, we averaged about three falling pole accidents each year. Since this

type of accident has been reviewed with our people by means of the model equipment, we have not had a pole fall on which a man was working in over four years.

The equipment used in our original laboratory model has been varied by other Bell System Companies who later built boards, to develop other features which tended to broaden the use of the model equipment. One company adapted it to show how electric shock accidents occur; another added the ladder accident feature. The model is portable and permits the instructor to carry it to locations in the field where instructions to workmen are to be given. It is so constructed as to permit the duplication of almost any of the plant conditions which might arise in discussion. It may also be used to demonstrate the theory of geying, as well as other pole line problems. In addition, it contains the necessary apparatus for the reproduction of electric shock accidents.

Electric Shock Accident

Open wire was being replaced with cable. In one span, two, 3-wire, 220 volt service drops crossed under the telephone lead. At the direction of the chief foreman of construction who inspected the job before the work was started, the telephone suspension strand was placed near the top of the 30 foot pole nearest the crossing in order to provide the greatest possible clearance. In addition, the strand was pulled somewhat tighter than usual.

These precautions provided sufficient clearance to permit the lineman ringing the strand, to ride over one of the three wire service drops. As he approached the other electric service drop, however, it was found that clearance between the strand and these secondary wires was not sufficient for him to ride over it. The head lineman in charge of the work, obtained a 28 foot extension ladder, placed it under the strand 10½ feet from the crossing and used it to raise the strand two feet, 10 inches above the drop. The lineman then started to ride over the service drop, placing the rings as he went. He had succeeded in passing his left foot over the three wires, which were on a level, and had lifted his right foot over the first two. In some manner, his right foot came in contact with the third wire. The head lineman cut the wire with a tree trimmer and the lineman in the cable car, fell to

the ground. Artificial respiration was started immediately but the employee failed to respond.

Lineman was wearing a heavy leather glove on his right hand, but his left hand,

with which he was grasping the suspension strand when his foot came in contact with the service drop, was bare. Weatherproofing on the service drop was badly deteriorated.

TUESDAY AFTERNOON SESSION

October 8, 1940

Presentation of National Safety Council Awards in the Public Utilities Section Safety Contest

Outstanding facts in the contest were presented by Mr. J. M. Orts, Director of Safety, Public Service Corporation, Newark, N. J., and Chairman of the Contest Committee, Public Utilities Section, National Safety Council.

The enrollment of 176 companies in the 1939-1940 competition exceeded participation in any previous competition. The Thirtieth Contest covered 172,408 employees who worked 333,394,148 man-hours during the year.

The average frequency rate for all contestants was 9.79. Combination gas and electric companies had the lowest rates, averaging 8.00; straight gas companies had the highest rates, averaging 12.34.

Frequency rates increased in comparison with the previous competition, averaging 7 per cent higher. While the increase among gas and electric companies was only 1 per cent, the average rate for straight gas companies was up 12 per cent.

Middle sized organizations—Group B in each division—had the worst records, on the whole, in the Contest.

Small organizations in each division, generally had the best results in comparison with the previous competition.

Thirteen companies went through the contest without a single reportable injury.

The presentation of awards was made in the name of the National Safety Council by Mr. Roy M. Godwin, Director of Safety, Philadelphia Electric Company, Philadelphia, Pa.

The awards in the contest consisted of Trophies, which were handsome Bronze

Plaques illustrating an eagle in flight and the Universal Safety Emblem, which were given to winners of first place in the various contest groups; and Certificates of Merit, consisting of handsome lettered scrolls, which were given to winners of second and third places. In the lists below, winners of first place are indicated by the numeral (1), and of second and third places by the numeral (2) and (3) respectively.

Combination Gas and Electric Division Group A

1. Virginia Electric and Power Co., Richmond, Va., 3,945,582 hours, 6 injuries.
2. Wisconsin Public Service Corp., Milwaukee, Wis., 3,050,206 hours, 8 injuries.
3. Wisconsin Power and Light Co., Madison, Wis., 3,364,725 hours, 10 injuries.

Group B

1. Pennsylvania Edison Co., Altoona, Pa., 1,586,916 hours, 2 injuries.
2. Southwestern Gas & Electric Co., Texarkana, Ark.-Tex., 1,286,952 hours, 3 injuries.
3. Central Illinois Light Co., Peoria, Ill., 2,288,190 hours, 7 injuries.

Group C

1. Fitchburg Gas & Electric Light Co., Fitchburg, Mass., 358,454 hours, no injuries.
1. Leominster Electric Light & Power Co., Leominster, Mass., 153,328 hours, no injuries.
1. Moncton Electricity & Gas Co., Ltd., Moncton, N. B., Canada, 116,312 hours, no injuries.
1. Athol Gas and Electric Co., Athol, Mass., 95,891 hours, no injuries.

1. Wachusett Electric Co., Clinton, Mass., 91,150 hours, no injuries.
Electric Division Group A

1. The Ohio Public Service Co., Cleveland, Ohio, 2,691,185 hours, 8 injuries.

2. The Toledo Edison Co., Toledo, Ohio, 3,455,054 hours, 11 injuries.

3. Duquesne Light Co., Pittsburgh, Pa., 7,046,693 hours, 27 injuries.

Group B

1. Nebraska Power Company, Omaha, Nebr., 1,806,372 hours, 4 injuries.

2. Kansas Gas and Electric Co., Wichita, Kan., 2,147,424 hours, 5 injuries.

3. Public Service Company of Oklahoma, Tulsa, Okla., 1,380,953 hours, 4 injuries.

Group C

1. Gulf Power Company, Pensacola, Fla., 487,527 hours, no injuries.

1. Edison Light & Power Co., York, Pa., 460,913 hours, no injuries.

1. Quincy Electric Light and Power Co., Quincy, Mass., 241,046 hours, no injuries.

1. Newport Electric Corp., Newport, R. I., 215,034 hours, no injuries.

1. Canada Electric Co., Ltd., Amherst, N. S., 105,965 hours, no injuries.

1. Granite State Electric Co., Lebanon, N. H., 141,446 hours, no injuries.

1. Kaministiquia Power Co., Ft. William, Ont., Canada, 136,133 hours, no injuries.

1. Department of Utilities, Fremont, Nebr., 126,873 hours, no injuries.

Gas Division

Group A

1. Columbia Gas & Electric Corp., Columbus Group, 6,256,760 hours, 11 injuries.

2. Hope Natural Gas Co., Pittsburgh, Pa., 4,277,586 hours, 15 injuries.

3. The Peoples Natural Gas Co., Pittsburgh, Pa., 3,357,291 hours, 15 injuries.

Group B

1. The Dallas Gas Co., Dallas, Texas, 1,180,432 hours, 3 injuries.

2. Manila Gas Corporation, Manila, P. I., 1,564,722 hours, 4 injuries.

3. The St. Louis County Gas Co., St. Louis, Mo., 878,489 hours, 4 injuries.

Group C

1. Fall River Gas Works Co., Fall River, Mass., 501,930 hours, 3 injuries.

2. Lynchburg Gas Company, Lynchburg, Va., 148,528 hours, 1 injury.

3. Columbia Gas & Electric Corp., Binghamton Group, 586,053 hours, 4 injuries.

Honorable Mention Certificates

The following companies had the best no-injury records among those submitting reports in accordance with Contest Rule 19 which provides "Honorable Mention Certificates will be awarded in each group to the winner, not a Trophy Winner having the greatest continuous man-hours of exposure without a reportable injury during the period of the contest."

Combination Gas & Electric

Group A

1. Philadelphia Electric Co., 1,021,700 continuous injury-free man-hours.

Group B

1. Central Illinois Light Co., 963,318 continuous injury-free man-hours.

Group C

1. Missouri Public Service Corp., 493,717 continuous injury-free man-hours.

Electric

Group A

1. Duquesne Light Co., 2,334,558 continuous injury-free man-hours.

Group B

1. Kansas Gas & Electric Co., 611,256 continuous injury-free man-hours.

Group C

1. Kansas Power Co., 365,615 continuous injury-free man-hours.

Gas

Group A

1. Hope Natural Gas Co., 1,292,022 continuous injury-free man-hours.

Group B

1. St. Louis County Gas Co., 437,028 continuous injury-free man-hours.

Group C

1. Columbia Gas & Electric Corp., Binghamton Group, 260,217 continuous injury-free man-hours.

Pole Top Resuscitation Developments

By W. R. SMITH

Safety Engineer, Electric Department, Public Service Electric & Gas Company, Newark, New Jersey; and Chairman, Accident Prevention Committee, Edison Electric Institute, Public Utilities Section National Safety Council

In the March, 1939, issue of the *Edison Electric Institute Bulletin* a paper which was presented by Mr. E. W. Oesterreich, of the Duquesne Light Company, entitled "The Pole Top Method of Resuscitating Linemen After Electric Shock," the following paragraph appeared:

"The Accident Prevention Committee Edison Electric Institute regards with much interest this method for giving artificial respiration to a linemen while on a pole and congratulates the Duquesne Light Company and Mr. Oesterreich for this contribution in the field of resuscitation and on that which has been accomplished so far through the use of this technique. The shortening of the time to the starting of resuscitation is the vitally important consideration. The results of a more extended experience with the method will be studied with interest."

Essentially the same paper was presented at the Public Utilities Section and will be found recorded in the Transactions of the 29th National Safety Congress.

In making this report today I consider that I am making a progress report, as the special representative of the light and power group on your Executive Committee. I wish to present this in three aspects:

(1) Record to Date

Our experience to date will need to be reported from a qualitative standpoint in large degree as complete quantitative data is not in hand. During the past year there has been evidence of an ever increasing interest in the pole top technique, there having been many inquiries for information on the method and for copies of instructions that could be used in training men. Among the companies represented on the Accident Prevention Committee E.E.I. a large majority report that training in the method is being given to linemen.

Mr. Oesterreich in his report referred to 16 cases in which the Pole Top Method had been used, with success in 14 of these.

Reporting on the matter of cases I find that our E.E.I. data pertaining to Edison

Medal awards shows three successful cases since Mr. Oesterreich made his report and I personally know of two others that are on their way and another case on which application for medal has not yet been made. Here we have therefore 22 cases with 20 of them successful.

From statements made to me by members of the Accident Prevention Committee and others to whom I addressed inquiry, I have information to the effect that of 34 instances in which this method has been used 25 were successful. In my own opinion these figures are below the actual ones if we had all the information.

It is important to report that no instances have come to my attention of any cases in which the men giving such aid have been reported to have experienced shocks themselves and at no time has there appeared in the reports of cases any statements on the part of doctors or others that would even suggest that the victim had been bruised in any respect by the resuscitation procedure.

(2) Fundamental Considerations

It is unfortunate that, from the early announcements concerning the pole top technique there should have been formed in the mind of anyone the impression that here was some new resuscitation method that was being proposed and which might do harm to our recognized standard Schafer method. It is my impression, however, that it is now understood that the principles of the Schafer method are being made available by this technique to the unfortunate victim of shock when he is in a position where he can not quickly be placed in a prone position. And the victim does not necessarily have to be on a pole; he may be in a boiler in between tubes and in such a position where many minutes would inevitably elapse before he could be taken to a place where he could be laid down in the conventional position.

There is already on record a gas poisoning case in which one of two victims, on

losing consciousness, slumped down between the edge of a bath tub and the wall in such a way that he could not be readily and quickly extricated. This individual's life was saved by an ambulance driver, to whom information on this method had been imparted by an employee of one of our light and power companies. But the most interesting aspect of this case is that the employee had never been trained himself, being in the underground department, but had observed the training being given to linemen.

Now as to the real justification for action so prompt as is made possible by this technique on a pole. In his discussion of Mr. Oesterreich's paper last year, Dr. Cecil K. Drinker, Dean and Professor of Physiology, Harvard School of Public Health, Boston, reemphasized the fundamental relationship of time to the victim's chances of being resuscitated. Up to three minutes there is little loss of ability to resume respiration and the chances are therefore good that efforts of resuscitation will be successful. After 13 minutes this latent ability of the individual to respond is in general gone and our hopes are gone too. But we work on until the evidence of this is beyond all doubt and convincing.

Let us see what an examination of the E.E.I. record shows as to the periods of time within which resuscitation was started in these cases where the Prone Pressure method was employed with success, such success having been duly attested to, together with all pertinent data.

I personally examined and tabulated the data from the 21 cases acted on by the Committee of Judges of the E.E.I. Prize Awards Committee from January 1st, 1938, to the present, and the average of the elapsed time to the starting of resuscitation was 1½ minutes. In no case did the time to starting of resuscitation exceed three minutes. In all but five cases the time was two minutes or less. The length of time over which resuscitation had to be continued before revival was effected seemed to bear no particular relationship to the time before resuscitation.

Now what does this mean? Emphatically that the majority of the successful cases will be found to have been started within the three minute period emphasized by Dr. Drinker.

In weighing the relative merits of the pole top technique and a well studied and perfected procedure for lowering the victim in the shortest possible time and performing resuscitation on the ground, it seems not amiss to direct thought to the consideration that when the actual experience confronts us many factors can influence the realization of such short periods of time for lowering, and on which we are counting strongly for success. And it seems to me that all of our experiences and certainly our understanding of the physiological aspects would suggest that even with such perfected lowering procedure I would wish to give the victim every chance and therefore give him aid as quickly as possible and then carry on from there. And to this point of view Dr. Drinker gave support in his comments above referred to, and which I have found also to be held by Dr. H. B. Williams of Columbia and Dr. W. B. Kouwenhoven of Johns Hopkins, men also prominent in the field of scientific investigation with which we are concerned.

Returning now to the questions of danger to the rescuer and to the rescued it has not appeared to those in the light and power field who have studied this entire matter thoughtfully and who have in turn been guided by the opinions of physiologists and medical men that there is any greater cause for anxiety in this regard than in connection with many another aspect of our work. There is, it would appear, no greater risk to be run by the rescuer with safety to himself when he goes up to give pole top resuscitation than when he goes to make the usual rescue which involves freeing the victim from the circuit if necessary and making all arrangements for lowering him. And there is an aspect of this that it seems to me has not heretofore been stressed sufficiently.

Shortly after we received our first instruction in this method from the linemen of the Philadelphia Electric Co. who had previously been instructed by the men of the Duquesne Light Company, we prepared an outline of procedure for our field forces. In order to completely relieve the rescuing group from the urge for haste which would necessarily exist if the victim's chances depended on how soon he reached the ground, we established a minimum of 50 respirations to be given to the victim before he was to be lowered. At 12 respirations per min-

ute this gives a period of slightly over four minutes. If everything is then in readiness and the state of the victim does not justify continuing with the Pole Top Method he is lowered. In general the time will more probably be five minutes or more, depending upon pole conditions. The advantage of this procedure in easing the strain on the men and lessening the likelihood of accident will be apparent, but recently it was shown to have another very fundamental value.

Dr. Yandell Henderson of Yale, one of the leading authorities in this field of investigation, has called attention in his writings and especially in his "Adventures in Respiration" to the state defined as apnea which exists when there has been a sufficient period of over-breathing which has increased the concentration of oxygen in the blood and so diminished the concentration of carbon dioxide that the respiratory organs in the brain were not stimulated to activity. Under this state, normal breathing ceases for a brief time, presently to be resumed when the carbon dioxide concentration builds up and again produces the stimulus. When "conscious" subjects submit to artificial respiration which is efficiently performed this period of apnea is shown in the records made of the movement of air in and out of the lungs.

In this connection I am privileged to refer to a paper which will be presented on Friday, October 11th at the Middle Eastern District Meeting of the American Institute of Electrical Engineers by Drs. W. B. Kouwenhoven, D. R. Hooker and O. R. Langworthy, all of The Johns Hopkins University, entitled "A Comparison of the Relative Efficiency of the Schafer and Pole-Top Methods of Artificial Respiration." I shall not attempt to go into the detail of the investigation but am privileged, as a member of the Institute, of its Committee on Safety which sponsored this paper and because of the great fundamental interest that we have in this investigation to say the following.

- (1) Both the Pole Top and Schafer methods when correctly performed are shown to be efficient and the actual volume of air used by their use in a given time is comparable to the amount that the subject would breathe under normal conditions.
- (2) The time to move a given volume of air (10 liters 1L -1000 cu. cm.) was

shown to be slightly less for the Pole Top Method which indicates the effectiveness of the Pole Top Method.

Dr. Kouwenhoven presents a record of a Schafer Prone Pressure test, which in response to my inquiry he has stated is identical in important aspects with that made on the Pole Top investigations. This record shows clearly the 15 to 20 seconds period of apnea and cessation in normal breathing following about four and one-half minutes of efficiently given artificial respiration.

It is, therefore, obvious that after such a period with all in readiness, the 15 to 20 seconds time for lowering the victim is not likely to lessen the chance of recovery. Whether or not it is desirable to lower just at that time is a matter of good judgment on the part of all concerned and it is believed that well trained men can be depended upon to do what is best. If the working conditions are bad lowering as soon as possible is no doubt indicated. If conditions are favorable and at the expiration of the five minute period the victim is beginning to show signs of recovery, the pole top resuscitation might be carried on uninterruptedly for a longer period.

At all times it must be remembered that the rescuer is working in a very abnormal manner and that fatigue will come more quickly. Relief is not easily given him except by lowering the victim. I have referred to well trained men and to resuscitation efficiently given. As we consider this matter of risk to the rescuer we should recognize that the pole top technique is not a procedure to be undertaken by other than trained personnel. The Accident Prevention Committee has laid emphasis on the importance of this from the beginning.

There is no greater service that can be rendered to this whole situation by all of you men of the Public Utilities Section than by carrying forth the message that the adoption and use of this method by field forces should only be after adequate training has been received by at least one gang at the hands of those qualified to teach the method. Such a trained gang can then pass the instruction on to all the others. If I were privileged to leave only one thought with you it would be this, "adopt the pole top technique or not as your own system conditions and other procedure dictates, but if you do adopt it, carefully train and peri-

edically drill your men in its principles and execution."

Pole Top resuscitation can be seriously harmful and those men who might live because of its performance irrevocably affected by untoward experiences unless the men who attempt its application are carefully trained before they undertake it.

The Schafer Prone Pressure method stands today in a position where it is not affected by any of these considerations. Pole Top is making its way. Let there be no stumbling blocks cast in its path by any uninformed and untrained groups or individuals when there is information and instruction to be had for the asking at the hands of those who have the knowledge and the experience.

As concerns any likelihood of injury to the victim by the technique, it is my opinion that this is no greater if as great as the danger from the Prone Pressure method, all conditions being equal. Dr. Drinker mentioned this aspect of the matter in his comments last year, especially when a powerful man worked on a relatively thin one over a long period of time, but gave it as his opinion that such was unlikely, especially within the length of time that such resuscitation would be given and which would probably not exceed 10 minutes.

During recent years we have noted the emphasis that has been placed on the avoidance of too great pressure in the Prone Pressure method. Men are cautioned not to drop on the victim with any violence, and not to return to the "rest" position by a sudden thrust against the victim. Here again, training is of the very essence of the whole matter and the experience among linemen who regularly practice the method has shown nothing that would constitute an argument against its use. It is my understanding that this point of view is consistent with the results of Dr. Kouwenhoven's recent investigation and in the report on which there is no mention of this at all, in spite of his having worked with a number of subjects of varying physical characteristics.

(3) Case Review Procedure

It will be remembered that at the October 19th meeting of this section, Dr. Drinker suggested in the closing remarks of his discussion that it would be very helpful if the

Edison Electric Institute would undertake to receive reports on cases of electric shock, in order that the information that would thus accumulate over a period of time could be analyzed and conclusions reached that would be helpful to all concerned. The E.E.I. Accident Prevention Committee had taken action to bring this about at its meeting in New York during the previous week, and Dr. Drinker's suggestion and proposal of form were welcomed.

I made a preliminary report to your Executive Committee at its meeting in Roanoke last spring and am now pleased to report the appointment of a Resuscitation Review Board of the Accident Prevention Committee E.E.I., which will receive and review all reports on important electric shock cases which come to its attention as the result of procedure already set up and now beginning to function.

The personnel of this board is one of which we can all feel proud and I am glad of this opportunity to express our appreciation to each and every one of these men from the fields of medicine, physiology and our own industrial ranks who have offered their services.

(Personnel of this Board is given below.)

The fullest cooperation on the part of all concerned is solicited and the Outline of Purposes and Procedure of the Board and forms for reporting may be obtained from E.E.I. headquarters.

Any efforts that can be put forth by the members of this section in bringing this matter to the attention of the proper representatives of light and power companies, electric associations and others who can contribute through rendering reports will be greatly appreciated and will further the work of investigation that the E.E.I. Accident Prevention Committee has initiated.

Personnel of Resuscitation Review Board

Chairman—Dr. H. B. Williams, Dalton Professor of Physiology, Columbia University.

Dr. Cecil K. Drinker, Dean and Professor of Physiology, Harvard University.

Dr. W. B. Kouwenhoven, Dean of School of Engineering, The Johns Hopkins University.

Dr. C. H. Watson, Medical Director of American Telephone and Telegraph Company, New York.

Dr. Hart E. Fisher, Chairman of Health Committee, Public Utility Section, National Safety Council.

Dr. Yandell Henderson, Laboratory of Applied Physiology, Yale University.

Dr. R. R. Sayers, Director, United States Bureau of Mines, Washington, D. C.

Dr. Paul A. Neal, Acting Chief, Division of Industrial Hygiene, National Institute of Health, Washington, D. C.

Mr. E. W. Oesterreich, General Superintendent of Distribution, Duquesne Light Company.

Mr. Wills MacLachlan, Consulting Engineer, Toronto, Canada.

Mr. Ralph A. Bloomsburg, Niagara Hudson Power Corporation, Albany.

Mr. H. F. Webb, Chairman of Subcommittee on Artificial Respiration, Pennsylvania Electric Association.

Ex Officio—Mr. A. B. Campbell, Secretary, Accident Prevention Committee.

Ex Officio—Mr. W. R. Smith, Chairman, Accident Prevention Committee.

Mr. Pro and Mr. Con Discuss Safety

Safety Engineer—L. P. HOFFMAN, and **Foreman**—J. J. BROWN, Florida Power and Light Company, Miami, Florida

In preparing this dialogue it naturally follows that the operating procedures and engineering standards are those in use by our company. Certain reference to types of orders in the dialogue are mentioned in abbreviated form. For instance, an Engineering Order is an "EO," while a Work Authorization is a "WA" and an "ER" is an Expenditure Requisition.

A "DA" is a Delivery Authorization, used to secure material from an outside vendor on a Purchase Order previously issued.

An "ER" covers expenditures in excess of \$1,000, while a "WA" is for expenditures up to that amount.

Engineer: "Good morning, Jim, how's the job going?"

Foreman: "Not so hot."

Eng.: "What's the trouble?"

Foreman: "Everything seems to be going wrong. I have tried to lay this job out to finish up Tuesday night and I'll sure play hell doing it at this rate."

Eng.: "What allowance do you have on your 'ER'?"

Foreman: "That's just the trouble. Those damn engineers have an estimate on this job that no one can work to. You get a layout for a job like this, you have all the wire, hardware and other supplies you need, but labor and truck time is sure cut thin. Now, to add to the troubles of this job, you came along."

Eng.: "Wait a minute. Where do you get the idea I am going to add to your trouble? I came out here to help you if I can."

Foreman: "Yes, I know, you fellows do help. You see things that get past us now and then, you give the men a lot of help. They are on their toes because they know that the tools they work with are always subject to inspection and— Say, wait a minute. Hey, Red, what's the idea of putting that tie wire on that way. You know better than that, coil those ends. Can't you see there's a Safety man on the job? That's the way it goes. No wonder a fellow gets gray hair. Always have to keep your eyes open. And this last bunch of 'Klum Sums' are they a headache?"

Eng.: "Yes, but how about that remark of yours, that I was going to add to your troubles?"

Foreman: "Oh, that. Well, here I am trying to finish this job by Tuesday, going to need all the time I can get in, hoping that rains will not bother me, and then you come along. You'll want to inspect the truck and equipment, all the tools, the men will have to stop what they are doing. Now don't get me wrong, it's a good thing, but why in hell didn't you pick some other job to come out on?"

Eng.: "That's okay with me, you know very well we never do anything to hold you up. On the other hand we try to help you. You said that the 'ER' did not give you

sufficient allowance for labor and vehicle?"

Foreman: "That's right, they don't have any trouble measuring the distance of the run, counting crossarms, pins, insulators, braces and other hardware. So we always have enough material, but their idea of labor is something else. I did have one the other day that forgot to include a transformer for the job. I guess he thought I was going to run 4 KV right into the meter socket."

Eng.: "Say, didn't Woodie have part of this same job?"

Foreman: "Yea, he worked the other end."

Eng.: "He had about the same mileage as you have, didn't he?"

Foreman: "Yea."

Eng.: "If I remember correctly, he had a two per cent underrun on his 'ER.' You wouldn't be trying to beat him would you?"

Foreman: "Hell no, he got the breaks, that's all. Only one corner pole that was bad. No cross over or jogs, and only very few junctions. If I come out with a two per cent overrun I'll be lucky. Then I'll have to write a letter explaining the overrun. Just because those engineers didn't give a large enough allowance."

Eng.: "Have you been having this trouble on all your jobs?"

Foreman: "No, I usually come out about the same as the 'ER' or 'WA.' Sometimes I have a small overrun or underrun."

Eng.: "Well, I'm not going to do anything to hold you up on this job; however, let's just take a look around. Maybe I can help you some way."

Foreman: "Okey, what do you want to look at? Want to go over the truck?"

Eng.: "No, let's let that go. I am quite sure everything on the truck is in good shape. You always did keep a clean truck. Can't recall when I ever had to 'write you up' for poor housekeeping. Your tools are always in good shape. You keep the heads ground down on chisels, you have good rope. By the way, did you get a new set of sleeve twistlers to replace those that were shot? Remember the last time I inspected your truck I told you that they would not last much longer?"

Foreman: "You bet, I changed those the next day. You know I'm for safety."

Eng.: "Those pikes look like they could stand a little cleaning up. Why don't you leave them with Mac and take out another set?"

Foreman: "I'll take care of that in the morning."

Eng.: "How come Red is only using two line hose and one hood up there?"

Foreman: "That's all he needs."

Eng.: "How about that hot phase right in back of him? Also that head guy just below his feet?"

Foreman: "He don't have to get that far over or stand on the guy."

Eng.: "He could lean back and hit that hot phase, perhaps step on the guy at the same time. Did you stop and think just how much time you would lose if you had an accident on this job? Here you are fussing about the time this job is taking and then you let Red work up there in that position, taking a chance on having him hurt and really setting you back."

Foreman: "Oh, Red's a careful workman; he won't get into anything."

Eng.: "No? Perhaps not, but you must admit he could."

Foreman: "Yes, he could."

Eng.: "It's not your habit to let men work that way, is it?"

Foreman: "No, but he is all right."

Eng.: "Look here, Jim, let's look this thing straight in the face. You are not kidding me one little bit. First you figure you are going to have an overrun on this job. Then you start cutting corners, trying to save time. One way you are trying to save time is to cut down on the use of rubber goods on the pole, am I right?"

Foreman: "Well, maybe; but Red's all right."

Eng.: "Sure, Red is all right now. But you must admit he is in rather a hazardous position. And on top of that, Jim, you are not saving anything."

Foreman: "What do you mean I am not saving anything? It takes time to put up rubber. That 'grunt' would have to carry more rubber from the truck to the pole; he would have to take more time to send it up the pole; Red would take more time putting it in place; then when he finished it would take longer to clear the job and move to the next pole. How come I'm not saving time?"

Eng.: "Well, for instance, you say the ground man would have to carry more rubber goods from the truck. He looks like a fairly husky fellow. I am quite sure he could carry all he needs in one load, the same time that it took him to carry two ells and one head."

Foreman: "Yea, that's right, but how about sending it up the pole and then putting it on?"

Eng.: "Sure, it will take a few minutes longer to send it up and perhaps a few minutes to put it on. But watch Red for a minute. Look how he moves around up there. Always looking around back of him. Look, see him glance down at his feet. Now that's taking time. Not a few minutes time to put up proper protection but real time that's cutting into your 'ER.' That man's uneasy up there. He is losing time in his work because he is apprehensive of his position. He is losing time because he knows that one false move will really get him into trouble. He is not working with a mind free and clear, free from outside worries, and clear to think about the job at hand."

"Take a look at those two fellows down on that next pole. They have twice the protection that Red has. Still they should have more rubber material up that pole than they have. Why not put an ell on that street light series. Sure, I know you say its not hot. But you know as well as I do, and I know you know that on the slightest provocation that relay will trip and energize that circuit. Look at Meyers down there; he knows that circuit is cold, but look at him stretch over it. That's taking time. There is where you are losing it. You are not saving time in cutting down on protection, but rather, you are losing time in not providing it. Watching pennies but losing dollars."

"I noticed a while ago you hollered to Red about coiling the ends of tie wire. Did you ever take time to explain why the ends of tie wires should be coiled? Show the men how to roll a tie wire on rather than let the ends fly all over the place?"

Foreman: "No, I just said that in putting on tie wires they had to coil both ends."

Eng.: "That's a point you should cover. I am quite sure when you have an idea of any kind if you will take the trouble to explain why it's to be done, the fellows will

take to it better and you will have fewer gray hairs."

"Now, let me point out several things to you. Down on that corner pole there should be a rope mat on top of that blanket which is on top of that transformer. You should have three cone blankets on those J.D. insulators, you should make those fellows put two hoods and two line hose on that street light series circuit we were talking about."

"How come Meyers is not wearing goggles? The saw-dust or chips from that hole he is boring or the gain he is going to cut can get in his eyes."

"Now, here on Red's pole, he should have a hood and an ell on that hot phase at his back and also a line hose on that head guy."

"If you will take the few minutes it will require to put up that protection, and see to it that it is followed out on this job, or on any job, I'll be willing to bet you a new hat that not only will you be able to finish the job by Tuesday but that you will have an underrun on your 'ER.'"

"Remember, if you use plenty of rubber goods, day or night, you will never get burned."

Foreman: "Yea, I guess you are right. Never quite looked at it that way. Sort of couldn't see the forest for the trees."

Eng.: "Well, Jim, think it over. When lunch time comes get the boys together and tell them why they should coil tie wires. Talk to Meyers about wearing goggles. Don't try to 'rawhide' the job, explain when you would like to finish. But let the boys know that you want everything 'covered up.' I know you don't want to have anybody hurt and I know you don't want the job to run over. Well, Jim, think I'll be on my way. Don't want to hold you up, but remember what I said about 'the new hat.'"

Foreman: "Okey fellow. Thanks a million. Come back any time and don't worry about holding me up. So long and thanks again." "Hey, Red, drop down a little. That's good. Now get a couple of line hose up there on 'B' phase. Put an ell on that head guy, too."

"Meyers, where in hell are your goggles? What are you trying to do, get hurt? Let's put a mat on that transformer. I sure want to talk to you fellows at lunch time."

ADJOURNMENT

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Past General Chairmen—

L. W. DAWLEY, Southern United Ice Co., Jackson, Miss.

C. H. HARPER, Southern United Ice Co., Jackson, Miss.

MONDAY AFTERNOON SESSION

October 7, 1940

The opening session was called to order by General Chairman A. A. Rall, Safety Supervisor, Kansas City Power & Light Company, Kansas City, Mo., who presided. The opening remarks of the Chairman dwelt briefly with activities of the Section during

the past year, and with the work of some Standing Committees. Officers of the Section were elected, as listed elsewhere in this record. The Chairman then introduced the first speaker.

Hazards of Car Icing and Their Elimination

no value

not used W.R. Holgren 11-22-44

By R. C. LEDBETTER

Manager, Safety Engineering Department, Texas Employers' Insurance Association, Dallas, Texas

In this subject, as well as all other phases of safety engineering, the usual conception of safety is that of practical, every day horse sense. So, in my approach, I first sought an answer to the question "When should safety begin?" And it appears to me to be at the time the necessary equipment to do the icing job is secured, and

almost coincidentally with the employment of men to make use of it.

In considering the employment problem more and more thought is being given to physical examinations, but numerically there is a long way yet to go. Many employers do not have physical examinations made at all; many have them made, and, having done

so, consider the job as done and make no further use of them, except as file material; a comparative few make intelligent use of such examinations and the examination fee is made to earn its keep many times over.

The larger business organizations, with their personnel man or department, are usually in this latter group but the smaller organizations are too prone to plead lack of time, lack of knowledge, or expense of examinations, as an excuse. Yet, at the same time they are probably the very group who would best benefit by taking time or by acquiring knowledge of the cardinal points to be observed in intelligent selection. (From the expense angle the average physical examination costs \$2.00; the average hernia \$350.00 Q. E. D.)

No human eye has yet developed the ability to see through clothing and flesh and determine whether a man has a potential or a developed hernia. No superficial survey can detect high blood pressure or a defective heart. I have seen eyes, stone blind, that had all the appearance of perfect, normal eyes. Only the physician can detect these and other conditions which may make it a dubious favor you are conferring by employment.

For example, high blood pressure often provokes spells of dizziness. Put together one employee with high blood pressure, one high job on platform or car top, and one dizzy spell, and you have the makings of one bad accident. Again, take a potential hernia, put him in an awkward position, throw a sudden strain on him and the dull pop of a rupturing peritoneum blows 350 bucks down the river. How many times have I heard the remark after an accidental injury, "I had a hunch I should not have employed him, but I felt sorry for him." That's what I mean when I say you may confer a dubious favor on a man by employing him for a job he may be physically incapable of performing.

Susceptibility to hernia often dates back to birth and in approximately one man in five the normal closure of rings does not take place. By way of comment, many of these potential hernia conditions need not be a bar to any job if the person affected has knowledge of the condition and takes protective measures, one of which is learning how to lift properly—and then remembers it.

Another pre-employment hazard seldom

taken into consideration is the mental condition of the employee. It is inviting disaster to place either a low degree of intelligence in a job requiring forethought and consecutive sequence planning or in placing one, otherwise sound, but with slow mental reactions, in a position demanding continued alertness and instant responses. Many accident prone are in this category and their inability to recognize potential accident making situations, their faulty judgment of speed or distance, and sometimes their impulsiveness (jumping at the job) cause a considerable percentage of the injuries to which they are subject.

Luckily there are many readily recognizable accident-prone types which can be detected by the medical examiner. The epileptic, the late syphilitic, the pre-senile, those suffering from high blood pressure, the feeble-minded, and the chronic alcoholics can be excluded from jobs where lack of control may be a source of danger not only to themselves but to others.

The answer to Mark Twain's remark about the weather finally reached the railways; and pullmans and passenger cars had after-thoughts swung beneath their floors, in which several tons of ice are placed for the purpose of temperature control. These bunkers open on both sides of the cars and in some of them the doors are hinged at the top, others at the bottom. These latter, from an icing standpoint, are probably the easiest to fill as the doors drop, leaving a wider opening; but from the railroad's standpoint are not so safe. In one instance a bunker door on a chair car dropped down while the train was in motion and a wreck was narrowly averted.

At best all these bunkers are hard to get at and must be loaded by main strength and awkwardness with the attendant discomfort of cold and wet clothing. A potential hernia here is most likely to become a reality. Slips and falls, bumped heads and upper parts of the body, particularly against those doors which lift up, ice cuts and scratches, abrasions from doors and doorway openings, and perhaps a serious injury from a dropped door striking the head or the small of the back, present the major hazards. These are complicated by the mandatory speed with which the job must be done in order that no unnecessary delay may occur to the train.

Let's begin with the arrival of the train

which finds the icing crew on hand, a loaded hand truck approximately in position where the car is to stop. Right here is where cooperation between train crews and loaders is demanded. As the train slows, the hand truck is jockeyed into position, and as it stops the latches of the bunker doors are tripped and the doors opened.

A rapid survey determines the number of blocks which the bunker will take. Usually this means that the partly melted blocks in the bunkers must be pulled or at least shifted about and the loaders must literally dive into the ice cold water to perform this task. Half in and half out and wholly at the mercy of the train crew, who if they inadvertently or thoughtlessly move the car can cause serious injury, the loaders make room for the re-supply. Then, to their feet, grab a block, heave to the door's edge, splash and a geyser of ice water shoots out, repeat until full—all of this on the passenger dock side.

But there are bunkers on the opposite side to load, too; so, hurriedly closing the doors, seeing that the safety catches are secure, a chute is slid under the car,—and there is only one place it will pass under—blocks are passed across the tracks and the bunker loading repeated with the added complication that the level from which this is accomplished is invariably higher or lower than the dock side. Add poor lighting conditions and it is easy to understand why many of these loaders have a poor opinion about this work.

However, let's take some of these hazards in order and see if we can find a means of combating them. Strains and hernias can be largely avoided by proper selection and training of employees. Slipping can be minimized by proper footwear—this remedy will to a large degree also assist in eliminating the serious bumping—against injuries. Cuts, scratches, and abrasions will respond to first aid. The only remedy for a falling door is to make sure that those which raise are securely locked open. With the present highly efficient battery lights available the poor lighting conditions can be ameliorated.

There is one particular hazard, that of kicking safety latches open or closed with the heel. This practice should be discouraged and a heavy rubber hammer provided with which to loosen these often stubborn safeguards. The rubber hammer also makes

less noise, a desirable feature when night loading is performed. Personal injuries such as bruised heels, abraded or bruised ankles or shins, when the kick misses or slips off—this latter injury easily can become very serious as you well know, and the off-balance slips and falls are by-products. Provide a hammer and insist on its use.

Hand and arm protection is a big problem. Most loaders prefer to work bare-armed instead of enduring the discomfort of wet sleeves. Injuries to the arms are usually in the nature of cuts and scratches. The only suggestion here is prompt attention to these skin breaks. Some loaders wear rubber gloves, but most of them work with no hand protection. There have recently been placed on the market inexpensive gloves made of rubberized fabric which a number of men say are very satisfactory. They get wet through and through, but they do minimize the cold and they cost very little, hence, can be replaced often.

There is a public hazard in connection with this job which is serious and can be very costly. The hand trucks, of course drip water on the passenger docks and, in the process of loading, small pieces and chips of ice fall to the floor. Also, many passengers will attempt to pass between the truck and the car. Should one of these passengers slip and fall, the fate of your bankroll may hang on the opinion of a trial jury. This hazard can be largely avoided by cleaning up after the loading and by allowing only sufficient working room between car and hand truck. There have been a few cases in which the bed of the hand truck is made up as a shallow tank with a drain pipe and a hose carried to the edge of the dock. This, however, provides a stumbling hazard, but perhaps is the lesser of two evils. It has been suggested that a drain pan under the truck would solve the problem of drippings—to be emptied as a part of the clean up program after the loading is accomplished.

Improvement in the design of bunkers will eventually come, of course, but at present each icing location presents particular problems that will respond only to individual study. Cooperation with railway employees is absolutely mandatory. Good equipment properly maintained should be provided and only crews who have been trained to work together should be used. Employee replacements should be made from physically and

mentally selected men and supervision vested only in careful, considerate foremen, who will see they are adequately broken in.

In supplying ice to dining cars it appears to be common practice to toss 12½-pound pieces from the truck to a man on top of the car. The principal danger here is from slipping of the man on the car top. I don't know what's to be done about it other than to perform the operation with as much precision as possible and to attain speed by steady prosecution rather than by "haste." It goes without saying the men doing this job should be physically capable.

Quick frozen products have been tossed into our laps in very recent times. The usual hazards of extremely low temperatures, the problem of extra employees working for short periods, and the speed of handling demand careful planning and preparation. Hands and feet numbed by temperatures of 10 degrees or lower can suffer injuries without men being conscious of them. Now or stopped circulation is provocative of gangrenous conditions, difficult to cure without amputation. Suitable clothing for body protection and woolen gloves over which are worn heavy rubber gloves will protect hands against bruises and cold. Foot protection can be had by rubber boots sufficiently large to allow the wearing of several pairs of socks, one of which preferably should be of wool.

For hand protection one company I know procures condemned linesmen's rubber

gloves. The small solidly frozen cartons are apt to have glass-hard and razor-sharp projections and edges which rapidly cut and destroy any hand protection, but these rubber gloves have, with this company, given the best service of all means tried.

The installation of chutes or conveyors wherever possible will assist in reducing injuries occasioned by tossing smaller packages from man to man in loading out car-load lots. Supervision to the Nth degree is compulsory in this situation. Employment of many extras presages a large turnover in labor. Speed in handling is demanded by the nature of the product where a sharp rise in temperature means total loss.

In point of newness the servicing of long-haul vegetable trucks with crushed ice is the infant of the icing family. These trucks usually run in groups and hauling perishables, as they do, can't afford avoidable delays. This calls for heavy duty, high speed crushers. The hoppers must be designed for safety and for ability to be fed quickly. Discharge bins must avoid rough spots and projections on which the scoop may hang. It may be necessary to change or re-design platforms to reduce public liability hazards or to allow spotting of trucks in position for safe and economical loading. At one plant 2,000 pounds of ice was crushed and loaded by two men in 8 minutes.

It is good practice for these truck groups to give advance notice of the approximate time of arrival at icing points and of the number of trucks and probable amount of ice required by each.

WEDNESDAY AFTERNOON SESSION

October 9, 1940

Safe Practices in Refrigeration of Breweries

By B. L. KIERNAN

Chief Engineer, Jackson Brewing Co., New Orleans, La.

The brewing industry has become one of the nation's largest users of refrigeration. The industry relies upon the regulation of temperatures for the control of its product.

The start of the process is by the application of steam to convert the grain to liquids and to change the starch of the grain

into sugar; continuation of the application of steam and heat concentrates the process; further use of steam is for purposes of sterilization and cleaning.

Immediately upon the completion of the conversion and concentration process, refrigeration is applied and from thence after-

ward, to the final consumption of the beer refrigeration is the controlling factor.

With few exceptions all breweries are equipped with plants using anhydrous ammonia as the refrigerating chemical. It is a highly volatile substance having an alkalinity, very nearly caustic having the ability to digest copper and copper alloys (such as brass and bronze) and has the same effect on aluminum, zinc, etc. It has a high affinity for water; one volume of water at 60 degrees Fahrenheit will absorb about 15 volumes of ammonia. This chemical will develop pressures of from five pounds per square inch to 210 pounds per square inch in normal operation in a brewery.

The exposure of any part of the human body to anhydrous ammonia results in pain, to a greater or lesser degree. If the tender membrane of nasal passages is affected, a terrifying, burning sensation is experienced. If the membrane of the throat or larynx is affected a desire to gasp for more air is the natural result; if this happens to the subject in a confined place and the ammonia gas is taken into the lungs, the subject may lose control of his faculties and become panic stricken.

Loss of direction will cause the subject to invariably waste any oxygen reserve he may be able to retain and result in unconsciousness.

The eyes are in great danger from the effects of exposure to ammonia. When so exposed, there is a natural flow of fluid, or tears, which absorb large quantities of ammonia, which change in chemical composition to ammonium hydroxide; the effect is a decomposition of the transparent covering of the eyeball, and if not quickly and properly treated, will result in permanent blindness.

Selection of the Personnel

No one should be allowed to install, operate or maintain refrigerating equipment unless he is fully qualified by experience and has a sound knowledge of the principles of refrigeration.

The installation, operation and maintenance of refrigerating equipment should be under the supervision of a highly competent engineer, who should be given all the tools and supplies to do a good job and men of his own selection. It is folly to attempt to

have an unqualified person select that personnel in preference to selection by the person trained in engineering.

Installation of Equipment

Many serious accidents can be traced to faulty installation jobs. Misalignment of compressors has caused stresses to develop in places where they are least expected, and since it is generally considered that the machine was properly installed, a check up on alignment is only made when other means fail to disclose the trouble, usually, after someone has been seriously injured.

When hangers are installed they should be calculated for safe working stresses with a good measure allowed for corrosion when they are used for evaporators made up of black piping. We in New Orleans have all hangers in our cellars galvanized and find that it saves many dollars in cleaning and repairs.

Materials which are produced by manufacturers of ammonia equipment are the only kind that should be used and great care should be taken to check into the reliability of the manufacturer.

No pressure vessel should be installed unless it meets the requirements of the A. S. M. E. Code for unfired pressure vessels, and bears the symbol of the A. S. M. E. and inspector's number. A pressure vessel so marked guarantees the highest type of workmanship and safety which can be put into a vessel and guarantees that it is the proper vessel for the work to be performed.

Maintenance

In this branch there are hidden causes of accidents.

We have found that the continuous use of the same bolts, which have been tightened and loosened a number of times, is a great hazard; gaskets which have been used too often take their toll in accidents and in a way you would not recognize.

A tremendous force is exerted on a bolt by screwing a nut up tight. How tight? Well, give me a spud wrench and a piece of pipe and I will break your bolt. Somewhere between the contact at the nut and flange and the limit of flexibility, or the yield point of the metal, is the safe working point.

Let's be safe, throw the old bolt away; a new bolt costs very little, an accident costs much. Every time your man goes up a ladder to work on a leaking flange there is an exposure. A good repair job on an ammonia flange should last 40 years, if new bolts and gaskets are used. If old bolts and gaskets are used, who can say when you will be called back for repairs? Maybe in an hour another exposure, maybe another frequency.

Painting of the ammonia line a definite color is good practice. Training the personnel to have respect for an ammonia line is good practice. We train our men to always get an okay from the assistant engineer on watch that the line is clear. Too many accidents are caused by the maintenance crew taking the work of someone else. In our plant the assistant engineer in charge of the watch is the only one who can clear an ammonia line. We believe that only one man should handle that job and we hold him responsible. Since this rule has been in force we have not had an accident from opening charged ammonia lines.

Many major accidents have occurred from compressor heads being blown off. Usually this type of accident happens where the old style machines are still in use. I do not know of a single accident which involved the more modern machines having safety heads and safety valves. Usually the fault does not lie in the machine but can be traced to maintenance which may be at a very remote

point and hundreds of feet from the machine.

It is my opinion that every moving part of the whole plant should be taken down for inspection and repair, as well as checking, at least once each year.

When coils are submerged in brine they should be inspected at least once each year.

I emphasize the great necessity for a higher intelligence among the personnel of the engineering department of breweries. Our refrigerating systems are growing more complicated and we are applying principles of operation and maintenance to equipment which has advanced by leaps and bounds. We have lost the benefits of the apprentice training system, which so thoroughly equipped our men of the past generation in the art of operation and maintenance.

We are increasing our frequency rate of accidents, which is our punishment for negligence on that point.

It is my opinion that we should encourage the licensing of engineers who operate equipment of the type under discussion and encourage trade schools where the technical information will be imparted to those who have the ambition to study.

Good housekeeping is the greatest contribution that man can offer to safety. A clean shop will be free from the disease we know as accidents. Above all places, the brewery should be the model for cleanliness and sanitation.

Safe Practices in Dairy and Ice Cream Plants

By E. G. QUESNEL

Director of Safety, The Borden Company, New York City

In one of our large cities an ice cream driver, while serving a stop, was rearranging his load in his truck when the wind blew the door closed. This door could not be opened from the inside and because of the lowered temperatures from within, a life was lost.

In another city the hardening room door was locked, not knowing that a man was on the inside. Since no provision had been made for his escape he had to remain until discovered sometime later. As a result he

suffered severe disability because of exposure.

In still another city the supports holding ice coils which had become overloaded with ice, gave way and in falling struck an employee. The result was another life lost.

All of these regrettable cases could have been prevented. In the case where a man was locked in his truck, the doors should be so equipped that they can be opened from within. This should be considered standard practice for all ice cream refrigerated trucks.

In the second case adequate alarm systems should be installed in all hardening rooms so that employee can advise others of his situation. Also an axe should be available so that he may chop his way out if necessary.

In the third case overhead coils should be defrosted at such intervals that excess ice will not accumulate, and further all hangers supporting coils should be regularly inspected to see that they are substantial and secure.

The prevention of accidents, as looked upon from an operating viewpoint, is after all a common-sense and practical way of doing work. Taking chances is usually going out of the way or disregarding normal practices. Therefore from this standpoint alone there should be little justification for permitting continuation of work habits which lead to both inefficiency and accidents.

Men working where it is cold should be properly dressed and likewise when handling dry ice their hands should be protected.

Ammonia pipes and containers, aside from being regularly inspected for leaks, should be definitely marked so that inexperienced employees cannot easily make the mistake of turning the wrong valve. As a matter of precaution the rescue technique in case of accidents caused by ammonia should be thoroughly understood and men should be taught the use of gas masks and know definitely where they are located. This also applies to emergency control valves.

Housekeeping is important wherever ice is present and loose ice should be removed from floors just as quickly as possible.

While trucks are being refrigerated at the plant, definite instructions should be issued so that truck will not be moved while it is on the line. Ignition key should not be left in the ignition lock and not carried by the operator. A good location for the key is the rear of the truck where operator can readily see whether or not truck is still connected. Wheels should be blocked and a cover placed over steering wheel. Some trucks are now so equipped that when the rear door is open the ignition is automatically cut off.

When we stop to think about these things it is surprising to see how easily accidents occur when working procedure is not fol-

lowed and also how easily they could have been prevented.

The reason so many of us are having a hard time stopping accidents is that we are spending too much time causing them; that is to say, we permit certain practices to continue which we know lead to accidents. Probably the reason for this is that we ourselves experience few accidents but we forget that we may be causing many accidents to other people.

Among the many things that cause us to dismiss accident practices and causes at the moment, are expediency, familiarity or position. We often feel we are privileged to do things others should not do. This, of course, is not good business nor does it set good examples.

When we analyze accident causes we find as a rule that most accidents are the result of either improper work habits or wrong attitudes toward work. Both of these characteristics can be corrected. During such correction we learn a lot of things not only about the other fellow but about ourselves as well. The one thing we ought to realize is that if we are to help people we must learn to like them. We must also do things that will make people like us. This attitude cultivates a desire, and desire always precedes accomplishment.

Another interesting observation is that most people want to do right and further it is just as easy to learn to do things right as it is to learn to do them wrong.

These things being true we can approach our accident prevention program with confidence as there seems to be no longer a mystery connected with safety activities. There is a reason for work. There is also a reason as to how work should be done. When these things are understood and intelligently applied safety will be accepted as an operating problem. Therefore it is no longer necessary to wait for accidents to occur in order to correct the conditions which cause them. There can be but one answer to all the many questions as to how accidents can be prevented and that is understand what we are doing, why we are doing it, be conscious and alert to our surroundings and skillful in our performance. Very few accidents ever result from such a combination of events.

Safe Practices in Ice Plants

By W. BRILEY WRIGHT

Safety Director, Eastern Shore Public Service Co., Salisbury, Md.

It seems to me perhaps the most good can come from discussing the A B C's of ice plant safe practices. You know, frequently we become so interested in the advanced stages of accident prevention work that we forget the elementary things, which after all are the real causes of our accidents in the ice industry. In a review of the elementary things in accident prevention we may find the reason for the unfavorable comparison of this industry with other industries which statistics so clearly show.

During my investigations over recent months, I have been reminded of the following conditions existing in the ice business:

"Most ice plants are small, have no complete set of proper tools for maintenance work and take chances with tools on hand. Also, all maintenance is done by a few all year around men, only part of whom are qualified for the work."

"Working under variable temperature conditions causes unfavorable muscular reaction resulting in accidents."

"Frequent opening and closing of doors results in eventual carelessness in observance of door hazards."

"Ammonia gas."

"The natural SLICKNESS of ice present in small pieces on our tanks, platforms, storage room floors, walks, etc., presents an unusual hazard."

"No pride in the ice business by employees and supervisors results in indifference and carelessness."

I absolutely agree that all of these hazards exist in our business; but other industries have hazards in far greater numbers and importance and are away ahead of the ice industry in eliminating accidents.

In my search for information to present to you, I began checking our own accidents for the past four years; from the beginning of 1937 through 1940 to date.

Our operations, I believe, are about on a par with the average group of small plants. We operate in Maryland, Delaware and Virginia. The management has been sincere and active in providing all mechanical and

personal safeguards. Periodic checks are made to see that the protective equipment is in good order and is being used.

We have a safety department with division safety supervisors who hold safety meetings regularly in the territory to which they are assigned. All safety meetings are held on company time and attendance is part of the employee's job.

Every employee has a safety manual. In fact, immediately after employment the new employee spends his first day with the company reading the safety manual and discussing it with his supervisor. The personnel department notifies the division safety supervisor in the area where the new employee is located so this supervisor can, as soon as possible, spend some time with the new employee, going over the manual and stressing the importance of safety from all angles.

In spite of what I call an average, or perhaps better than average, safety set up, we had 39 accidents in our refrigeration department during the 1937-1940 period: 21 of these accidents resulted in loss of time.

I am not far wrong when I make the statement that all of these accidents could have been prevented by observing safety rules. Most of them would never have happened had the employee used the simplest principles of self-protection, such as common sense, forethought, good housekeeping. In other words, in practically all cases the employee did something he knew was wrong. He just didn't give any thought to the danger ahead. He failed to recognize the hazard.

I could go into an extensive discussion of the use and care of ammonia masks, the proper guarding of machinery and equipment, safe practices in defrosting coils, the handling of electrical equipment, etc., but to do this would be to repeat only those instructions which are included in the safety rule books of practically every company. And then, too, our experience shows we have very few accidents caused by the failure of employees to use protective equipment or to follow safe practices in doing those jobs.

which we have pointed out to them are hazardous.

In order to illustrate my point, I will briefly run through reports of some of our accidents.

1937

Employee was assisting carpenter when piece of timber slipped, falling on employee's left foot, mashing toes badly.

Employee, helping to do some rebuilding, scratched palm of his right hand against a protruding nail.

Employee was going after drinking water in the dark, when he walked into a hole at the end of the ice tanks. The trap door covering this hole had not been put in place. Left side bruised.

1938

Employee was burned on face and left hand when he poured hot tar into a bucket, evidently containing some moisture.

Employee was helping to unload pipes from a car when he caught his finger between the side of the car and a piece of pipe, breaking the middle finger on the right hand.

Employee started down in condenser pit and slipped, falling into fan placed to blow ammonia away. Employee was wearing ammonia mask which had clouded. He sustained several cuts on his left forearm.

Middle finger of employee's right hand frost bitten from staying in quick freezer too long.

Employee sustained a hernia in right side when he slipped while attempting to lift a tubboy of sulphuric acid.

Employee was loading apples on elevator when rope holding safety gate broke, striking employee on right forearm.

Employee's instep of left foot mashed when cake of ice which he was loading in truck slipped and fell on foot.

Employee's big toe on left foot mashed when ice hooks slipped out, allowing cake of ice to fall on foot.

1939

Employee was moving ice from one storage room to another where the floors are of different levels and in pulling the cake over the sill, he slipped, spraining his back.

Employee was lowering barrels when he caught his fingers of left hand between the

barrels and the side of the chute, skinning his fingers on left hand.

Employee was walking backwards with can on crane when he became lodged between the can on the crane and cake of ice, bruising his left leg.

Employee stepped off of ice runway when he turned his left ankle, spraining same.

Employee was putting ice in crusher when hooks caught in teeth of crusher, crushing three fingers of the employee's right hand against the side of the crusher.

Employee was scraping ceiling when ladder slipped, causing him to fall and sprain his right ankle.

1940

Employee was attempting to start blower fan which had stuck, by throwing oil into the fan, when it started, lacerating the end of the second finger of his left hand so badly it was necessary to amputate the last joint.

Employee was working in cold storage room and worked too long, getting right heel frost bitten.

Employee was helping welder when a spark was blown in his left eye. (Goggles would have prevented this accident.)

Employee was stacking strawberries in cold storage room when he strained his back.

Employee was carrying 150 lbs. of ice from rear of truck to the sidewalk over snow and ice when he slipped on ice and sprained his right ankle.

Employee was dumping a grid of ice from the tank to the handling room and while pushing cake of ice from the chute, his foot slipped, causing him to fall. Sustained a hernia in his left side.

Employee was stooping over setting up cake of ice to load in truck when he felt severe pain in his right groin. Examination showed that the employee had sustained a small hernia in his right side.

While employee was carrying cake of ice from platform to truck, hooks cut out, striking the employee on the left leg, cutting same.

Employee was working on hoist repairing reverse latch when hand came in contact with 220 volt cable which supplied current to the motor on the hoist. Employee re-

ceived shock and slight burn on the forehead.

Employee was helping to defrost storage room coils and in lifting piece of canvas to move it from one location to another, felt a sharp pain in his right side. He sustained a right inguinal hernia.

Of 39 accidents reported, we find in analyzing them for cause that 10 were the result of employees slipping on small pieces of ice—or oily surfaces—conditions that could have been eliminated by following simple rules of good housekeeping; five by equipment, such as ladders, platforms, etc., slipping and causing injury to employees; four resulted in finger injuries and were due entirely to carelessness; four resulted in strains caused by either undue haste or an absolute disregard of safety rules and practices; three by employees walking backwards into openings or off of elevations; three hand injuries by nails extending from boards, etc.

I dare say that the majority of us emphasize most strongly in our accident prevention work the hazards arising from the handling of ammonia and the danger of electric shocks. We have not had an accident due to the handling of ammonia or electric circuits in our ice plants during the period analyzed.

One of the accidents resulted in frost bitten fingers due to too long a stay in a low temperature room. I am personally interested in knowing more about the hazards existing in low temperature freezing plants and how to avoid frostbitten fingers, etc. In my efforts to secure some data on this subject, I have found very little information available.

Now going back to ice plant safety and to my analysis of our company's accidents. You can see that most of these accidents were the result, not of hazards peculiar to the ice industry and those that are dwelt upon at length in our safety manuals, but by situations and conditions that are and

will continue to be present every day unless we develop a safety consciousness on the part of everyone in the plant.

In our own case, the so-called little things, which may have been overlooked or certainly not emphasized in our accident prevention program, have been the cause of our downfall. I feel that my supervisors and myself are as much to blame as the employees involved. We were no doubt concentrating on hazards peculiar to the ice industry and overlooking the importance of constantly reminding employees to watch for the little things that happen or exist each day and may be overlooked. The old *watch your step*, if uppermost in our employees' minds, would have prevented at least half of our accidents.

All of this naturally leads us to a discussion of the value and necessity of "interested," "safety minded" supervisors, from the owner to the most trivial "straw boss." We men who have been doing accident prevention work for years know that the very keystone of a successful accident prevention program must be the wholehearted cooperation of our executives.

I believe that any manufacturer will agree that in order to prevent personal injuries to industrial employees, safety activity must include three fundamentals:

1. All mechanical and personal equipment must be adequately safeguarded.

2. Employees must be furnished with a set of safety rules covering their job and on frequent occasions be taught and encouraged to work safely in conformity with such rules.

3. And most important—management and employee must both accept and discharge their respective responsibilities.

And—it is the management's job through its supervisory organization to keep before the employee in a convincing manner his portion of the mutual responsibility.

ADJOURNMENT

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MONDAY AFTERNOON SESSION

October 7, 1940

The opening session of the Rubber Section was called to order by the General Chairman, R. W. Morse, Director, Workmen's Compensation & Safety Departments, The Firestone Tire and Rubber Company, Akron, O., who presided. The Chairman

first made a brief résumé of the activities of the Section during the past year, taking the opportunity to mention the good work of various Standing Committees. He then introduced the first speaker.

Getting Safety Off the Defensive

By A. C. HORROCKS

Public Relations Department, The Goodyear Tire & Rubber Co., Akron, O.

If you are in supervision, you were placed there because you possessed, first of all, craftsmanship; second, judgment; and third, because you were a skilled handler of men. Your most acute need then is to learn to use what you already know.

Up to the present time we haven't had a technique for men in supervision to use in handling other men. We have told them they were chosen because they had developed a fine craftsmanship. We also paid tribute to the fact that they had a keen judgment and knew how to render decisions. We also told them they were skilled handlers of men and promptly started to take away the personal contacts they had.

We decided it would be a fine thing to have a personnel director, and the hiring and the firing was taken away from the foreman. He wasn't to set any piece work prices or day rates. The time study man, the efficiency department did that. He no longer had anything to do with the purchasing of materials used in his department. The production control department estimated his needs and the purchasing department bought them. He didn't have anything to say about his monthly budget and the

breakdown of that was given to him by an accounting department. By and large, he found himself assuming the role of being responsible for his production mindedness or, in other words, he was charged with the responsibility of getting the work out.

But of the three M's of industry—Man, Material and Money—Man is by far the most important. So I am asking those in supervision to get back again to the contacts that mean so much to them and to realize that your most acute need is to learn to use what you already know. What I mean by that is that you are a skilled handler of men. The success of a safety man revolves around his contacts with the individual workmen, and the success of a production foreman likewise revolves around that workman.

We recently made a survey in seventeen cities, large, small and medium size, in various industries, to find out what the foreman's job was as he contacted men, and of the hundred and five duties that were listed we found ninety-six of them to be human contacts.

Therefore, I wonder in the promotion of danger consciousness if we have seriously

asked some of the following questions. They will get glorious results for us if we will follow a plan:

What makes this employee tick? If I am going to make him safe while he is in my employ, I must know him.

What is his education? What experience has he had prior to coming to me?

Then you should ask and be satisfied to know, what are his tendencies toward society; toward work and toward management?

What is his temperament? Is he the kind of a fellow when things get going a little bit tough who will be the emotional type, who blows up, or is he the plodder type that you can count on and rely on in an emergency, like a fire, and know full well you have a level-headed man pitching for you who will do exactly what you told him to do?

What are his supervisory needs? If you have a hundred men working for you no two have the same needs when it comes to supervision.

How does he present his problems to me? That tells me a lot about how that man's mind works.

How must I approach him? What plan of progress have I made for him?

How important it is in this new day because there is a pattern or common procedure, which applies to all foremen-workmen contacts, and it is as fine and swift in the final conclusion as the steps to a sale, which are: Favorable attention, interest, appreciation of value, desire, decision, action, satisfaction, confidence.

My next statement is probably one that you would like to challenge until you hear the explanation. Listen carefully: Production-mindedness is at once an asset and a liability. An asset when service is cheerfully built into the product, and pride in what is turned out, because we know the consuming public is able to get out of the article the service we built into it. A liability when our drive is emphasized and men are considered as only a cog in the machine, when we ignore the human feelings and the human element.

So it seems to me the production-minded supervisor in this new technique, in order to make men conscious of what they owe society, in order to make it a sacred place, in order to make them conscious of danger,

has to step up to a man and give him a wholesome greeting with a smile. It doesn't cost much. That is the initial step. That corresponds with the salesman getting favorable attention from his prospect.

Then you are going to create the proper atmosphere before you start to talk to that man about the job. If you are in supervision, if you are up there because of your craftsmanship, your judgment and because you are a skilled handler of men, you must take a step down to that fellow's level when you step in to create atmosphere. He can't come up to you in your thinking, in your planning or in your conversation. You might be thankful he can't. If he could he would be competition for your job. It is necessary for you to come down to his level.

Then the next thing you can ask yourself is what are the dangers of the job; and that doesn't only mean physical dangers. It takes in mental dangers and you can watch that man's attitude and help to lift the worry from his mind.

A short time ago we had one of the general foremen notified that an employee of eleven years' service in his department had broken the machine for the third time. Now, Jack was a big raw-boned Pennsylvania Dutchman, who stood about six feet and weighed about 225 pounds, and there was no fat on him. He was the kind of a fellow who had come up from the ranks years ago. He knew his job, he thought he knew how to handle men.

Jack had listened to some of this development, and he remembered a chance statement made by the lecturer to the Goodyear supervisors. He had heard, "Remember, foreman, a good man doesn't go wrong in a few days' time without there being a sufficient reason."

So Jack said, "All right," to the inspector who had just brought the news to him, "I will fix him," and out of his office he went and came over toward the workman standing with his back up to the window, contemplating the destruction of the machine. Jack took in the picture and he walked a little more slowly, then this thought flashed into his mind: "A good man doesn't go to pieces in a short time without a good reason." He said, "Jim, it looks to me as though you had had a pretty rough night at sea last night. This is the third time this week that you have smashed this machine."

Without looking up, Jim said, "It was rough and tough, Jack." Jack said, "Tell me about it." He said, "You wouldn't be interested. The thing that worries me is you might fire me."

Jack said, "Well, if it is that serious, come over into the office and we will talk, Jim." So he took him into the office and closed the door and offered him a smoke. He said, "Tell me what you were doing last night." Jim said, "Jack, the wife is awfully sick, and now the baby is sick. My mind isn't on my work. I know I am wrong. I know I am all they have got to take care of them. I know that fire is out up home and my mind is there, Jack; it is not on my job."

Jack said, "Why didn't you tell me about it. Go and get your hat and coat, you are going home." "O, Jack, please, I need the money every day to pay for the doctor and buy the medicine."

"Don't worry about that, Jim, we are going on home and I promise you, you won't lose out." He called for a police car and by the time they got to the gate it was waiting and it whisked them to Jim's home.

When they got in they found the house was cold. Jim hurried up the stairs to take a look at his wife who was coughing and wheezing. He looked over at the little crib, and the little hands were blue and numb with cold.

Jack said to himself, here is where I go into action. He told Jim to get the fire going and he went down to the corner grocery and called the hospital and asked them to send a nurse and a doctor right away. The doctor came and when he looked at the wife he said, "Yes, it's pneumonia." He looked at the little crib and said, "Likewise here."

So the little baby was sent to the Children's Hospital and the nurse stepped in and took over.

While the doctor was making his examination, Jack went into the kitchen and threw the cupboard doors open. He saw that the shelves were pretty bare. He looked at the supply of coal and there were only a couple of handfuls there.

Jack got into action and in a short time a coal wagon backed up and Jack came up to the back door with two big baskets of provisions and had the pleasure of putting them in the cupboard.

Then he went back to the job—everything had been taken care of.

I saw Jack after Christmas this year and I said, "Jack, how did that case work out up on the hill that you were so interested in?" He said, "Mister, you know, I am not a church man, but honest to goodness, I have had a vision of heaven." I said, "What do you mean?" "Well," he said, "I know what it is now to get a Christmas present by knocking on the front door on Christmas Eve and throwing the door open and seeing a little toddler coming to me lisping my name, 'Merry Christmas, Jack,' and that is worth more than anything I get in the pay envelope at Goodyear."

That is what I mean when I say we need to learn to use what we already know.

We are going to look carefully for the dangers, to become danger conscious; observe the job difficulties and then decide what action is necessary.

So far, so good. Any bright production-minded supervisor can do that. We walk away telling ourselves that the job is well done, when really there is an insulation point between the man and supervision, right here, and an opportunity for grievances to build up in his heart.

So, now I am going to ask you to split your personality, to imagine that you have a dual role to play. With your one eye on production, knowing that you can only pay your way as you can get the work out, and arriving at the point where you decide what immediate steps are necessary, then you assume the role of a skilled handler of men.

Now, take a definite step into the thinking and planning area of the workman; decide right then and there what ideas must be presented to that man, whether he needs repetitious instruction or additional and new instruction; and before you say anything make a plan and present it to that workman, and do it by using the third person. Talk about "it."

The new technique says that you should use the third person approach. You are talking about "it," and we begin to talk with your Fred or your Jim. If he is doing the wrong thing, if he is doing something contrary to the way he has been instructed, and you know you have the best standard practice available, you approach him and say: "I notice, Fred, you have been doing your job this way. Go ahead, do another and let

me watch you." Fred turns out another piece of work. Then you take him to one side and say, "Fred when I worked on that job (or when So-and-So was working on that job) I was taught to do it this way. Now, you are doing it like this. Now, one or the other of these two methods is the better—I am not sure which one is. Let us try it the other way," and he goes through the process doing it the other way. Then you start to make a comparison. You got this result and you got it in this length of time. This took a little longer. This didn't require quite so much material. This took a bit more, and you compare them.

Usually Fred will look up and say, "Well, Boss, I have been doing it wrong all the time. That other way is right."

Then you do the gracious thing, the thing that everybody admires you for doing as a leader of men; before you leave him you summarize that contact. "All right, now, Fred, we have decided we are going to do this and this and this because—" "Is that right?"

"That is right, Boss. I am going to do this and see that this is taken care of." "That is fine." "We will have this licked, won't we, Boss?"

Then don't leave abruptly there, even though you feel fine and all glowing within, because you are not ready to leave yet. Now, you want to step out of that dual role of yours, you want to get back to the original role of the production-minded foreman.

I know what is in your mind—"modern production methods don't give time enough to do that." Gentlemen, that is the bunk. You are going to take that time for a little human engineering now, when it only amounts to a few minutes at the most, or you are going to find eventually the buildup of that resistance and grievance until the pressure gets so high it spreads out and you have to take from one to three to five to seven weeks to sit down and try to iron it out. All the big things start little. Let us take care of them while they are small and keep everybody sweet and happy.

We are executing a plan, and when we get away from that man we write out in our little book the summary of that contact; and again we are the production-minded foreman and we have created the atmosphere to leave him, and we do that with a smile and we summarize the contact.

Over in St. Louis last month I gave this same presentation of this personal analysis, and the next morning before I had left the hotel the telephone rang and a man says, "Mr. Horrocks?" I said, "Yes." He said, "Well, I just called up up to tell you what a blankety blank blank liar you are." I said, "Well, that is interesting. It helps keep my feet on the ground. What is the matter?" He said, "I tried your personal contact out. It doesn't work. It isn't worth a damn." I said, "Tell me about it. I am interested." He said, "I went into my department this morning and I went up to a fellow I have been having a lot of trouble with and I said, 'Good morning, Robert' with a smile on my face. Do you know what Robert said to me?" I said, "No, I would be interested in knowing." He replied, "The sour puss looked at me with a fishy eye and said, 'What the hell are you trying to pull off?'"

That foreman didn't know how much he told me in just a few sentences, but he doesn't belong in foremanship, or at least he doesn't belong in that old job; and I recommended that he quit that job and go and get a position somewhere else where they didn't know him quite so well.

You know you can't overcome the natural suspicion that builds up over many months of fear and mishandling. It dams and holds back the flow of generous impulses of man to man. The only thing that puts fear out of the hearts and minds of individuals is confidence, and it doesn't take a group of men very long to have a nickname for you.

In fact a group of Boy Scouts is pretty good medicine for anybody who has a swelled head. I bet you wouldn't go out on a weekend camping trip without a good name to suit you by the time you got back.

You can't fool men very long. If you are serious and you have a generous attitude toward men, they know it in a remarkably short time. You can't kid them, much less can you pull wool over our own eyes and kid yourself.

These problems that I have brought to your attention are the problems that are in the minds of men. They are not only conscious of the danger of the mechanical hurts to their fingers and their bodies. They are conscious of the hurt that is within their souls, the unanswered question in their minds, and that is your human engineering

problem. You must be conscious of those questions and you must answer them to their satisfaction.

That means a little more responsibility, it means a little more work, a little more study, a little more devotion on your part, but if you and I don't assume that greater responsibility who will?

Are they to be sheep without a shepherd, or are they going to begin to give you the confidence you deserve when you deliver the goods? Who have they except you to reach up to and say, "Give me?" You are the one who makes those contacts day after day and hour after hour. Personnel directors cannot do it. You can, and you will measure up.

So we all now salute these men who pioneered and blazed the trail in these twenty-five years of safety education and training. Go back to your individual plants, where on the bridge of that ship of yours there is

one mind, the general manager who charts the course. Only one hand can be on the wheel of that ship and when the order comes down it is for you and I to say, "Aye, Sir," and do our part.

A two-fisted policy, if you please. One that reaches up to management for help and inspiration and a little lift; and another that reaches down and catches hold of some that don't have hope and that think there is more danger around them in the darkness than really exists, and they need the steady, uplifting influence of the foreman who is danger conscious.

Go on then, fully conscious of the dangers around you, but unafraid, not stepping back but confronting every issue and handling them as a man, a leader of men, welcoming for the sake of our countries and civilization, the opportunity to give the highest that you can possibly give. Man owes it to his fellow men to be his own best self.

Safety in Original Design

By R. A. NORTH

Chief Engineer, Farrel-Birmingham Company, Inc., Ansonia, Conn.

The significance of safety is differently interpreted by almost every department in an industry. Unfortunately, too often the production manager's angle, as interpreted by the purchasing agent, is the only one that is relayed back to the designing engineer at the time new machinery is being considered. The builder of that new machinery is forever damned by those other individuals who have to live with and operate it, but who had little or nothing to say regarding its purchase.

Let us consider what is brought to the mind of the safety engineer when he hears the expression "Safety in Original Design." Presumably he will immediately think of in-built operator protection. Are all belts and gears properly covered? Are safety trips, automatic finger guards, dual hand controls, and safety stop buttons provided and properly located?

Today most people take it for granted that gears and belts will be guarded, but there is a wide difference of opinion beyond this. Many dangerous points are left unguarded because of frequent adjustment requirements. The production man will say

these are hazards of the job. "No guards to hinder production." The safety man's answer will be, "No production schedule is worth a life—cover it up."

Much money has been spent designing and providing protection for this type of place only to find, a short time after the machine is installed, that this protection has been discarded, lying on the floor as a dirt catcher or a tripping hazard. Selling another machine later, the vendor is asked to omit this piece and reduce the price. The machine is so built and shipped, and the builder severely criticized by the safety department for sending in a machine without adequate safety protection.

At the time of attempting to make a sale of a new machine, we have been the innocent side-line spectator at arguments between production men and safety men over just such details. Often the machine can be built either way, and usually in-built safeties cost money, so it becomes a management decision as to whether a lower capital cost with a higher accident hazard, or just the reverse of this, is what that management wants to buy.

Some concerns are so safety-minded that they have gone to the other extreme and demanded in-built operator safety to the point where it is nearly impossible to operate the unit. They have seen what could be done with the fully automatic machine, and have attempted to apply these principles to other units which are manually controlled, but their analysis was not sound. If the operation cannot be made automatic, it is because operator brain-control is required, and the requirement of brain-control should, at least, insinuate discretion. This being so, the machinery builder must be allowed to expect the use of that discretion in the operation of his unit. Full and automatic protection costs money—brain control and discretion also cost money; hence it is a management decision again as to which pocket they want to pay that money from, and that question can usually be answered by an operations analysis to establish definitely the amount of brain or operator control required to properly process the product.

But what about the maintenance man? The machinery builder used to hear a lot about accidents to productive men. Within recent years these reports are seldom heard in the design department. However, we do hear of occasional maintenance man accidents, and it is time we gave this individual a little attention.

Analyze it a minute. Repairs are irregular and occur at long intervals. Why spend money to provide protection for the repair man? Everyone knows his job is hazardous anyway. Take that same money and cut another half minute off the production schedule. With the increased speed we will need increased guarding for the safety of the operator, and what have we done?

In the olden days maintenance was easy because everything was out in the open where you could get at it. Today it is difficult, if not impossible, even to inspect your equipment, to say nothing of overhauling it. There are so many guards and covers to remove that the repair man either wants so much time for a repair that the production department will not give him the machine and it runs until it falls apart; or he tries to make a repair by removing half of the covers and either makes a poor repair, worse than none, or gets hurt doing it.

Designers of certain classes of machinery have met this obstacle by making sub-units

which can be quickly changed for another complete sub-unit. Production goes along as usual and maintenance is performed in another room with no "breakdown" push behind it, so that extreme care can be taken to do the best possible repair job. This is fine for small machines but becomes costly and impractical on the heavy type of equipment many of us are familiar with.

To help the repair man, many manufacturers have provided certain aids for him in designing their equipment, and we have been told by the purchasing man: "Take it off; that must make an additional machining operation. What will be the price reduction if you omit it?"

Safety factors in design are necessary for four reasons:

1. Uncertainty of ultimate usage or application.
2. Uncertainty of design calculations.
3. Uncertainty of materials.
4. Emergency or accidents.

Too much equipment is sold today without the designer knowing exactly what the customer is going to do with it. There are several reasons for this, many I think unnecessary, but still they exist. The customer is rearranging his plant and he knows he needs additional equipment and wants to order it so that it will be delivered at the time he is making his changeover; but his plans have not progressed to the point where he is sure where he will place, or what product he will work on the particular unit in question. He will order a general purpose machine, or give a very broad set of specifications with the hope that when his plans are complete, the new unit will serve his purpose with a minimum of change.

The designer probably knows this and is inclined to do one of two things: make that unit heavy enough to do anything it may be called upon to do in the future, in which case he knows his price will be high but his machine will not break down under abnormal loads. Or, he may take a chance so as to keep his price low and design for the lightest load application he dare, hoping to squirm out of a failure with the alibi that the customer was not specific, so "how was I supposed to know?"

This latter case is usually fairly well protected because of the safety factors he must use in his design in any case, so the unit will probably pull through, although its life

may be short and its efficiency may be low. The first case, however, may also have a low efficiency, and if it is actually put on a light load application, it will have a very low economical efficiency.

A little more time and effort on the part of the user before placing his orders will usually enable him to give the designer a definite picture of what the unit is to do. Many times a new product has been developed and the re-arrangement or new unit is occasioned by this new product. In developing this product, the equipment user has the means in his own plant to prove out exactly the ideal size, power requirements, special equipment requirements, etc., before ordering the new unit. This data would give the designer a much better opportunity to know how far he can go with safety factors and how effectively he can build in operator protection.

In making design calculations there are some things that cannot be figured. There are others which can only be approximated and, of course, there are many which can be computed accurately, provided the original information upon which the design is predicated is reliable. The unreliability of original information is the greatest reason for factors of safety on design calculations.

Materials are still uncertain but we know a great deal more today than we did ten years ago on this subject. Processing methods have improved, control methods have been developed, and we know better how to use those materials which are available. Many new materials have been developed, too, within this period, but still there are uncertainties, and we are forced to play on the safe side far enough to cover these uncertainties. We have improved foundry technique and forge shop technique, but there are residual stresses in all processed material and even with the best of control, there still exist many natural casting, forging and welding hazards which are ultimately protected against only by the use of a factor of safety.

Of course, we are always faced with the emergency and the accident—the unpredictable. Sometimes this is in the normal course of production, occurring from a temporary loss of production control. Cold stock is introduced into a warm machine. A feed is lost, or over-feeding occurs. Something is inadvertently dropped into the machine,

which creates an undue overload. Temperature control apparatus failures are not uncommon, and yet the stresses resulting from heat and load combined are impossible to calculate. Some most peculiar accidents occur from electrical causes, and either electrical or mechanical overloads result. True, these are emergencies or accidents, and are not in the usual specifications; but in one form or another, accidents happen daily and we cannot afford to have machine failures with every one of them. The design factor of safety is again your protection against these frequent potential shutdowns.

The best guarantee against frequent required maintenance interruptions is rigidity and perfect alignment originally, and sufficient and proper lubrication always. Most managers agree with this statement but they turn right around and let any third rate mechanic care for this alignment and lubrication problem. Small machines may be designed to be self-contained and self-aligning. Large, heavy machinery must be erected and aligned in the field. Much of the original design safety in heavy machinery is predicated on the assumption that an experienced heavy machinery mechanic will erect, maintain and repair it; yet our experience has shown that the mechanics in some plants are not at all familiar with the problem of handling heavy machinery.

The training of productive workers receives much attention today, but most managements just "hire another repair man." Proper installation, inspection, lubrication, and repairs when necessary, will materially lengthen the interval of time between repairs, and hence reduce this accident hazard as well as keep units on the production line longer; but few managers realize that the old-time mechanic who could do this work does not grow on every bush and must be trained or made today.

I feel that real safety in original design can only be obtained by a closer cooperation between the purchasing agent, the production manager, the plant engineer, and the safety engineer before they discuss their problem with the equipment designer.

The buyer invariably concentrates his attention on the production guarantee and the money saving features; all too often this is the production manager's point of view, too. The plant engineer is concerned with the space occupied and whether he has to

pipe water or steam to and from the unit, and how big an electrical connection must be brought in. The safety man may not hear of the unit until it is installed, when he will be asked to survey it and specify what additions the plant engineer must put on to give adequate operator protection.

All of these questions can be answered with a degree of intelligence by the machinery builder directly in proportion to the degree of specificness given him by the ultimate user. The designer can give you considerable if you will give him all of the

facts. When you who have the data ask him to do the guessing and steer a middle course between your own variously different departmental ideas, you will get a hodge-podge machine as a result; and yet the builder who knows best how safely he can trust his materials and the degree of safety in his calculations, knows best how far he can go in providing the other elements of safety you may desire to have incorporated without jeopardizing the production requirements, thereby giving the maximum economical in-built safety in the original design.

TUESDAY LUNCHEON SESSION

October 8, 1940

After the luncheon, the session was called to order by J. T. Kidney, Manager, Employees' Service Division, The Goodyear Tire & Rubber Company, Akron, O., who presided as Toastmaster. The report of the

Nominating Committee was presented and officers elected, as listed elsewhere in this record. The final feature of this session was the presentation of awards in the Rubber Section Safety Contest.

Presentation of National Safety Council Awards in the Rubber Section Safety Contest

Outstanding facts in the contest were presented by Mr. Gilbert E. Teal, Safety Supervisor, Naugatuck Footwear Plant, U. S. Rubber Company, Naugatuck, Conn., as follows:

The Rubber Section has conducted annual six months' contests since 1932, and last year the contest period was extended to include a full year's experience, instead of the January to June period originally in effect. Starting with 25 units in the contest in 1932, the enrollment has gradually increased, and in the contest year just ended 30 participants were entered in the contest.

These entries, representing 39,534 employees, worked a total of 75,969,153 man-hours, during which 389 reportable injuries occurred. This indicates that at least one injury occurred for each 102 employees represented. The frequency rate was 5.12 accidents per million man-hours worked, which is a new record for the Rubber Section contest.

Previous years' records varied from a high of 10.08 in 1937 to the low of 5.76 in the 1932 contest, when lack of definition and

understanding probably resulted in fewer accidents reported. Other years since 1932 show frequencies of 9.64 in 1933, 6.43 in 1934, 6.29 in 1935, 6.47 in 1936, 10.08 in 1937, 6.62 in 1938-1939, and 5.12 this year, a best record for the contest ever made.

There was a 13 per cent improvement over the 1938-1939 year for all entries. Large plants showed 22 per cent improvement, but small plants showed a 40 per cent increase in accidents over the previous year. Frequency for the large plants in Groups A & B was 4.67 while Group C & D reported 8.75 accidents per million man-hours.

The 1940-41 contest year will show us how well our house is in order. We have a new record to beat now. We will be getting more orders, due to Government defense programs. We will be hiring more new men, not as highly qualified as our previous personnel. We will be transferring women to jobs formerly done by male employees. We will work more at night under artificial illumination which may or may not be adequate.

Conservation of man power and human

resources during the coming year is our contribution to National Defense. Plant expansion, heavy hiring of untrained men, and increased production put us on the spot. Even with some of the cards stacked against us, let us try to set a new record again next year.

The awards in the contest were presented in the name of the National Safety Council by Mr. J. I. Banash, Consulting Engineer, and Past-President of the National Safety Council. The awards consisted of handsome Bronze Plaques depicting an eagle in flight and the Universal Safety Emblem, which were given to each of the winners of first place in the contest; and Certificates of Merit, each a lettered scroll, which were given to winners of second and third places.

In the lists below, winners of first place are indicated by the numeral (1), and win-

ners of second and third places by the numeral (2) and (3) respectively.

Group A & B

1. U. S. Rubber Co., Naugatuck Footwear Plant, 8,155,327 hours, 5 injuries.

2. U. S. Rubber Co., Indianapolis Plant, 2,532,311 hours, 3 injuries.

3. Dominion Rubber Co., Ltd., St. Jerome Plant, 2,381,026 hours, 3 injuries.

Group C & D

1. Van Cleef Bros., Chicago, Ill., 387,113 hours, 0 injuries.

1. Collyer Insulated Wire Co., Providence Plant, 221,404 hours, 0 injuries.

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TUESDAY AFTERNOON SESSION

October 8, 1940

The Placement of Accident Responsibility

By PAUL VAN CLEEF

Van Cleef Brothers, Chicago, Illinois

Whenever an accident happens the first question that arises is: "How did it happen?" That may only be answered by an investigation. In that way the direct and indirect causes will be discovered. If it were a street accident involving automobiles, the subject of traffic rules not observed may be mentioned first. Then the condition of the participants and their training. What were their social backgrounds? As well, the condition of the street will be considered, and perhaps the location of adjacent obstacles to clear view, such as other cars, buildings or signs. Perhaps mechanical warnings furnished by the city were out of order, or a rule of the road enforceable in one place inapplicable in this. The extenuating circumstances reach back far into society's organization.

When we speak, therefore, of the placement of accident responsibility, we are dealing with a subject of many ramifications. It is of interest to look at our present national, state and local viewpoints regarding

this important matter. In such a study, one can observe to what an extent the safety movement, inaugurated over 25 years ago in this country, has developed.

Broadly speaking, accident prevention occupies three fields—the home, industry, and the public. Naturally each of these calls for activities of a different sort. Therefore, the agencies may vary. Fundamentally, they all take the same forms such as education, engineering practices, and laws. If we reach back to the broadest interest we find the Federal Government devoting a great deal of effort to accident prevention.

The Honorable Frances Perkins, Secretary of Labor, speaking before the National Safety Council last year, laid particular stress upon this. She stated that the Federal Government had an obligation in this direction. The U. S. Department of Labor has been charged with the responsibility to assume leadership in the cause of safety. It has "established a special unit as a service aid in developing better safety and health

standards and to aid and promote their adoption by management and by the State." The Federal Government is the largest employer of labor and thus has definitely embarked in this form of safety work.

To carry out such objects, a Federal Interdepartmental Safety Council was organized to act as a clearing house for safety programs. Madam Perkins referred to three safety promoters—education, engineering and enforcement. Thus she epitomized what she conceives as the government's responsibility in helping to preserve the government's workers against personal injury. One of the best visual evidences of this is the danger flags used by WPA workers surrounding many jobs.

What is the position of our states in relation to this subject? Most of the states have established laws pertaining to the compensation of workers who suffer injuries, and in some no autoist is allowed to drive a car who doesn't carry insurance. These acts indicate that the state appreciates its responsibility in the elimination of accidents, for the payment of money for damages is always a deterrent force. The effective way to learn of the progress which states make in the safety movement would be to trace statistically each state's improvement in this field over a period of years. This much is true that since 1917 the total accident rate in this country has steadily decreased by states. But it is not possible to state whether the states' governments are to be directly credited with this gain.

As far as automobile safety records are concerned, the winning of the first award by the state of Minnesota in 1939 must be directly attributed to the great efforts made by it under the inspiration of Gov. Stassen.

In Illinois the Department of Labor takes a live interest in industrial safety. It has a corps of efficient inspectors who make frequent and regular contacts with companies throughout the state who are imbued with the idea not only of enforcement, but of helpfulness. This bureau has done much to reduce the hazards of occupations and apparently has a fine realization of its share in promoting accident prevention. No doubt other states have equally good records and industry owes such institutions its very best cooperation in fostering all of their activities.

Where do the cities, towns and other

branches of government line up? Their interests seem primarily centered on public safety which is admittedly an important enough field in which to accomplish good. Strange to say, many of these units are more interested in the collection of fines for infractions of law rather than in an effort to control traffic for the ultimate benefit of the individual. In Chicago, the City Council has a committee interested in reducing traffic casualties, a traffic court radios a part of its proceedings and a Keep Chicago Safe Committee is headed by Mayor Kelly himself. Here may be observed a sense of responsibility whose example may well be followed by many other cities and towns. Other notable examples of safety consciousness are the cities of Cleveland, Kansas City and Worcester which won the awards of the National Safety Council for the best safety records. There is a growing sense of responsibility in every part of the country toward improving safety records.

Let us take a look at non-political divisions of our life, perhaps best defined as economic and social, which are undertaking the solution of our personal injury problems. Foremost, above all stands the National Safety Council of which we are a part, and next the numerous local city councils. These groups have no enforcement powers. They must, therefore, exercise all their efforts through educational channels. They cannot make regulations. They only suggest ideas for the promotion of safety and stimulate a constant interest in it. These bodies represent a sense of responsibility which stems directly from those whose personal activities create safety problems. The industrialist, the plant manager, the fleet owner, the safety supervisor and the worker himself constitute the backbone of these agencies. Just who among these groups should be held most accountable for improving the record has always been a debatable subject.

Possibly a glance at the record first will show how we stand in regard to solving the safety problem, then we may consider what other people think, suggest how to go about producing a better record and draw a final conclusion. Let us look at the industry which caused the largest number of deaths in 1939. We find that 4,200 agriculture workers were killed while at work. These deaths made up 27 per cent of all occupational accident fatalities. While this repre-

resources during the coming year is our contribution to National Defense. Plant expansion, heavy hiring of untrained men, and increased production put us on the spot. Even with some of the cards stacked against us, let us try to set a new record again next year.

The awards in the contest were presented in the name of the National Safety Council by Mr. J. I. Banash, Consulting Engineer, and Past-President of the National Safety Council. The awards consisted of handsome Bronze Plaques depicting an eagle in flight and the Universal Safety Emblem, which were given to each of the winners of first place in the contest; and Certificates of Merit, each a lettered scroll, which were given to winners of second and third places.

In the lists below, winners of first place are indicated by the numeral (1), and win-

ners of second and third places by the numeral (2) and (3) respectively.

Group A & B

1. U. S. Rubber Co., Naugatuck Footwear Plant, 8,155,327 hours, 5 injuries.

2. U. S. Rubber Co., Indianapolis Plant, 2,532,311 hours, 3 injuries.

3. Dominion Rubber Co., Ltd., St. Jerome Plant, 2,381,026 hours, 3 injuries.

Group C & D

1. Van Cleef Bros., Chicago, Ill., 387,113 hours, 0 injuries.

1. Collyer Insulated Wire Co., Providence Plant, 224,404 hours, 0 injuries.

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sents an average for all industry, taking into consideration the numbers employed, agriculture compares unfavorably with some other employments. Manufacturing, of which we are a part, for example, includes 22 per cent of all workers but contributes only 11½ per cent of all occupational deaths.

Apparently machinery accounted for many deaths in agriculture, showing that somewhere along the line insufficient thought and attention were being given by the proper authorities to this vital subject. I do not know whether the U. S. Department of Agriculture has even concerned itself with it. Do the various state bureaus issue bulletins to farmers on the use and care of machinery and the avoidance of accidents? Of course the causes of agricultural accidents are manifold and vary by states, but it is probable that lack of training and advice is due to a lack of needed agencies for spreading more education for the prevention of accidents.

A much greater sense of responsibility appears in the industrial field. The best evidence is the constantly improving record. Except for 1932 and 1933, the year of 1939 had the lowest death total for occupational accidents since 1928. The rubber industry was near the top of the 1939 list both as to frequency and severity among industries with relatively few injuries or days lost.

Since 1926 the frequency rate has declined a total of 69 per cent. Most of the decrease occurred prior to 1932, and from 1933 to 1937 there was little change. In 1937 the rate index was 39. In 1938 it dropped and in 1939 to 31.

In 1939 the severity rate was only half as large as in 1926. Much to my regret, I understand that in 1940 there is an increasing trend toward accidents. This no doubt is due to the hectic state of present affairs. When calm returns to the country we will again achieve better records.

Every known cause of accidents must come under the scrutiny of those interested in accident prevention. Not alone must guards be provided for equipment. Reports of State Labor Departments or Industrial Commissions indicate that injuries due to handling objects made up 24 per cent of all compensated cases. Manufacturing showed that this source of accidents came first with a total of 26 per cent. Falls are a prolific

source of trouble and are at the head of the compensation list.

An American Standard Cause Code analysis of 1,000 cases submitted by the N. S. C. found that an unsafe act was found in 87 per cent of the cases and a mechanical cause in 78 per cent. The most important unsafe act was unnecessary exposure to danger, including 26 per cent of all cases. Lack of knowledge or skill was the personal cause found in 48 per cent of the accidents. Improper attitude was indicated in 31 per cent and only 3 per cent in bodily defects.

On the other hand, numerous companies throughout the country have perfect records, that is, without a lost time accident.

The best no-injury record in American industry, compiled by the National Safety Council, is an honor roll to be proud of. Many of the country's leading industries are represented. It is hard to realize that any company, for example, could accumulate over 11 million injury-free hours. It certainly raises the question of how it could be accomplished. What is the marvelous force behind such a record or similar ones? Who assumes responsibility for the prevention of injuries? Do these firms rely on the workers among the rank and file? Perhaps the foremen or supervisors carry the banner of safety. Some will credit management.

It was Tom M. Girdler, chairman, Republic Steel Corp., speaking to the Metals Section of the National Safety Council at the 25th Congress, who said he recognized the great problem of safety, knowing that in it there can be no dissenting voice. Mr. Girdler, by the way, credits the steel industry with providing the leadership and the initiative in the safety movement. As early as 1907 the Association of Iron and Electrical Steel Engineers appointed a safety committee. Later in 1912 it passed resolutions to organize and guide a permanent body devoted to the promotion of safety to human life in the industries of the United States and out of this came the National Safety Council.

There is no question but that some companies have splendid safety records because of the leadership shown by management. One could select many examples of this, but take only a few. Writing in 1937 on the subject of "A Paying Proposition," Lamont du Pont, president of du Pont Company, considered that human interest was a worth

while motive justifying the safety effort. His company's Old Hickory Plant secured the 11 million man-hour record mentioned. The inspiration most assuredly came from the top. The General Motors Corp. is another example of what can be accomplished in leading an industry's record. When the Fisher Body Co. made an outstanding record for the automobile industry, it was Mr. Sloan who personally sponsored their safety contests and thus indicated where in his company a sense of responsibility was placed.

Early in the last decade various du Pont plants began to have long no-accident records and Mr. Irene du Pont, then president, agreed to recognize personally any record made by a plant of the company which equalled or bettered a rather remarkable one which a certain plant had accomplished, which again shows the influence of management.

In 1935 a contest for finding and eliminating unsafe practices and the uncovering and remedying of unsafe conditions was held in all of the du Pont plants. Du Pont operates more than eighty plants.

M. L. Wurman, plant manager for Bayuk Cigars, Inc., Philadelphia, stated, "Unless management assumes responsibility and participates actively in the cause, the industrial safety movement will never reach its ultimate goal. Management must insist on safety." This firm realized through injuries that something must be done. They felt that supervision was the key to their problem.

But here is a somewhat different view. Mr. R. H. Cabell, president of Armour & Company, was quoted in *National Safety News* of June 1938 to the effect that foremen are held accountable for safety just as much as for output. He stated further that experience has shown that safety education alone is effective only up to a certain point. Nevertheless, he pointed out that when vigorous executive action is added to education the accident rate in a plant drops sharply.

Another example of where the head of a company shows his interest is in the article by E. G. Seibert, president of the Standard Oil Company (December 1936 *National Safety News*) which company has had organized safety for 20 years and has won many awards. Accidents were reduced 96 per cent in the manufacturing department.

Costs of prevention, such as nurses, etc., fell to 48 per cent. In sales department improvement was 80 per cent.

Mr. Thomas S. Hammond, president of Whiting Corp., Harvey, Illinois, wrote in the *Executive Service Bulletin* of April 1940 an interesting article on "Personalizing Accident Prevention." This coming from the head of a very prominent organization is a clear example of responsibility acceptance. He believes it desirable that if noteworthy improvements in accident records are to be made, efforts must be directed down a path leading to individual response of every person in his organization. The result was 1,426,697 man-hours without a lost time accident. "This accomplishment was due to a recognition that, from management or ownership down, the responsibility for fingers, eyes, toes and the body remaining unharmed was on each and everyone in the company." What a fine record and what a fine spirit are combined!

Maintaining interest in safety is part of the educational plan and subject to that sense of responsibility so necessary to keep up a good record.

I would like to consider one more case of this type. If we take the opinion of W. E. Mitchell, vice-president and general manager of Georgia Power Company, who speaks for executives, he believes that management should take the lead in carrying out a program of safety work. He feels such a program must not be of the spasmodic type but of continuing force. Since the staff will reflect the policy of the company all the way down the line, it will be just as conscientious. He is convinced that management must meet with the committees and must actually lead all employees in the activities taken to prevent accidents. Quoting from Mr. Mitchell, "The foreman is the key-man in any safety program, but he will never truly enter into it, nor sell his men on it, unless the superintendent, local, district and division managers and the main office supervisory staff, clear up to the general manager and president are also thoroughly sold on the worthwhileness of the plan. Therefore a same program must be organized from the top down."

Very interesting is this attitude expressed by Mr. Mitchell. "It is my belief that in getting at the causes of accidents, management must assume a social responsibility

for the welfare of its employees." So his company seeks to alleviate employees' personal worries. It provides benefits in case of sickness or accident, annual medical examinations, makes loans to employees possible and so on. This considerate and broad-minded policy reduced accidents sharply after its adoption and justifies his company's humanitarianism.

Why are we so interested in the matter of the placement of accident responsibility? Do we wish to punish those who seemingly shirk it? No doubt we are groping for reasons to reinforce the efforts made. Waste is to be avoided and no avenue is to be left closed that will lead to a greater sense of this responsibility. It is that hope that through an appreciation of responsibility the accident records may be improved.

In the rubber group, one of the best evidences of a sense of responsibility, is the presence at the Congress of so many representatives of this industry. They come here to learn from one another and from the other industries what the latest thought is. They are ready to give from their own experiences whatever help they can. The splendid record of this industry as a whole and of the numerous companies with outstanding records should prove an inspiration to this Congress. For none of these achievements could be established without the wholesome sense of responsibility so necessary in the reduction and prevention of accidents. I am sure that in every case where a safety record has been maintained on high level, management will be found supporting wholeheartedly every plan or effort made to safeguard the lives and health of the workers. There, also, will be found workers entirely in sympathy with management. Beyond there will be discovered the families who encourage the workers to share with management the desire to make their plants safe places to work. Can such a combination be beaten?

I corresponded with several of our leading members in the belief that a knowledge of the attitudes of the various parts of their organizations would add to our information. The responses were wholesome and very interesting.

A personnel director of a moderate sized company, in writing to me about the good safety record of his company, stressed the fact that competent leadership is required

to carry out a good safety program with sufficient time allowed for the purpose. He himself is charged personally with organizing the program and is supported morally, if not actively, by his company's officials. However, I believe his work would be more effective if his superiors were to participate in the safety program. If possible he should secure such interest in some direct manner. It would emphasize the quality of his work. There are many ways to do this, such as by presenting trophies, coming to meetings of committees of employees and talking for safety. He should not overlook the beneficial effects which the personal contact of employees on behalf of safety gives to any safety program.

A representative rubber company believes that there is a close relationship between plant safety and sanitation. If plant conditions are hygienic and pleasant, then safe conditions are also promoted. For this reason it has a committee in each field. The membership of these committees includes the physician, an office force representative, department managers, chief of plant police, personnel manager and subcommittees composed of foremen and workers—a very democratic arrangement. Thus it is obvious that no element concerned with safety is overlooked, a very important consideration where there is a desire to distribute the responsibility widely. The plant superintendent in this case has immediate charge of all the safety activities.

In another company the vehicle for direct safety action is entrusted to a committee composed of the foremen of several departments. At all meetings of this committee they have as guests two foremen, supervisors or executives. These men take an active part in the meetings and their views, opinions and recommendations are always considered.

Another company places the responsibility for the prevention of accidents with the general plant safety committee through the management which builds the entire program around the foremen and supervisors. The program is first presented to their executives, which include the general manager and five division heads. This program is presented to the supervisory force for execution.

I would like to name one of our group that went almost 800 days without a lost

time accident for 1,600,000 man-hours. In this company every important safety notice is signed by the vice-president in charge of production. This man has appeared on the safety platform and is 100 per cent behind the plans of his company to do safety work. His company reaches all employees, as soon as hired, with a safety talk. The National Safety Council booklets are given to them. Regular plant inspections, supervisors and workmen's safety committees, thorough investigation of all accidents, constant check-up of plant conditions and use of workmen to preach safety are just a few of the many agencies used to actuate the safety work.

If there is a desire to understand the real cause of accidents, the myriads of agencies, governmental, state, city, public and private which exist should be of prolific help in accomplishing this. When the causes are understood, the responsibility may be placed. It is apparent that the placement of responsibility for accident prevention is not simple. Does it reside as a whole in society? Is our economic structure at fault? Are we so rich, for example, that the very abundance of automobiles represents a danger? Are there social differences which make people indifferent to the welfare of others? Wherein can these elements be corrected?

Has any thought ever been given to the increase in life period on our accident problem? The other day a police officer in Evanston was penalized because he insisted that an elderly woman observe the traffic rules. It was comical to read about it, yet it has its serious implications. In 1900 the life expectancy at birth was 48 years. In 1920 it was 54 years. In 1940 it will be 65

years. In 1900, 13.7 per cent of the population was over 45 years old, whereas, today 20.2 per cent have reached that age. The percentage of those past 65 has risen from 41 per cent in 1900 to 63 per cent today. With aging comes a greater expectation of leisure and an increasing problem of support. In industry remains a growing body of older people. What is industry going to do about these people? Will the government be able to keep them out of harm's way? Will the aged increase or diminish our accident problem? Here is an underlying situation that must be considered in connection with the placement of accident responsibility. It is upon us now.

Just as we see this stage in our study of the broad question, we can look further backward to the good old days before industry came to the fore, when society was largely agricultural. I suppose in ancient days when the shovel and scythe or sickle were the chief implements of the farm, accident records were of little concern. Today with the highly mechanized equipment on every farm, the story is different. Possibly we should blame Galileo for this. From his brain sprang physical science, both theoretical and applied, and from this came modern industrial civilization. Would it be fair to blame him?

Our association is with increased life, with increased mechanization, with a faster tempo of human activity. Just as Galileo started a world to thinking, we are confronted today with a society so integrated that the least of us has a responsibility he cannot shift. The burden of accident prevention confronts each and every one.

Public Opinion Frowns on Recklessness

By LAWRENCE H. SELZ

President, Lawrence H. Selz Organization, Chicago, Ill.

As publicity experts, it is the job of my organization to be specialists in interpreting and shaping the thought processes of the public to the accomplishment of certain ends. The objective might very well be to sell traffic safety completely and irrevocably to the country at large.

In any case, our methods are the same. We first find out "what people already think" and then proceed either to reshape mass

thinking on the subject, or to bring the subject into conformation with public opinion.

Now it seems to me, as a public opinion specialist, that your various groups have begun to apply these principles rather successfully in the job of selling traffic safety to the public. More and more public opinion is beginning to frown on the reckless citizen.

Time was when publicity on behalf of

safety consisted primarily in keeping the facts about accidents of any sort—their number, cause, and results—in the forefront of public attention. A good job has been done in keeping aware of these deplorable accident facts, and the public shudders as it thinks about these things.

I say "shudders" advisedly because your campaign for safety, and I mean of any sort—traffic, industrial, and domestic—for a long time was built primarily on one emotion—that of fear. You have been depending on this one thing—fear of sudden and violent death—to lower the number of accidents. It's true that there is no stronger basic instinct in human nature than that of self-preservation, but it's also true that this instinct operates most effectively only in an emergency.

It has always been my belief that a safety campaign based solely on the negative attitude of fear is sharply limited in effectiveness. It fails to marshal an actively approving public opinion to back up your efforts. You are attempting to coerce people into being careful under threat of death, instead of making them want to be careful under pain of forfeiting the esteem of their fellowmen.

It is only when you get public opinion to frown upon recklessness that you enlist full and complete support to cut down the accident rate.

During the time I worked on the daily newspapers in the 1920's, each of the metropolitan newspapers had a rule that never should a woman be shown smoking a cigaret. It is only seven years ago that the first movie came out showing a respectable woman actually smoking a cigaret. The first ad which carried a picture of a woman with a cigaret caused tremendous consternation.

Yet today you will find at church socials in the smallest and most prudish towns in America that the dignified matrons in those communities think nothing whatever of smoking while they discuss the gossip of the day. I cite this only to explain how social attitudes may change in a short space of time.

Will a similar change take place, I wonder, in the public attitude toward the accident offender whose recklessness endangers the life and property of others? I think we can trace the beginning of such a change

to the new tactics that are being used to sell traffic safety.

Today the traffic policeman is, to a far smaller degree, an enemy in the motorist's mind. One of the biggest things that has happened to bring him closer to the public he must supervise is the fact that policemen have been stationed at grade school crossings in communities through the nation. From earliest childhood, now, the policeman is becoming a friend and protector, rather than an antagonist and someone to fool.

His attitude, too, has changed. Instead of the old "Where d'ya think yer goin'?", he now takes a much more civil tone in his explanation of why you are being given a warning or a ticket. I think all of you can well afford to ask yourselves whether you are taking the attitude in your plants of the old-time policeman or the modern policeman. Are the employees trying to fool you or are they trying to cooperate with you? Are they afraid of you or do they realize that you are there solely to protect them from their own mistakes?

One of the most attractive characteristics of young people is their lack of fear. You will find it hardest of all to sell safety to the young on the basis of fear of accidents. But once let them think that it is not "smart" to violate safety rules, once let them realize that they will be in disgrace with their fellow citizens if they do, and they will be sold on safety 100 per cent. This is a point which is becoming more and more important in modern safety publicity.

But can this great principle—mobilizing public opinion against anti-social recklessness—be applied in other kinds of safety campaigns—industrial safety drives, for instance? I believe that it can, with good results.

Now I would be the last to disparage the patient and valuable industrial research and engineering that have done so much to eliminate the causes of accidents in our factories. The dangers of the penultimate hour of the shift, the protective devices that have been devised, the training in working motions to avoid accidents have all played a valuable role.

But in the very effort to make machinery and equipment "fool-proof," laudable as it is, do we not too often neglect the human element? No matter how you train them,

men are not machines. If safety rules are handed down in the form of an order "from the front office," without the workers' understanding or caring, what kind of cooperation can we expect?

It is my firm belief that safety efforts in industry will fall short of the mark, unless we succeed in creating widespread sentiment among the employees themselves that condemns recklessness as anti-social.

Just as today's powerful automobile brakes are of no use if the driver fails through drunkenness or poor judgment to use them, so all the safety devices in the world will not prevent industrial accidents unless the workers exercise the proper precautions and understanding.

How can "public opinion" among the workers be built up against recklessness?

Naturally this is a question that must be solved in detail by each individual factory and shop. But it seems clear that education and discussion can play an indispensable part in any such process. Education brings home the causes, frequency and consequences of accidents. Discussion among employee groups, properly directed, can be relied upon to bring many suggestions for eliminating safety hazards, some of which may be new; but, most important, it will get the workers themselves to thinking about safety; it will help build up a sentiment within the plant against recklessness and taking chances.

Is not the individual who takes chances in the factory often as great a hazard to his fellows as the drunken driver is on the highway?

Again the same old principle works. The fellow who is too lazy to use protective devices, or thinks it is "smart" to take chances, will be little moved by a set of regulations. He may even take delight in evading safety inspectors, as some people seem to delight in parking near a fire plug if they can "get away with it."

But let him once realize that his fellow workers condemn his carelessness, and he will mend his ways pretty quickly. Incidentally, that is why it is so important when conducting a safety effort in a factory to try and draw into the administration of it men and women who have the respect and admiration of their fellow-employees.

Dr. Alvin Johnson, of Yale University, has expressed this tendency by saying that, "Discipline by consent is rapidly displacing discipline by dictation."

It may seem simpler and quicker to draw up a set of safety regulations based on the findings of industrial engineers, put them into effect by executive order and trust to safety inspectors for their enforcement. Undoubtedly, this procedure can be followed where management is not interested in selling the idea of safety to employees. But as we have already pointed out, this would mean sacrificing the great power of public opinion among the employees themselves to bring the careless and reckless worker into line.

It may take more time and trouble to arouse this public opinion on behalf of safety within the plant, but you will be well repaid for your effort. Just as the reckless driver and traffic law violator is increasingly frowned upon by fellow motorists, so the worker who neglects safety precautions will be frowned upon and rebuked by his fellow employees. When tempted to "take a chance," he will be restrained by his fear of "what people will think."

Our century is gearing itself for a great defense effort. Industry has vital tasks to perform in building up our preparedness. As the wheels of industrial plants turn faster and faster in response to the needs of our defense program, undoubtedly considerable numbers of new workers are going to be drawn into the factories.

To train this new contingent of our industrial forces in the basic principles of safety constitutes both a responsibility and an opportunity. From the first we can accustom them to the idea that carelessness, recklessness and chance-taking are frowned upon both within and without the factory. We can inculcate a sense of social responsibility to avoid accidents.

In doing so, we shall be following the principle that has already proved its worth in the drive to make our streets and highways safer—the principle that people are moved not only by fear of personal injury or death, but even more by the positive desire to win praise and avoid condemnation from their fellows.

Dermatitis in the Rubber Industry

By DR. W. E. OBETZ

Medical Investigator, Division of Safety and Hygiene, Industrial Commission of Ohio, Columbus, O.

To those of us who are interested in industrial claims and compensation for disability and medical expense, it seems that a large percentage of skin diseases are industrial. Investigators, however, advise us that only from 2% to 20% of all skin diseases are occupational in origin. When occupational diseases are classified, it is found that about 65% of all claims filed are due to occupational skin diseases.

In the rubber industry, dermatitis has long been known to be one of the prevalent occupational diseases. A few years ago, and perhaps even yet to some extent, rubber poisoning, rubber itch and rubber dermatitis were frequently reported by employees and attending physicians wherever skin irritation was found to exist. More recently, however, physicians are required to give a more accurate description of the cases they treat, and the reports filed are usually more inclusive and give a much better idea of the conditions under treatment.

Previously, much of the dermatitis in the rubber industry was attributed to hexamethylene-tetramine, commonly spoken of as hex or hexa. More recently, the use of this chemical has been eliminated or it has been so combined with other chemicals that its irritating action has been greatly reduced. It is said that if this chemical is combined with sufficient amounts of sulphur, a reaction occurs in which a non-irritating compound results. If, however, some of the hexamethylene remains uncombined or remains in an acid reaction, formaldehyde and ammonia are liberated, thus accounting for the irritation of the skin that results from contact. It has been found that persons who have an acid reaction of the perspiration are more subject to hexamethylene dermatitis than those having an alkaline reaction.

Basing an opinion upon the experiences of those who have treated dermatitis and written articles upon their conclusions, it is probably advisable to consider all of the chemicals and compounds used in the rubber industry as being capable of producing skin diseases in persons who happen to be sus-

ceptible. Reports that have come under our observation have shown that not only rubber compounds but even soap stone, talc, varnish, lacquers, ink used for stamping and the soap used in the wash room were found to be responsible for dermatitis. In this day of allergic reactions resulting from so many common household articles, even such as foods, spices, flour, sugar, etc., it is not surprising to find persons who are allergic to almost anything.

It is generally accepted, however, that the accelerators, anti-oxidants and stabilizers are the most frequent offenders in the production of dermatitis. Some of our industrial physicians, however, seem to be of the opinion that solvent such as gasoline, naphtha, benzol, carbon tetrachloride, etc., are the most frequent causes of dermatitis in those cases coming under their supervision.

Classification of Causes

To understand the mode of action by which these causative agents produce skin disease, it is well to give a classification of causes. The classification given by Dr. Schwartz is very complete and helpful, as follows:

1. Physical agents—such as burns, scalds, extreme cold, friction or trauma.
2. General irritants—substances which will irritate any skin. Included in this list are the strong acids, alkaline, corrosives and solvents.
3. Specific irritants—those which do not affect every individual but may react on hypersensitive persons. Under this classification,
 - (a) Oils and greases—lubricating oils, vegetable oils, etc.
 - (b) Dyes and dye intermediates. Various aniline dyes, some of the solvents used in dyes and their products.
 - (c) Explosives—T. N. T., fulminate of mercury, etc.
 - (d) Rubber compounds, including the accelerators, hexamethylene, etc.
 - (e) Plants—ivy, sumac, pyrethrum, primrose.

(f) Biologic agents. These are divided into

1. Parasitic insects, such as may cause grain itch, straw itch, etc.
2. Bacterial infections; anthrax, glanders, trypsin.
3. Fungus infections occurring among those who handle fruits and vegetables.
4. Ringworm infections occurring in barbers, wool sorters, fur manufacturers, and swimming pool attendants.

Skin Lesions

The skin which forms the protective covering of the body is usually soft and pliable. It contains oil glands which secrete an oily substance, sweat glands which produce the perspiration that aids in temperature control, nerves and nerve endings which are instrumental in perfecting our sense of touch or feeling, and hair follicles from which the hairs on the surface of the body protrude. In addition to its secretive function, the skin is also absorptive and has the ability to take up or absorb solutions or emulsions and possibly some dusts which come in contact with the skin. An example of this is the rapid development of aniline poisoning after some aniline dye is spilled upon the clothing, or a pair of shoes which has been dyed and is worn before the dye has thoroughly dried. In medicine, some drugs are given by being rubbed into the skin in ointment form.

When the skin becomes diseased, the lesions are usually one of four classifications, either macules, papules, vesicles or pustules. In common phraseology, this means that the skin may be red in the form of a rash, may have small pimples raised on the surface, may have water blisters, or may have small blisters containing pus.

In industrial dermatitis, irritating dust or solutions such as acids, alkalies, plating solutions, etc., produce a redness of the skin which may become more extensive as the contact continues. Sometimes such a condition is complicated by a bacterial infection. Oils and greases are sometimes irritating, but more often produce small pustules by plugging up the pores in the skin with oil or grease that contains bacteria. The result is oil folliculitis, or what is commonly called "oil boils." Dusts or chemicals in powder

form may be caustic in their action, such as lime or cement, or they may simply produce a mechanical irritation by friction and also tend to plug up the normal openings of the skin sometimes with infection. The fat solvents, such as naphtha, gasoline, benzol, carbon tetrachloride and washing powders dissolve the natural oils of the skin, leaving it dry, roughened and sometimes covered with minute cracks or fissures which form an ideal surface on which secondary infections may develop.

Plant poisonings such as ivy, sumac and primrose usually produce water blisters in persons who are susceptible. Some of the allergic reactions produce similar skin lesions. Various parasites, such as grain itch, jiggers, ticks, etc., burrow into the skin usually leaving a small pimple at the point of entrance. Bacterial infections are quite often secondary and it is interesting to note that pus producing organisms have been found when bacteriological examinations have been made of crude rubber. Fungus infections and ring worm quite often produce small water blisters between the toes or the fingers and these blisters rupture, leaving raw excoriated surfaces beneath.

Allergic skin reactions may result from internal or external causes. Certain foods will cause an outbreak of urticaria, commonly called hives. It has been said by some writers that much of our eczematous dermatitis is allergic in origin. In such cases the skin lesions are not always typical, and the causative agent is difficult to determine.

In a recent article commenting upon allergic reactions, Dr. Sulzberger makes the following statement. "Given a sufficient degree of susceptibility to sensitization or a sufficient concentration of exposure, every potentially allergic substance can, on occasion, sensitize; and thus become the competent producing cause of a dermatosis. In other words, the older concept of poisons or irritants which was originally the basis of most compensation laws, led essentially to a listing of certain substances as recognized causes—to a list which included, mainly, known primary poisons or irritating substances."

It is evident, therefore, that many of the substances to which employees may become sensitized following either short or prolonged exposure are not necessarily poisons or irritants. Such substances are called aller-

genic or, as Dr. Sulzberger calls them, sensitizers.

Another quotation from the same article gives this information. "The present day concepts of allergy as a relatively common and basic factor in the production of occupational dermatosis leads to the conclusions, first, that no list of substances will prove adequate to encompass all the possible causal agents; and, second, that many allergic dermatoses will be attributable not to any one cause or factor but to a complex mechanism, a motley interplay of various causes and factors, some constitutional and hereditary and some acquired, some local and some systemic, some of occupational and some of non-occupational nature.

"This conclusion shows that it is necessary for the industrial physician to be on the alert for remote causes of the questionable cases arising in industry, and it is possible that the sensitizing substances may be encountered in the home and, therefore, the condition would be non-industrial. Such non-industrial exposures could be due to dyes, cosmetics, toilet articles, insecticides, clothing, paint, varnishes, plants, soaps and similar substances."

Treatment

The treatment of industrial dermatitis requires, first, that a definite diagnosis be made by a competent physician in order to be certain that the disease is industrial and to rule out non-industrial cases. In a large plant with 1,000 or more employees, it is only reasonable to expect that there would be many cases of non-industrial dermatitis. In one such plant, 29 doubtful cases of skin disease were encountered during the first six months of this year and were referred to a dermatologist for a diagnosis. The reports submitted show that many various skin diseases were encountered; these included keloid, tinea infections, folliculitis, erythemas, psoriasis, seborrhea, urticaria, and other non-industrial diseases, as well as a few that were found to be the result of contact at work.

If the disease is found to be of industrial origin, then an effort should be made to determine the cause in order that it may be removed. In this, individual patch tests are quite often of value. The employees should be removed from contact with the offending substance by a change of employment or

protected by the use of appropriate clothing. Suitable medication, such as lotions, ointments, etc., are usually prescribed by the attending physician, and in some instances, the use of the x-ray for treatment has been found very beneficial.

Claims Filed in 1939

In Ohio, most of the smaller plants engaged in rubber manufacturing are covered by state fund insurance, while several of the larger plants are self-insurers. In the state risks, a total of 41 claims are filed during the year; 18 of these claims were for industries engaged in rubber manufacturing other than tires or tubes. Seven of the 18 claims showed a loss of seven days or over, but the total time lost from all of these claims was 179 days. In 11 claims there was no loss of time. From plants engaged in the manufacture of tires and tubes, 23 claims were filed in which there was a loss of time in 22 totaling 237 days, and no lost time in 11 claims. It is evident, therefore, that there was very little loss of time as a result of dermatitis and that in 22 out of 41 claims, medical expense only was involved.

The claim in which the longest period of disability occurred was that of a young woman who was wrapping inner tubes with wax paper. The exact cause of her dermatitis was not determined, but she had several recurrences and the attending physician seemed to be of the opinion that heat was a factor. In another claim a man lost nine days because of a dermatitis which resulted from contact with varnish used in varnishing tubes. Another man lost 20 days because of a dermatitis resulting from the use of glycerin. After the cause was determined, the man's employment was changed and he returned to work.

In some of the large rubber plants where thousands of employees are in daily contact with various chemicals and rubber compounds, mild cases of dermatitis frequently occur and are treated at the plant hospital with no loss of time from their work. One of these plants has not had a compensation case of skin disease in three years. In many instances a change of employment is all that is necessary if such can be arranged. In another plant in which individual case records were available, it was found that 169 cases of skin disease were treated during 1939. In only two of these was compensa-

tion awarded for a loss of more than seven days. In this group of employees were 123 males and 46 females. In most instances the skin disease was attributed to contact with some of the rubber compounds.

A summary of the claims shows that rubber compounds were given as the cause in 100 claims, tube stock was mentioned in six claims, rayon cord stock in five, and various chemicals, oil, paint, tape, etc., were mentioned in 15 claims. From the standpoint of age of the employees it is found that only one case was less than 20 years of age; 28 were between 20 and 29; 69 between 30 and 39; 45 between 40 and 49; 23 between 50 and 59, and 3 were 60 or more. It is evident, therefore, that age plays little or no part in the development of industrial skin disease and in this particular plant, the age of greatest susceptibility was between 30 and 39 years.

It seems safe to conclude that there are occupational hazards in the rubber industry and that there are many cases of industrial skin disease developing from contact with various chemicals and compounds used in the manufacture of rubber products. Most of these cases are very mild, requiring treatment but causing very little if any loss of time while under treatment. A small percentage of these cases are of such severity that the employees are disabled usually from several days to a few weeks and are, therefore, entitled to compensation. The period of disability seems to depend largely upon whether or not the employees can be given different work, thus avoiding contact with the offending chemicals. A few of the cases have shown a tendency to recur if the employee is returned to the same type of work without adequate protection.

Prevention

The prevention of industrial skin diseases is dependent largely upon several factors.

1. *Efficient methods of handling chemicals.* It is frequently observed that the handling of chemicals, especially in mixing rooms, is accomplished in such a way that there is a great deal of unnecessary exposure of the workers. This is true not only in regard to the causes of dermatitis, but also such poisons as lead, arsenic and cyanides. In the manufacture of batteries, red and yellow lead compounds are used and it frequently

happens that these materials can be found scattered far and wide over the entire mixing room and pasting departments. In order to be efficient, mixing rooms should be equipped with bins or containers from which materials can be removed as nearly mechanically as possible with very little, if any, handling of materials or exposure of the employees. The old method of scooping materials from a barrel with a scoop or shovel should not be tolerated.

2. *Good Housekeeping.* This includes keeping the mixing rooms and also the workrooms as free from dust, chemicals and debris as possible. Proper spacing of equipment together with suitable means for handling materials is a great help in keeping the workrooms clean. The uses of vacuum cleaners wherever possible is a great improvement over the old fashioned brush or broom method of cleaning. In some types of employment, concrete floors which can be washed with a hose are of great advantage.

3. *Control of Dusts and Fumes or Vapors.* Wherever possible, it is advisable to control the contamination of air by dust or fumes at the source at which they are generated. Sometimes one machine or operation is responsible for the liberation of dust or fumes which penetrate through an entire workroom. The enclosing of such a machine, with possibly an exhaust to the outside of the building, completely removes such a hazard. Sometimes an exhaust hood over a tank is sufficient to remove all irritating vapors in the area.

4. *Personal Hygiene.* When employees are engaged in many of the operations in industry, it is impossible for them to keep clean while at work. It is necessary, therefore, that washrooms should be provided for their convenience. If a washroom is to serve its real purpose it must be large enough to accommodate the number of people by whom it is supposed to be used and be so equipped and maintained as to be acceptable to the employees. In many of our industrial plants, small, dark, dirty, inconvenient washrooms are provided and then the managements wonders why they are not used. Personal cleanliness for the removal of irritating dusts, solutions or greases is one of the most important methods of preventing industrial dermatitis. The frequent removal of these irritating substances from the skin can do much to prevent skin irritation. In order to

accomplish a satisfactory degree of personal hygiene in the average plant, it is necessary to have suitable washing facilities and to educate employees to the benefits to be derived by personal hygiene and in this manner secure their cooperation.

5. *Protective Clothing.* In many operations where employees are subjected to various dusts and solutions, protective clothing is of great importance. If the hazard cannot be removed by ventilation then gloves, aprons, hoods, masks, respirators, boots and leggings are protective devices which are sometimes very helpful. In many instances the use of a rubber apron and a pair of long rubber gloves have entirely eliminated dermatitis from a plating operation. The application of a protective ointment to the exposed surface of the body is of benefit in some types of work. This ointment forms a coating over the skin which helps to maintain the normal excretions of the skin and also protect it from the irritating effects of some caustic alkali or acid. There is also the advantage in proper cleansing of the skin in that the ointment is usually soluble when soap and water are used, taking with it the accumulations with little or no skin irritation. In many plants the use of these protective ointments has met with much success.

6. *Medical Examination.* Pre-employment examinations for the proper selection of em-

ployees is becoming more popular, especially in our large industrial plants. By this means, employees can be selected for work for which they are physically and mentally capable. From the standpoint of industrial dermatitis, care should be taken to eliminate those who show evidences of skin disease. It has been said that light complexioned persons are more susceptible to skin irritations than those with dark complexions. A person with dry, scaly skin should not be subjected to solvents, or one with an oily skin should not be subjected to work in which additional oil or grease would be encountered. Persons with certain diseases, such as diabetes, should not be employed where there is danger of skin irritation. Periodical medical examinations are also of benefit in detecting early cases of skin disease or evidences of any unfavorable reactions to any of the hazards to which the worker is subjected.

In summarizing, there are three points which seem to stand out as being worthy of special emphasis. First, the careful selection of employees to be placed in occupations where skin disease is likely to develop. Second, the maintenance of good housekeeping and adequate ventilation throughout the plant. Third, the benefits to be derived from personal cleanliness on the part of all employees as a prophylactic measure in the prevention of skin diseases.

Discussion of Dermatitis

By DR. J. NEWTON SHIRLEY

Medical Director, Arrow Mutual Liability Insurance Company, Newton, Mass.

A few of the men here can look back at the problems confronting the doctors and executives of the industry when "rubber itch" appeared with the advent of organic accelerators in the early teens. More have had some experiences with rubber rashes developing in the mid and late twenties, as the chemists developed newer and better accelerators, antioxidants and coloring materials in the process of producing more and better rubber products at a price where the public could buy them.

In more recent years, the rubber industry has taken up the manufacturing of plastics, where the chemists have and are developing synthetic resins in almost numberless quantities. All these have their value in the in-

dustry but we may have an increasing problem in dermatitis and health control with the use of these materials.

Let us glance over the past. The industry has been susceptible to all types of occupational dermatitis common to any industry. Dr. Louis Schwartz has listed them under the following major classifications of causes:

- I. Mechanical
 - Friction
 - Pressure
 - Trauma
- II. Physical
 - Heat
 - Cold
 - Water
 - Electricity

- Sunlight
- Röntgen ray and radium
- III. Chemical
 - Acids
 - Alkalies
 - Plant poisons (organic compounds)
- IV. Biologicals
 - Bacteria
 - Fungi
 - Animal parasites

In referring to dermatitis in the rubber industry, we usually refer to those cases caused by the materials under Class III.

Class I deals largely with cases coming from handling materials and tools and we might mention as examples: The callouses formed from shears used by trimmers. The callouses from knives in the hands of mill men. The wearing away of the ends of fingers of shoe makers where they have to pull over the edges of stock, or the picking up of stock from the table. Our time study men with the methods men have been able to render considerable assistance in preventing these by making slight changes in the methods used.

Class II deals with the hazards incidental to the manufacturing processes and should be capable of adjustment if the condition is recognized. Here we can suggest the burns from handling molds, presses, vulcanizers, etc. The maceration of the skin of the hands of those men required to work in water for long periods at a time. Several years ago, one company installed an x-ray unit to inspect heels for the washers inserted in them. The men doing this work, not realizing the hazard, found they could make faster time using their hands for moving the heels along rather than using the stick supplied for that purpose. Before supervision discovered it, several cases of x-ray burns had developed. A slight change in the method was introduced preventing the recurrence of the hazards and the process is no longer a dangerous one.

Class IV deals with skin infections from bacteria, fungi and animal parasites. These conditions are common to all types of manual labor and are of importance in the rubber industry only in so far as they are complications of cases developing in the other three classes, especially in Class III. Let me call your attention to one possible condition which has developed and can come up at any time. The industry has many processes

where the work progresses from one employee to another. If a case of contagious disease is present, this may be carried from one employee to the next. I doubt if this often happens but it has been claimed from time to time. Here we are helped by the employee, for often we have one come down and say, "I am afraid to work alongside of Bill; his hands are all broken out." Cases of contagious skin disease should be kept out of work until they are cleaned up.

Class III deals with the materials normally considered as the cause of industrial dermatitis in the rubber industry. Beginning in the early teens, the chemistry of rubber advanced by leaps and bounds. With this progress came "rubber itch." The chemists were primarily interested in producing rubber products that were good. Labor problems were some one else's headaches. Lost time and insurance costs soon caused a change and other compounds were developed to replace "hexa," the one outstanding cause of dermatitis at the time. In the twenties, the chemists made more and more progress in the chemistry of rubber and developed more and better organic compounds used in speeding up the vulcanization of rubber and giving a better end product. Some of these materials were capable of producing dermatitis and were only known by the trade name. Increasing cases of dermatitis and a growing tendency for the employees once developing a dermatitis to be more susceptible to these materials caused the industry to become dermatitis conscious.

The Rubber Section of the National Safety Council began a study of the materials used in the industry. Under the careful guidance of Dr. L. J. D. Healey the various materials were listed with particular reference to the health hazards of each. Tendencies to produce dermatitis were carefully noted. The results of these studies appeared about 1931 in the Industrial Safety Series of the National Safety Council. More recently, Dr. Louis Schwartz has made a survey of Industrial Dermatoses for the U. S. Public Health Service. His findings and suggestions are to be found in U. S. P. H. Bulletin No. 215. These references are of great value when confronted with an unexplained case of dermatitis in the mill.

At about the same time the Rubber Section began a survey of the compounding materials, the manufacturers of materials used, especially accelerators and antioxi-

dants, began to look at the effect of these compounds on the employees. This work was done primarily by animal experimentation with some patch testing. The Haskell Institute operated by du Pont is the outstanding development in this line.

It is now common practice for the manufacturer to place in the hands of the buyer, information as to the hazards presented by the use of this particular compound. You can also go to the plant chemist today and get from him information as to health hazards of the various materials used. This was not possible ten years ago unless the material was highly dangerous to use. They formerly knew little about dermatitis unless they happened to be one of those individuals who were susceptible and had developed dermatitis in the process of making up a compound formula.

The many places where dermatitis may occur in the rubber industry covers practically every job, but perhaps some attempt should be made to say something about the various jobs.

The receiving department first gets the materials as they come into the plant. Here we find exposure to any dusty compound, particularly if there has been damage to the container. Dermatitis of the hands, arms and legs have been noted here.

The compounding room is usually the next department in line. Here the materials are weighed out. The usual procedure being to put the more bulky materials into large compound pans. The less bulky compounds are weighed out into small pans or paper bags. Here the material has to be handled by hand, usually using a scoop or even a large spoon to handle ingredients used in small amounts. Gloves may be worn as a protection but care is the most important item. It is usually true that the more dangerous materials are used in the smaller amounts.

Fortunately, this type of work is done by a fairly good class of help. These small amounts must be accurately weighed if the resulting stock is to be satisfactory. This better class of labor is expected to have the ability of using a little more care than the rough labor batching the bulky compounds. Care and cleanliness are the two big items in safely handling powders capable of causing dermatitis.

From the compounding room we progress

to the mill room, where the various ingredients are worked into a common mass or stock. The mill man comes into contact with all the various ingredients as he adds them to the batch on the mill. Where the materials are weighed out in paper bags, care will prevent this material from getting on his hands or gloves. He will then have to touch the materials only after they have been mixed on the mill.

While many cases of dermatitis did show up in the mill room during the early days of organic accelerators, we rarely see one now. A factor which has been of considerable importance in the reduction of dermatitis in the mill room, is the introduction of the enclosed mixing methods. Where the open method of mixing is in use, the mill apron has materially reduced the contact of the worker's hands with the stock in process. The use of the dipping tank to cool the stock as it is taken off the mill may introduce a hazard but I have failed to see any.

We then come to the stock bins where compounded stock is kept before wanted. The men working in this department come into contact with all stock in process. The talk, whitening or other dusting powder may pick up materials from the stock which can cause dermatitis. We do not see it today. In the calendar room the stock passes through the cracker men for breaking up or directly to the mill men for warming previous to use on the calendar. All these operators are subjected to the dusting powder or the rags used to keep the various layers of the stock separated. The exposure is maximum but the incidence of dermatitis today is negligible.

In the cement house, the compound sticks are worked up on the mill and in churns to make the cements. Exposure is to the compounded stock and to the naphtha or other solvent. The operators handle the stock and then come into contact more or less with the cement which may be spilled onto the sides of the containers or machine.

In the spreader room, the workers handle the stock in semi-liquid form as it is taken from the container and placed in front of the spreader knife. I believe the tendency today is to do all this work with a scoop or spatula and a clean worker has little real cause to be covered with the spreader material. Here a hazard is introduced when the men use naphtha or other solvents to remove the spreader material from the hands.

An element of heat is here also important as the heat from the steam coils is always present.

The next operation is usually the cutting room. Today mechanical methods have been so far introduced that we rarely see any dermatitis here. The men do have to handle the stock and book it in some case but dusty stock books are now out.

The preparation room is next in line, here the preliminary operations of assembling a shoe, tire or other product takes place. The various parts are all handled by hand, taken out of books, the various steps of work done and replaced in books or other containers.

Some operations, as in making canvas rubber footwear, an operation is made in the stitching room. The parts are here handled from books or other containers, stitched and replaced on some type of container. There is little hazard here save one will notice that the passing of the needle through the material does cause a dust. This dust is composed of cotton, compounded rubber, dye, etc. A case of dermatitis has been known to arise from the mechanical action of the dust caused in this operation. Another has been traced to the dye used in the fabric being stitched.

The making room is another place where all materials are handled largely by hand. Dermatitis will appear here if there is a cause for dermatitis.

In the inspecting and packing of goods dermatitis is not expected. Here the product is in the condition it will be worn by the consumer. I regret to say that dermatitis has occurred here in days gone by. The cause was apparently a product containing a dermatitis causing accelerator. Fortunately the product was not worn next to the skin.

Let us follow the procedure where a case of occupational dermatitis is suspected. Rarely do we show much interest if it is the first case, but when several cases appear, especially if lost time develops, we at once start action. We refer the case to a competent dermatologist for an opinion and possible treatment. We carefully investigate the work the employee is doing. We list all the materials handled. We go back to the chemist in checking these materials, especially as to the ingredients in the compound and to possible by-products of processing. We draw our conclusions if possible.

We may resort to patch testing. This is not always a safe procedure and should only be done by a physician. Samples of the various stocks are taken and tried on the patient or on other persons. Special compounds of the stock, made by omitting one or another of the ingredients are patch tested. Even the separate ingredients may give results. These tests are made carefully under as near working conditions as possible. The best part of the body to be used is considered to be the flexor surfaces of the arms. The tests are carefully watched and are allowed to stay in contact with the skin of the person being patch tested for what appears to be a longer time than one would expect to be necessary, always checking the tests at intervals, for fear an early marked reaction may occur. These tests are not entirely harmless. A recent series of tests on a suspected material put one man in the hospital for ten days and another out of work for three days. In fact, a marked positive reaction may cause a lot of worry.

If a positive finding is made, what can be done?

1. Replace the causative agent if possible. Such a remedy can only be made by the plant chemist in cooperation with the production department. All rubber compounds are made up only after weeks of testing. A change in one material will require certain additional tests to insure the same end results.

2. Where a change of material is not possible, a change in the method of handling the material may be worked out. The dusty stock books of former days are now missing. The bloom formerly seen on rubber stock is now absent because of improved compounding methods (the bloom is indication of an excess of some ingredient). This bloom often carried to the surface material which is the cause of a dermatitis. Modern mechanical processes have removed many of the manual operations which formerly contributed to rashes.

3. Where a change of material or method is not possible, a selection of workers may help but protection of the workers is more important. About 20 per cent of all workers will show reaction to materials which cause dermatitis, but only about 2 per cent will show reactions which are troublesome. It has always been contended that blondes are more susceptible than brunettes. In many plants, negroes are used in the compounding.

ing rooms as they are less susceptible to the rashes. The dark skin races appear to be resistant to dermatitis causing materials. In cases where the vapor or gas given off is a cause, ventilation will help. Protective clothing and gloves may be worn on some jobs. The use of protecting creams is being tried. This should be watched with great care. A cream may collect and increase the strength of the material causing the rash. The use of a bland cream during non-working hours may improve the skin to the point where it may better resist the disturbing material.

Cleanliness, an ideal for all health hazards, is just as important in the rubber industry for protection against dermatitis as any element. This refers to the cleanliness of the machine, the workroom and the worker. In connection with this reference to cleanliness, your attention is called to the paper presented by Drs. Klander and Gross at the Health Service in Industry Section a year ago which appears in the Transactions of the 28th National Safety Congress. The

paper is well worth the time it takes to read it.

Reference has been made to plastics and plasticizers. Up to the present time, I have had very little to do with these materials but I hear a little here and a little there. Many of these materials are synthetic in origin and when not properly handled and used may cause dermatitis.

A factor of increased sensitization has been mentioned in connection with dermatitis from organic accelerators. Patch testing has done considerable to bear out this contention. A person who has been slow in giving a reaction to the first test, may later become hypersensitive to the materials used. In fact, some workers have been forced to give up the line of work they are doing because a return to work causes an immediate recurrence of the rash, usually in an aggravated form.

Variations of reactions in varying seasons may be noticed. We often see a little epidemic of rashes in the spring where the same people have worked for months on the same material.

ADJOURNMENT

Steam Railroad Section

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TUESDAY AFTERNOON SESSION

October 8, 1940

The opening session of the Steam Railroad Section was called to order by the Chairman, E. L. Henry, Superintendent of Safety, Chicago & North Western Railway Company, Chicago, who presided.

He outlined briefly some of the activities of the Section during the past year, and took

the opportunity to mention the work of many Standing Committees. He then introduced J. R. Tenney, Supervisor of Safety, Western Maryland Railway Company, Hagerstown, Md., Chairman of the Program Committee, who assumed the Chair. Mr. Tenney introduced the speakers.

The Effectiveness of Grade Crossing Protective Devices from the Viewpoint of State Authorities

By WARREN HENRY

Assistant Chief Engineer, Illinois Commerce Commission, Springfield, Ill.

The art of grade crossing protection has made rapid advance in the past few years and I believe it is fair to say that the state of public opinion on this point has advanced fully as much. It was not long ago for instance that a major obstacle to progress in

this field seemed, to some of us at least, the prevalence of what was often called the claim agent point of view, that is an undue emphasis upon legal liability rather than on public safety.

Another very persistent mental attitude,

which I think is definitely on the way out, is that we are only concerned with giving highway users and especially automobile drivers a fair warning, that he may avoid getting hurt or killed on a crossing, and that it is no concern of the public authority whether the driver obeys or disregards warnings so given. Right here is a division between the liability and the public safety point of view.

Very possibly the victim of an accident (and he may be only one of the victims) has been so negligent as to be chargeable with the disaster. It may have been his fault, but the occurrence was by no means his own affair and the business of no one else.

There has been altogether too abundant demonstration of the fact that it is quite impossible for anyone to drive an automobile into the path of or against a railroad train on a crossing without injuring, or at least trespassing upon, the rights of others. Trains have been wrecked many times by such a proceeding and both passengers and members of the crew killed or injured.

A collision recently occurred in which a fast train struck a small truck at a grade crossing adjacent to the business district of a central Illinois city. The streets were full of people. The truck was totally demolished and the two occupants killed. The motor of the truck was thrown through the air and crashed violently against the side of a hotel. Can there be any doubt that the guests and occupants of this hotel who were thus endangered, as well as numerous other people in the vicinity had an interest in the transaction or that regardless of who was at fault, the public safety had been gravely endangered?

Another thing which is somewhat of a stumbling block is a confusion between occurrence of accidents and public safety. Members of the public can be in very grave danger without an accident actually happening. The practical importance of this lies in the common disposition to regard the accident record at a particular crossing as the criterion and measure of hazard. Not that the accident record can be disregarded altogether; but where we are working fundamentally for the public safety the major emphasis should be upon producing conditions that accord with safety rather than upon remedial measures designed to meet certain combinations of events.

The primary purpose of grade crossing protective devices is to promote public safety, that is to reduce the exposure of the public to conditions of hazard. In that fundamental view there should be no difference of opinion between state authorities and anyone else, railroads or others who are dealing with this problem.

The factors which make for effectiveness or non-effectiveness are not all mechanical ones. Many of them are human factors, and are not as readily subject to control as are the mechanisms employed. The fact that there are human factors, however, is not a matter that can be disregarded, and moreover it does not follow that human factors may not be dealt with, anticipated, studied, and, to some extent, controlled.

This is a very essential aspect from the standpoint which I am endeavoring to present. From this standpoint we are not so much concerned with what ought to happen as with what does generally happen; not depending so much on what a motorcar driver ought to do as what the ordinary human being is likely to do; not dealing with a theoretical personage, who is at all time-vigilant, watchful, alert and has his mind on what he is doing, but rather with the common ordinary run of mortals who are subject to shortcomings, frailties, lapses and infirmities which are the common heritage of mankind and also of womankind.

An accident occurred near the outskirts of a small city in western Illinois at the crossing of a minor, gravel surfaced local street, with the tracks of a main line railroad. The crossing was marked only by regulation crossbuck signs and it was not such a crossing as would usually be protected by gates or signals. An oncoming train would be clearly visible for a distance of something like a mile at all points along the street within some 300 feet from the crossing. The driver of the car was a local resident. Accompanied by his wife and their four children he was on an ordinary neighborhood errand, shortly after one o'clock in the afternoon. They stopped at a house near the crossing, where a neighbor joined the party and then the car proceeded first to make a right angle turn onto the graveled street, some 220 feet from the crossing, and then to drive this 220 feet to the crossing in full view of an approaching local freight train. It seems quite impossible that the

automobile could have attained any considerable speed in this short distance. The train was a local freight which seldom exceeded 40 miles an hour in speed, and at this particular moment was slowing down for the next stop. The day was clear, the surface of the road was dry, and the automobile seems to have been in good condition. Whatever may be the explanation, the fact is that the automobile proceeded onto the crossing in the path of the approaching train, was struck squarely, and the collision resulted in the deaths of all seven occupants.

For our purpose here, we may assume that what happened was the driver's fault, that he was negligent in not observing the train and bringing his car to a stop.

Even so, here are seven people killed, four of them children, and each man of the train crew endangered. The public authority is properly concerned, but what can we do about it? It is no answer to condemn the dead driver. It is a real problem when we have situations, thousands of them in fact, where a very brief lapse of attention, or distraction, a thing common enough to all men, may produce such a tragedy.

As a matter of fact crossing accidents apparently chargeable to lapse of attention are very common, far more so, in my observation, than those in which intoxication are involved. Nor does education seem to help here. In another accident where the facts were very similar to those narrated, the occupants of the car were two college professors and a physician, a professor at the wheel.

One of the things we can do about it, at least in many situations, is to make it less likely that the hazard will escape attention. Suppose, for instance, that crossing signals were installed at the crossing just described. Would it be logical to assume that this particular driver, having failed to see a train in plain sight, would likewise fail to see the signals? The answer lies in the fact that the signals are located in or near the natural focus of a driver's attention, whereas the train, seen in time, is not.

This may explain why crossing signals, installed on so-called wide open crossings, do actually reduce hazard and accidents, even though an alert driver might see any oncoming train in ample time. The signal is overlooked less often than the train, mainly because it is in the field of view. This

may also explain the infrequency of the inattention type of accident on crossings protected by the better forms of automatic or manual gates. Here the thing to see is directly in the path of travel, the very place where the driver's eyes are normally focused.

Let us notice this point carefully. Crossing signals and gates are not always provided to warn people of trains they cannot see. Quite often the trains they warn against are in plain sight, yet experience shows the wisdom of providing the signals or gates nevertheless. Actually what we are doing here is dealing fairly effectively with that human factor of inattention, by providing something that is no more visible than the train but is less likely to be overlooked.

Perhaps, as an ultimate goal, the conception of having all highway crossings either separated or protected is sound, but there is a major obstacle in the way. Automatic flashing light signals installed according to our present standards in this state cost from about \$2,500 a crossing upward, and the various forms of barrier and manual protection are still more expensive.

The crossing where this accident happened was a minor crossing, so-called. There are thousands of them, country roads, residential streets in cities and villages, carrying light traffic but locally necessary to the public. Some of them can be eliminated perhaps, but a large number must still remain. No funds are available to install our present relatively expensive types of crossing protection at these minor crossings, and there might be ground to question the justification of the expense if the money were available. Nevertheless one of these minor crossings was the scene of the shocking tragedy described, and that was no isolated case. In the aggregate these crossings account for a very substantial portion of the grade crossing casualties.

Here is the problem in this field which I believe is now farthest from solution. What can be done about the numerous minor crossings? The art has not yet produced, or at least brought into general practical use, any crossing protective system that is reliable, effective and practically usable for these situations. Our present protective devices are appropriate for major, but not for minor crossings. Here is a challenge to the engineers and technicians, a very real need which so far has not been met.

The problem should not be ignored, or lightly dismissed as the concern only of each offending driver who gets hurt. It is actually a widespread situation of public hazard, for which we have not yet a satisfactory solution.

In the present absence of any mechanical apparatus suitable to be installed at the minor crossings we seem to be depending upon two things: first the caution and alertness of the highway user in discovering the approach of a train on his own account; and second the audible warning that may be given to him by the whistle, siren, or bell on the train.

One practical thing that often can be done is to improve the local conditions. Removing brush, weeds and unnecessary foliage or other obstruction in the vicinity of a grade crossing are safety measures and properly considered here. Consideration to unnecessary obstruction of view at a grade crossing should likewise be given where any buildings or structures are to be erected on railroad property. We were, for instance, much concerned a short time ago because metal bins for the storage of corn and grain were placed adjacent to grade crossings at numerous locations in this state, transforming fairly open crossings to blind crossings. When attention was directed to this matter it seemed that no one had given a thought to the safety of the crossings involved. At a number of crossings safety has been greatly improved by so-called day lighting, that is by removing embankments or mounds of earth in such fashion as to make a fairly open crossing out of a blind crossing. Here is another safety measure or method of a non-technical nature.

At a residential street crossing lately a fast diesel powered train struck a grocery truck which the driver, a young lad, had left standing with the rear end on or very close to a main line track while he delivered goods to a house nearby. We found that the only vehicular approach to three dwelling houses adjacent to the crossing was over a driveway, the full width of which was twelve feet or less from the rail, too close to clear a train, and the track was on a curve at that, a piece of foolishness not chargeable to the grocery boy.

The whistle or siren on the engine seems to be our only present practicable warning device for minor crossings. This type of

warning has its limitations, especially in the winter when the doors and windows of automobiles and trucks are closed but there may be room for development here. I have made a number of trips on locomotives of fast trains for the purpose of observing the situation at grade crossings as viewed from the engine cab. Nothing is more impressive than the extent to which the whistle or siren is obviously the main reliance as a high speed train rushes through small villages, where there are usually several blind and unprotected crossings, as well as at other places where the interval of time between the train becoming visible to a highway user and it reaching the crossing is a matter of seconds or even a fraction of a second.

It may also be worthy of note that in the above described accident where the seven people were killed the car approached from the fireman's side, the engineer could not see the car, and the fireman was busy with his fire. While the statutory whistle signals seem to have been given, there was no whistle warning directed to the immediate situation.

The whistle or siren is a practicable and fairly effective device that does materially aid in the solution of the minor crossing problem, and to my mind this audible signal merits more attention and study than it has received.

Leaving the minor crossing and its problems for the time being, the more important and heavily used crossings are generally protected either by some form of barrier protection, that is a gate arm or arm, by automatic signals or by a watchman. Sometimes combinations of these are employed. It is not my purpose to describe mechanical details but rather consider their effectiveness from the viewpoint I am presenting and this especially involves consideration of this human factor. In the effectiveness of any type of gate, whether automatic or manually operated, the coordination of the raising and lowering of the gate with the arrival of the train is most important. A common fault with the older manually operated gates was the tendency of the operator to wait too long and allow the train to get too close before his gates were down, whereas with the newer forms of automatic gates the track circuits must be worked out carefully in order that the gates are not permitted to remain down an undue length of time.

At a crossing near Chicago where recently an installation of automatic short arm gates was made there was much report of automobiles running around the gates. Investigation showed that a suburban station was located within the limits of the circuit both east and west of the crossing and that no special provisions had been made for trains which stop at those stations. A series of checks at the crossing established the fact that with these local trains the gates would be down as much as two to three minutes before the arrival of the train at the crossing, that there was much violation of the gates during the early part of this interval but practically none when the train was within 20 seconds or less of the crossing. There was also practically no violation with respect to through trains where the operation of the gates coordinated properly with the train. The effectiveness of this installation was therefore much impaired by failure to realize how the public will act under the conditions brought about.

Unduly long pre-warnings and so-called false indications have been more common and flagrant with the flashing light signal and the complacency with which some people seem to view this situation indicates much of a disregard for the very important human

factor in the effectiveness of all such devices.

The conclusion which needs emphasis is that the effectiveness of crossing protective devices depends upon human factors. We should never overlook this fact. Warnings, for instance, should be placed as close as practicable to the normal focus of vision of drivers of approaching vehicles. This incidentally is one of the outstanding advantages of the modern barrier type of protection. Good maintenance and good illumination are highly important because of their effect on the human mind, higher visibility and attention getting value. Proper coordination of automatic protective devices with trains, avoidance of unduly long pre-warnings and of so-called false indications may be much more important a factor in effectiveness than is generally supposed, due to the favorable or the adverse influence, as the case may be, upon the driver's reaction.

The practical safeguarding of the minor crossing remains the problem in which probably the least progress has been made. We have a very serious problem of public safety here and the effectiveness of the measures and devices we can practically use at this time is undoubtedly much lower than with respect to the more heavily traveled major crossings.

Effectiveness of Grade Crossing Protective Devices from the Viewpoint of the Railroad Engineering Dept.

By W. M. POST

Signal Engineer, Pennsylvania Railroad, Philadelphia, Pa.

The only measurement we have of the effectiveness of work done to reduce accidents at highway grade crossings throughout the country is the Interstate Commerce Commission statistics. The number of such accidents declined from 4.49 per million train miles in 1930 to 4.12 in 1939. Measured in terms of the number of automobiles registered, accidents declined from 183 per million in 1930 to 113 in 1939.

Expressed in terms of chances of an accident: in 1930 a motor vehicle had one chance in 5,500 of being involved in a grade crossing accident, while last year the chance was one in 8,800.

This improvement is, of course, gratifying; however, when we consider the vast

amount of effort that has been made to reduce accidents at highway grade crossings we are disappointed that there has not been greater improvement.

Protective devices at grade crossings consist of advance and crossbuck signs to mark the crossings, audible and visual signals to give warning of an approaching train, and gates and other barriers across the highway. The question under discussion is the effectiveness of these protective devices. This subject, of course, includes what can be done to make them more effective.

The railroad engineers believe that they have done much to make these devices efficient, distinctive and easily understood. The real difficulty is to make all drivers un-

derstand that they must be governed by these protective devices and that they must not pass over railroad crossings until it is known that they can do so safely. Protective devices are merely an aid for the driver. The responsibility for his own safety rests with him.

The number of highway crossings equipped with automatic signals has increased rapidly during the years since the advent of the automobile. There were about 23,000 crossings protected by signals in 1939. The number of crossings protected by signals, gates and watchmen in 1939 was about 32,500. Approximately 190,000 grade crossings were protected by fixed signs only.

I. C. C. statistics show that for an equal number of crossings there are three times as many accidents at crossings protected by signals, gates and watchmen, as at crossings protected by signs only. Of course, the more dangerous crossings and those having heaviest highway and train traffic are the ones which are protected by signals, gates and watchmen. However, these figures are significant and indicate that intensive efforts should be made to secure increased obedience to warning signals and other protective devices.

Much has been done to make the motor vehicle driver realize his responsibility, but much remains to be done. The enactment into law, and enforcement of the law by all of the States, of Section 102, Article XIII, Act. V, entitled "Uniform Act Regulating Traffic on Highways," prepared by the National Conference on Street and Highway Safety, would go a long way toward making protective devices at grade crossings effective. . . . Whenever any person driving a vehicle approaches a railroad grade crossing, the driver of such vehicle shall stop within 50 feet but not less than 10 feet from the nearest track of such railroad and shall not proceed until he can do so safely when:

"(a) A clearly visible electric or mechanical signal device gives warning of the immediate approach of a train;

"(b) A crossing gate is lowered, or when a human flagman gives or continues to give a signal of the approach or passage of a train;

"(c) A railroad engine approaching within approximately 1,500 feet of the highway crossing emits a signal audible from such distance and such engine, by reason of its

speed or nearness to such crossing is an immediate hazard;

"(d) An approaching . . . is plainly visible and is in hazardous proximity to such crossing."

In 1937 six states had such a law, or one similar, with a penalty, and seven states had such a law without a penalty. There should be a penalty and rigid enforcement if the law is to be effective.

The Public Utilities Commission of the State of New Jersey has a staff of inspectors whose duties are to go over the state and check automobiles passing over grade crossings. They are dressed as civilians but have authority to issue summons to drivers who violate the law.

While primarily it is the obligation of public authorities to bring about obedience to railroad grade crossing protective devices, the railroads, through the Association of American Railroads and railroad employees working as individuals, often on their own time, have done much work with the public through their safety advertising and educational campaigns. We are all familiar with the horror picture posters of grade crossing accidents. Talks on precautions which should be taken at grade crossings have been given by railroad men before schools and civic bodies all over the country.

Railroad engineers have made an important contribution to the effectiveness of grade crossing signs and signals by years of committee work in their associations to establish standards for Railroad Highway Grade Crossing Protection.

These standards are contained in a bulletin published by the Joint Committee on Grade Crossing Protection, and issued to the railroads by the Association of American Railroads as recommended standards. These standards have also been adopted by the National Association of State Highway Officials and by the National Conference on Street and Highway Safety, and are published in their joint Manual on Uniform Traffic Control Devices for Streets and Highways. These standards have also been approved by the American Standards Association.

Before these committees of railroad engineers started work to bring about uniformity, about 20 years ago, there were many different kinds of signs and signals. After much debate, the following was adopted as

requisite for highway grade crossing signals and has governed generally throughout the country for the last 18 years:

"An electrically or mechanically-operated signal used for the protection of highway traffic at railroad highway grade crossings shall present toward the highway, when indicating the approach of a train, the appearance of a horizontally swinging red light, or swinging disc."

Uniformity of signals was, of course, the first step required to familiarize automobile drivers with the meaning of the warning signal. There are more than 40,000,000 automobile drivers in the United States and the task of having them all understand that horizontal alternately flashing red lights, or a swinging disc, is a warning that a railroad train is approaching is not as easy as it would seem. This led the Railroad Engineers to add to the flashing light signal the sign in reflector buttons—"STOP ON RED SIGNAL" and to the swinging disc signal—"STOP WHEN SWINGING," or, as an alternative for both types of signals, the word—"STOP"—in vertical red letters 5½ inches high, illuminated when a train is approaching.

The bulletin showing the recommended standards for highway railroad crossing signals also shows recommended standards for the well known crossbuck sign located at the crossing. This sign consists of two blades six feet long crossed at fifty degree angles where manual or automatic protection is not provided, or two blades four feet long crossed at right angles where manual or automatic protection is provided. The word—"Railroad" is painted on one blade and "Crossing" on the other and is suggestive of a grade crossing. The bulletin provides that the letters "Railroad Crossing" may be either painted with black letters on a white background or the letters may be outlined with reflector buttons, in which case the letters are painted white and the background black.

The use of reflector buttons on the crossbuck signs is a rather recent development. There is no doubt that the effectiveness of crossing protection can be improved by the more extensive use of reflector crossbuck signs to better mark the crossing at night.

Railroad advance warning signs, in practically all cases, are installed off the railroad property. The recommended standard design

is shown in the Manual on Uniform Traffic Control Devices for streets and highways. The sign is a metal disc 30 inches in diameter, yellow background with a black border and a diagonal black cross with black letters "R" in each side quadrant. The border and letters "RR" are shown outlined with reflector buttons. Money spent for the more extensive use of *advance warning signs with reflector buttons*, in my opinion, would contribute much to safety at grade crossings.

The effectiveness of the advance warning sign and the crossbuck sign depends on their being easily and plainly visible to the approaching driver. Their location should be given careful consideration. They should be kept well painted so that they can be seen, especially when illuminated at night by the automobile headlight. Where reflector buttons are used they should be kept in good reflective condition.

The floodlighting of crossings is receiving considerable attention. A long freight train passing over a grade crossing at night presents a hazard unless the crossing is plainly marked. Floodlighting illuminates the crossbuck signs and the cars while they are passing over the crossing. Floodlights should give additional protection at some crossings, particularly where there is a short, steep grade approaching the crossing where the automobile headlights may not be very effective in illuminating the warning signs and the cars on the crossing.

During 1939 there were 545 accidents at grade crossings caused by automobiles running into the side of trains during the night, and 51 such accidents during the daylight hours; more than ten times as many at night with fewer cars at night on the road. These I. C. C. statistics do not include the cases where the automobiles ran into the side of the train near the head end, as such cars may have been trying to beat the train. I think these figures indicate the need for careful study to determine where reflectorized advance and crossbuck signs, or floodlights should be provided to reduce accidents of this kind.

The effectiveness of the automatic highway grade crossing signal likewise depends on its location being such that it can be easily and plainly seen. Generally, the signal should be located close to the highway, about 15 feet from the center line of the

nearest track as indicated in the bulletin showing recommended standards. Uniformity in location is desirable, as the driver forms a habit of looking for the signal at that location. However, in exceptional cases it may be necessary to place the signal on a cantilever over the highway. Needless to say the signal itself should be arrestive. Both the flashing light signal and the wig-wag fulfill this requirement. The appearance of motion in these two signals, flashing light or swinging disc, is in itself arrestive.

The light intensity has been improved in recent years so that it is safe to say a modern highway crossing signal can easily be seen if the driver is reasonably alert. The recommended standards now provide that signals shall be placed on each side of the tracks and that they shall shine in both directions along the highway. This double signal, or gateway effect sets up a warning which can hardly be overlooked. The signal to the left of the driver and on the far side of the railroad also serves to warn a driver of a train approaching on another track when the train for which he has stopped has passed.

Operating conditions on railroads often make it necessary for trains to stop within the circuit that controls the crossing signals. Many drivers are impatient at this delay even though it is only necessary for them to stop and not proceed over the crossing until it is known that they can do so safely, the same as they should do if there were no signals. The serious feature of this is that some drivers may assume, when approaching a warning signal, that the train has stopped on the circuit or is approaching slowly, and disregard the signal. To afford protection to the driver having this attitude of mind is difficult. Railroad engineers have for some time designed the controlling circuits so that the unnecessary flashing will be reduced to a minimum by providing cut-outs when trains are pulling into sidings or standing at stations. The unnecessary flashing, however, cannot be entirely eliminated. Some railroads have a rule somewhat similar to the following:—

"To avoid unnecessary operation of automatic highway crossing signals, switches must not be left open, nor cars left standing on the main track longer than necessary within operating limits of such signals. When shifting movements are made in the vicinity of a highway crossing protected by

highway crossing signals, or when train is stopped, thereby operating the signals unnecessarily, every effort must be made by trainmen to avoid delay to highway traffic. When it is safe for vehicles or pedestrians to cross the tracks, the trainmen will say 'all right' and beckon to cross."

When considering the effectiveness of grade crossing protective devices improvements in the engine whistle should not be overlooked. These whistles are better and more penetrating than they were several years ago. The Standard Code of the Association of American Railroads provides that the whistle shall be two long, one short and one long sound, to continue from the whistle post until the crossing is reached, instead of two long and two short blasts sounded at the whistle post as was the case formerly.

While these methods are helpful, we cannot ignore the fact that a driver, when stopped at a crossing signal, if a train does not pass after a reasonable time, must then take the same precautions he would if there were no signal; namely, look both ways, listen for the engine whistle and proceed only when he knows it is safe to do so. The driver who takes chances must be made to understand that he must never assume that there is no train approaching when the warning signal is being displayed. This should be brought about by the enactment of laws, enforcement of laws and educational activities.

Because of that trait of human nature to take chances by disregarding warning signals at grade crossings, much thought and study is being given to the barrier type of protection. The earliest type of grade crossing barrier is, of course, the crossing gate operated by the crossing watchman.

Considerable work has been done during the last few years to make manually operated gates more effective at night by improving the lighting on the gates. Oil lamps have been improved and electric lights have in many cases replaced the oil lights. Reflecting devices have been placed on gate arms with good results. Many gates have been run through and broken, no doubt because of poor lights on the gates. While much has been done to improve this condition, much remains to be done. There should be one adequate electric or oil light, and at least one additional light, or one or more reflect-

ing devices on the gate or gates on each side of the crossing.

During recent years there have been quite a number of installations of crossing gates controlled by track circuits and without gatemen; known as the automatic crossing gate. The earlier installations provided gates over the entire width of the highway and when trains were stopped on the controlling circuit or when the controlling circuit was out of order, highway traffic was stopped until someone opened the gates. There was also the risk that a car might pass on to the crossing when the gates were raised on the approach side but due to an approaching train the gate on the leaving side might have descended. The gate on the leaving side was therefore designed to swing away from the crossing, so that the motor vehicle could push the gate and proceed off the crossing after which the gate would swing back in place. There was the possibility, however, that the driver would not know this, and become confused.

The most recent development with regard to the automatic gate type of barrier is the single arm, which when in "down" position is across the half of the highway on the approach side of the crossing. This type of gate is meeting with considerable favor, and there are more than 650 gates of this type in service. It has the good feature of having no obstruction on the leaving side of the crossing.

While it is possible for the driver to go around the end of the gate when it is down, the effort and hazard of turning out against the highway traffic probably causes most drivers to wait until the train has passed. This gate arm serves to hold an automobile after a train has passed when there is a train approaching on another track. The flashing lights on the left and far side of the crossing help to do this but there is no doubt the gate does it more effectively.

These gates are generally equipped with three red lights shining in both directions along the highway. The light nearest the tip is steady burning and the other two flash alternately. These gates are provided as an adjunct to the standard highway crossing signals which are used to give a preliminary warning to stop highway traffic before the gates are lowered. The gate arms are light and if broken can be replaced easily.

They are painted the standard white and black stripes.

Several installations of barriers are designed to stop vehicles which disregard the warning signal. One type is known as the "Auto Stop." It rises from the highway pavement on the approach of trains and is designed to so engage the wheels of automobiles that they will be stopped before they reach the crossing. The stopping device is placed about 75 feet from the crossing.

Another type known as the "Highway Guardian" is a gate which raises and lowers the same as the ordinary crossing gate. It is strongly constructed of metal members in the shape of a bow with a steel cable connecting each end forming the string of a bow, or the chord of an arc. When the gate is lowered, it engages a pin connected to a horizontal piston. The piston is part of a device consisting of a long horizontal cylinder filled with oil, with piston head and piston designed to permit the barrier to travel about seven feet against a retardation caused by the oil flowing through a restricted port from one side of the piston head to the other. An automobile disregarding the warning signal will engage the cable across the bow and will be brought to a yielding stop.

Each of these types of barriers includes automatic signals to provide a preliminary warning to stop highway traffic before the barriers start to obstruct the highway. Barriers which are designed to engage the vehicle to stop it are, when in position to stop highway traffic, across the entire highway. Like the earlier automatic crossing gates they stop and may congest the highway traffic when out of order, or when a train is standing on the controlling section. When they engage a vehicle they may cause some damage. Further experience, however, may prove their use is warranted in some locations, particularly where there are neither station stops nor switching.

About 86 per cent of the grade crossings in the United States are protected by fixed signs only. Additional protective devices are provided at the remaining 14 per cent because of the greater density of traffic, or in some cases because of physical conditions at the grade crossing. Motor vehicles, unless the driver takes chances, must approach the 86 per cent of grade crossings protected only by signs, prepared to stop, look both ways

and listen for the engine whistle, and not proceed over the crossing until the driver knows he can do so safely.

When motor vehicles approach grade crossings where signals, watchman or barriers are provided and no warning is being given, the driver generally assumes that no train is approaching and drives over the crossings without reducing speed materially. If the crossing is equipped with signals, and they indicate that a train is approaching, the careful driver will stop and not proceed over the crossing until either the train or trains have passed or until he knows he can do so safely. A small percentage of drivers, probably not more than 5 per cent, do take chances and pass over the crossing against the warning signal without ascertaining that they can do so safely. The percentage of drivers who take chances is probably about the same at crossings protected by signs only, as at crossings protected by additional protective devices.

This leads me to think that probably signals and other protective devices are more effective in facilitating highway traffic over the crossings than they are in providing additional safety. To further reduce the number of grade crossing accidents both at the 86 per cent of crossings protected by signs

only, and at the 14 per cent protected by special protective devices, all concerned should concentrate on the small percentage of drivers who take chances.

The most important step which can be taken, I think, is the enactment into law by all of the states with a penalty clause of Sec. 102, Act XIII, Sec. V, referred to and quoted earlier in this paper and provisions made for enforcement of this law.

Educational activities should be continued and intensified. A suggestion along this line is that a leaflet, showing pictures of crossing signs and signals with a few briefly stated instructions as to what precautions a driver should take before crossing a railroad, be enclosed with each automobile learner's permit, or that this information be included in the learner's Manual.

Efforts should be continued and intensified to designate grade crossings plainly by properly located, well painted and maintained advance warning and crossbuck signs, equipped with reflector buttons where necessary.

Signals and barriers should be further improved for use at heavily traveled crossings, and where installed should be properly located and well maintained.

The Public Aspects of Grade Crossing Accidents

By D. H. BEATTY

Superintendent of Safety, Southern Railway System, Washington, D. C.

The public—130,000,000 strong—of this country of ours, with its thirty million motor vehicles traversing our Federal and State highways, embodies many various types of people. Each group has its set way and definite belief, and when these set notions conflict while driving upon the highways, accident, death and injury often occur.

The National Safety Council informs us there were 93,000 accidental deaths in 1939, that 32,600 involved the motor vehicle, and within this number is included the 1,398 which occurred at highway-railroad grade crossings.

As in other studies, we must call in our analysts, our engineers, our teachers, our law enforcing agencies that we may present the truth, construct helpful preventives, proclaim correct motor vehicle usage, and seek

law enforcement whether the law infractions are in metropolitan, urban or rural areas and have justice, relative to punishment and damage cost, wisely administered.

With the ever increasing number of motor vehicles and their uses, we have concurrently the demand for greater and smoother highways free from impediments to traffic and safe as the engineer can construct. In this phase we find the rail and highway intersections, the majority of which were in existence before the coming of the motor vehicle. Other grade crossings have been constructed to meet some expediency and with full sanction of state or city authorities. The problem now is how can these occasional hindrances to highway traffic flow be eliminated or traffic warned and controlled, that death and destruction will not occur at these intersections.

Great amounts of study and research have been given in the past, and even now corps of engineers, representatives of Federal Government, State Government and of the railroads are seeking a remedy. In the past it has cost the railroads hundreds of thousands of dollars, but since 1933, the beginning of Federal Program of Elimination of Hazards at Grade Crossings, the expense of elimination and protection has been more wisely allocated. Under this Federal undertaking and up to the end of 1940 there will have been 3,368 crossings eliminated by separation or relocation and at over 2,000 other crossings protective devices have been installed, and the furtherance of this work continues.

Great as is this undertaking of grade crossing separation, the fulfillment of a single objective is not always 100 per cent acquired, for in some instances, after overpass or underpass has been constructed, the grade crossing still remains due to perhaps the diminution in property values or for political reasons; hence we often observe highway traffic using the old artery instead of the by-pass, when to use the new would require only the shortest deviation from a straight line and without any traffic delay. In many communities there are several street grade crossings when far fewer would suffice to carry the maximum traffic flow. In such localities traffic survey study should be made and unnecessary crossings eliminated. It is far more consistent to "pinch" a few of our neighbors than take the life of a single one.

We of the Safety Departments and Operating Divisions of the railroads know from the study of crossing accidents that we—the Public—must consider preventive devices other than physical ones such as crossing eliminations and visible or audible signals. Attention must be directed to the education of the drivers of the thirty million motor vehicles on the highway, enforcement of laws as to conduct of driver and speed of highway traffic at grade crossings; obedience to signals at rail and highway intersections, placed there through Federal or State funds—tax money. We, the Public, must be awakened, even though the form of awakening may seem drastic, to the realization that signs and signals placed on our highways are the rules of the road, govern the conduct and speed in restricted areas and really mean what signs indicate and laws specify.

We need from the state greater police supervision to insure respect for these signal indications and render to the user of the highway and to the railroad greater protection; both are taxable identities and protection is guaranteed.

We are not unmindful, as we keep within this special cycle of the safety work, that in 1939 there were only 3,476 crossing accidents involving casualty, but records will disclose that for every one with casualty there were approximately three others without casualty, totaling perhaps 14,000 crossing accidents. These, when enumerated as relates to the total motors registered, indicate that only one motor vehicle in every twenty-two hundred ever experiences any accident difficulty at a highway-railroad grade crossing, yet if this type of motor accident is to be lessened and accidental deaths prevented, the Public must acknowledge and assume its responsibility in the premises.

Many efforts in this direction have been undertaken and are now in existence. We have various state safety organizations, industrial safety councils, automobile clubs, school instruction, radio activities, Safety Section of the Association of American Railroads and the National Safety Council, which through its many diversified contacts in featuring greater safety still has unfathomed opportunities to reach the attention of the motoring world. All of these efforts have proved helpful, but the Public must search further, for we are advised America's highway traffic toll for the first six months of 1940 was 1,040 greater than for the same period last year.

We should be more thorough in our school safety educational instruction; we must not forget the minor of today is the driver of tomorrow. We should divorce the thought that "It cannot happen to me"; we must realize that traffic laws, signs and signals apply to everyone alike, and we should continue to urge equal recognition of and obedience to them.

Speed and inattention on the part of auto drivers cause many mishaps on our highway, likewise do these two factors enter into every crossing accident. Last year, numbered among the 3,079 collisions between trains and motor vehicles, 1,096 were caused by the motor vehicle running into the side of the train. In some crossing accidents we have trains derailed with casualties to

passengers and train crews and with property loss to the railroads of thousands of dollars. No better way seems apparent to awaken some drivers to their responsibilities in crossing accidents than to charge them with the damage involved. Pinching the "pocket book nerve" seems to awaken the "obedience nerve" and to create mental alertness.

We know tourists motor millions of miles every year, we know that well established motor bus and freight truck fleets traverse miles and miles of our highways, crossing and recrossing railroad tracks at grade, but don't lose sight of the fact they are seldom in a crossing accident, nor is it the heavily used crossing—a study for elimination—that is generally involved. It is the car or truck locally owned and operated and the driver who has crossed and recrossed the railroad many times and is fully acquainted with the complete layout. The serious accidents occur at crossings little used and on roads in the second and third grouping. Instructors and patrolmen need not go far from the site of the crossing to find those who should be contacted, instructed and governed.

What is the Public's aspect of this situation? Speaking, as we do, for the whole unit and bound as we are through mutual and business undertakings, we should circularize to a more extended degree the crossing poster published each year by the Safety Section of the Association of American Railroads; as representatives of the Steam Railroad Section and as individual railroad members of the National Safety Council we should request far more extensive crossing accident prevention activities in all of the diversified contacts by the National Safety Council in industry and public relations as it ties in so closely with highway and prevention of accidental casualties; we should urge the states to install only the signals and protective devices recommended by the Joint Committee on Grade Crossing Protection of the Association of American Railroads which have been approved by the Bureau of Public Roads, the American Standards Association, the American Association of State Highway Officials, the National Conference on Street and Highway Safety and the National Association of Railroad and Utilities commissioners, that uniformity in pro-

tection may be maintained for the benefit of the whole.

We should request the states to enact into law, having an appropriate penalty clause, Sections 102, 103, 104 and 105 of Article 13, Act 5 "Uniform Act Regulating Traffic on Highways" of the National Conference on Street and Highway Safety. These sections deal with the handling of highway traffic at railroad grade crossings. We can, and we are welcome to, extend our safety educational efforts through addressing school assemblies; we should approach civic clubs, state, county and city managements for greater or more frequent police survey and police protection; we should seek to have the burden of expense of accidents assessed against the party at fault; we should urge all of our employees and members of their families to set an example of safe driving on the highway through obedience to signs, signals and other mandates, and teach how to cross railroad tracks in safety. Remember, we—railroad employees—are over a million strong and with this number of safe drivers on our highways we will convert others to the ways of safe practices whereby lives and property will be saved.

We should make periodical inspections of the crossings and maintain them in sound and serviceable condition. Crossing signs and protective devices are being efficiently maintained; the Public can assist through removing obstructions to view wherever possible.

Railroad men are sounding crossing signals and are protecting when they switch over crossings. We must continue supervision as relates to these agencies.

We are informed through the Interstate Commerce Commission that for six months this year there have been 884 killed and 2,181 injured in crossing accidents as against 680 killed and 1,846 injured in 1939. The number of accidents has increased by 326, or 20.31 per cent.

Inattention and speed are the two evils the Public must govern, and we and our associates back on our properties are definitely a part of the Public. Let us then keep alive and pursue more vigorously through every agency at our command our efforts in this humane undertaking—the saving of life and limb, the elimination of accidental casualties.

Enforcement as a Factor in Grade Crossing Safety

By LIEUT. F. M. KREML

Director, Safety Division, International Association of Chiefs of Police,
Evanston, Ill.

I wish to compliment you men of the railroad industry. The fact that you have come here today from all parts of the country to devote an entire afternoon to a discussion of grade crossing accidents indicates a wholesome attitude on your part and augurs well for the success of programs aimed at the reduction of these accidents.

The police profession also recognizes the grade crossing accident problem and stands ready to cooperate, realizing of course that enforcement is not the only answer.

The ideal combination to reduce grade crossing accidents, in my opinion, is the same as for any other type of accident situation—get the best practical engineering protection; seek to educate the public in the importance of observing whatever protective measures are provided—be they warning signals, crossing gates or some other means, and finally, an efficient and aggressive enforcement program for those who won't be educated.

The main responsibility, as I see it, lies with public officials, who must give this problem their closest attention because of the severity of it, and with you railroad people, who, as pioneers in the safety field, should be interested in doing everything you can to raise the general level of safety through engineering, education and enforcement.

From the engineering standpoint, it is important that protective measures be complete. For example, at a number of bad intersections, it is not enough that warning devices be placed only at the grade crossing. There are some crossings where drivers should be warned as much as 300 yards back, to give them plenty of time to stop.

Warning signals and protective devices should be practical. Crack-pot contrivances that are apt to cause collisions as serious as those they are trying to prevent are practically useless from a safety standpoint.

The number of chance-takers on the road—as evidenced by the number of grade crossing accidents each year—indicates a real need for intensive educational pro-

grams. On these programs, the railroads should spend more time, money and effort than ever before.

From the enforcement standpoint in this problem of reducing grade crossing accidents, selectivity must be the theme—just as it must be the theme in the general plan of traffic law enforcement.

No police department in the country is sufficiently staffed to have men patrolling all of the streets every hour of the day. Therefore, it is a question of assigning men to those sections of the city where the greatest number of accidents are occurring—at the times of the day that experience indicates accidents are the most prevalent—with instructions to the men to be on the lookout for those violations that have been causing the most accidents.

Cities throughout the country have learned that selective enforcement pays—in lives saved and injuries prevented. Police have learned that their efforts can be much more productive when they concentrate on the trouble spots instead of scattering their efforts.

Translated into the grade crossing accident problem, selective enforcement may mean the assignment of motorcycle officers to areas including grade crossings with bad records for certain hours of the day; it may result in a special educational program directed at certain driver faults that have been observed, or it may mean the installation of extra protective devices or a system of pre-signalling some distance back from the actual crossing.

One of the prime functions of the traffic police is the enforcement of the traffic rules and regulations. The police must see that the laws are obeyed. But the work of the police in traffic safety is much broader than the mere enforcement of the law.

Some of the most sterling citizens will break traffic laws if they think they can get away with it. Therefore, one of the major functions of law enforcement officers is to instill in the public a sense of obedience—a general wholesome respect for the

traffic laws, as well as the other laws we have that make this a civilized country. In this sense, the work of the police is educational. The police would like, in every case, to get obedience to the traffic laws and to good driving practices without applying penalties. Unfortunately, this cannot be done always.

We all know that in cases of disobedience to signs and signals at grade crossings, the results to non-conforming drivers are often tragic. Enforcement is a definite factor in grade crossing safety for this reason. Observation of stopping lights, crossing gates and signs at grade crossings requires the same sort of driver obedience that other traffic regulations do.

We are particularly concerned about the grade crossing accident problem in rural areas, as most state police organizations, which are responsible for rural traffic safety, are so pitifully undermanned that they are unable to cope with these and other enforcement problems in the manner they should.

I think I can speak for all traffic law enforcement bodies in saying that the police are anxious to cooperate with the railroads and other agencies in every way possible to solve this joint problem of grade crossing accidents—and it is indeed gratifying to know that we have such outstanding leaders in the field of safety as the railroad men to work with in this project.

WEDNESDAY AFTERNOON SESSION

October 9, 1940

Trespasser Accidents—Panel Discussion

Presiding: P. F. BUCKLE

Superintendent of Safety, Chicago, Burlington & Quincy Railroad Co., Chicago

In this program we will deal principally with one phase of the railroad safety problem which, over the years, has perplexed railroad managements, railroad officers and employees generally. We will attempt to point out some of the difficulties in dealing with this problem and hope to offer you some ideas as to how it may, in some part at least, be solved.

I shall not take time here to present detailed statistics on the subject, but I should like to read to you the opening paragraph of that splendid Statement on Trespasser Casualties in Steam Railway Accidents, prepared by the Bureau of Statistics, Interstate Commerce Commission, last April. This is known as Statement 4018 and is available to all railroads.

"The average annual number of trespasser casualties (number killed plus number injured) in railway accidents in the period 1920-1939 was 5,248 compared with 9,969 for a like number of years 1900-1919. This represents noteworthy reduction; however, the number reported by the railways in 1939 constituted 54.9 per cent of the fatali-

ties and 12.2 per cent of the injuries sustained by all classes of persons in railway accidents involving train operation in that year, indicating that this particular field is still an important one for accident prevention work."

I would recommend that all railroad officers interested in abating the trespass evil obtain a copy of this statement for it can be used to excellent advantage in presenting the subject to employees and outside groups.

Dr. M. O. Lorenz, Director of the Bureau of Statistics, I. C. C., when at St. Paul last June said: "It may be said of the trespasser accident problem, as of the grade crossing problem, that you (the railroads) are not primarily responsible. It is the victim's own fault if he is injured while making unauthorized use of your property, but certainly the trespassers are not organized and the public will concern itself with the problem only if stimulated to do so. THE DRIVING FORCE MUST COME FROM THE RAILROADS WHOSE PROPERTY IS INVADDED BY TRESPASSERS."

Dr. Lorenz has been most sympathetic and considerate in his desire to be of assistance to the railroad industry in dealing with all of its accident problems, and we are grateful to him for his help and the inspiration he has given us.

The following appeared in the last report of The Committee on Trespassing of the Safety Section, Association of American Railroads:

The Public's Responsibility in the Railroad Safety Problem

By F. G. GURLEY

Vice President, The Atchison, Topeka and Santa Fe Railway Company, Chicago

The public's responsibility may be described as a conception by the people or the community at large concerning a phase of human relationship rejected by the first son of man, for it was Cain who, according to the Book of Genesis, asked scornfully and resentfully: "Am I my brother's keeper?"

In an ambition to achieve civilization man often has accepted that responsibility and unquestionably we would be nearer a true civilization if it were recognized more frequently.

The genus public usually accepts or rejects responsibility of the nature here considered through some act of Government. Our Constitution grants to Congress the power "to regulate commerce with foreign nations, and among the several states, and with the Indian tribes."

Railroads as the great carriers of commerce among the states are the nation's most regulated industry. Hundreds upon hundreds of Federal laws, rules, and regulations control various phases of their operation, including the hours employees may work, and prescribe the details of their facilities and equipment, especially cars and locomotives. Each of the states has entered the field of regulation in varying degree. Hundreds of men are employed as supervisors and inspectors to insure compliance with these requirements. A high proportion of all this is in the name of public safety. Some arduous obligations have been placed upon the railroads to promote safety.

Our Government thus has recognized a responsibility, but I believe it is fair to say that in this recognition the railroads, their

"IT IS BELIEVED THAT THE MANAGEMENT OF EVERY RAILROAD IN THE COUNTRY MUST HAVE THE DESIRE TO ABATE THE TRESPASS EVIL IF ANY SUBSTANTIAL PROGRESS IS TO BE REALIZED IN THIS ENDEAVOR."

Chairman Buckle then introduced the various Panel speakers, who delivered the following individual papers:

officers and employees, have been saddled with more than their proper share of the problem, and that the part of the public which is represented by individuals outside of railroad employment and by divisions of Government and Governmental departments has not always made its full contribution.

The primary purpose of a railroad is to move people and commodities from one place to another expeditiously. Some exposure to hazard and discomfort is incidental to any such accomplishment, but nevertheless the railroads accept the task of doing it safely and comfortably. Their reputation and financial success necessitate that. This latter is influenced by liabilities imposed upon American railroads to a greater degree than upon other forms of transportation in this and foreign countries and also upon the high seas.

Perhaps I should use the phrase "comparative safety." The cold hard fact is being forced upon us by events told in newspaper head lines that this earth does not know absolute safety.

In striving for a high degree of comparative safety, it appears proper first to focus attention on our passengers who entrust themselves to our care and to our employees. Surely that is our primary job because these are the only people who have to be on railroad property when trains are in motion.

The booklet, "Accident Facts," published by the National Safety Council reveals that last year 93,000 people met accidental death in the United States. In 1939, 597 railroad employees and passengers were killed, of

which 32 were passengers, a high percentage of those being the result of one very unfortunate and unusual passenger train derailment.

The 1939 record is undesirably high, (any number is undesirably high), yet comparatively speaking it was only .64 per cent of the accidental deaths. Considering the millions of passenger miles and the millions of employee man hours associated with millions of moving vehicles and machines, that is a good comparative record.

It was made possible by two things. First, a safe and sound transportation plant—there is none better in this world. Second, by a system of operation governed by definite rules and the use of discipline to enforce those rules.

I want to emphasize definite rules and enforcement through discipline, because those are the outstanding shortcomings in dealing with the problems of this section of the National Safety Council. I refer now to the perplexing and somewhat neglected problem of the trespasser.

Those 597 deaths I discussed a few minutes ago are not all of the accidental deaths which occurred in connection with steam railroad operation in 1939. The total as given by the Interstate Commerce Commission Bureau of Statistics is 4,699, and of that total 2,424 or 52 per cent were trespassers and another 1,519 or 32 per cent were killed in grade crossing accidents. These two groups account for 84 per cent of the total. In neither are rules, or shall we say laws, as definite as they should be, nor is there adequate discipline or law enforcement. This is especially true of the first group.

For many years the public did not manifest much concern about the hazards of grade crossings nor did it accept its obvious responsibility for accidents which continued to increase somewhat in proportion to automobile registration. Fortunately, however, that viewpoint has changed materially and more adequate protection as well as the actual elimination of grade crossings, largely at public expense, at the traffic intersections with the greatest volume have been carried forward vigorously in recent times. Discipline, although not yet what it should be, has improved. The highway traffic officer is alert and energetic. In 1939 deaths in grade crossing accidents were 56 per cent of

the 1929 fatalities due to the same cause. In other words, the loss of life now is about half what it was in 1929.

But in the trespasser group we find practically no improvement in the past ten years. The number killed in 1939 was surprisingly close to the record of ten years ago. Why is that? What is the public's responsibility and what should be done about it?

For one thing there should be universal recognition and acceptance of the fact that for every right there is an obligation. We Americans talk a lot about our rights, but not enough about our obligations. The fact that my neighbor has the right to own property means I have an obligation to respect it.

By the literal meaning of the word, a trespasser is one who has not kept his obligation and has violated the rights of another. In contemplation of this, the sign "No Trespassing" hangs across the railroads' right-of-way all the time. Because of the great dangers always present, by the very nature of the business, the entire public as well as the carrier has a vital interest in preventing trespassers from causing delays in service, loss or damage to property, injury or death to passengers, railroad employees, or to the trespassers themselves; but has the public established adequate rules about trespassers which it enforces by policing and discipline? It is not unfair to answer negatively.

Not only is that true but other laws, for one reason or another, have been so interpreted that some of us think undue burdens and liabilities are placed upon the owners of railroad property and the trespasser escapes his normal and proper obligation.

I have referred to the liabilities of the railroads for freight shipments. We are liable in case a shipment is lost or stolen. For a good many years the American people have been accustomed to seeing itinerants on freight trains. These are commonly called "hoboes." Most of them will not steal from railroad cars, but some will and do. Some of these freight train riders are professional thieves and to the extent they are successful in their ambitions we fail in one of ours, namely, the delivery of goods previously entrusted to us, and which failure becomes a legal liability.

Because the normal law enforcement officers cannot, or at least do not, protect us

against the evil of this form of trespassing, we of the railroads employ police officers of our own. They have difficult jobs and I want to express my gratitude and appreciation for the perfectly fine work they have done and are doing. They must look over these hundreds of trespassers with an appraising eye. If you think it isn't "some job" to distinguish the harmless hobo and the thief, try it some dark night in a railroad freight yard.

If the railroad police officer guesses wrong by taking a professional thief for a harmless hobo his family often issues a notice a few days later reading: "Please omit flowers."

If on the other hand he guesses wrong the other way and takes protective action against some one who later establishes himself as a trespasser who is stealing a ride, both this police officer and his employing company find themselves in a lot of trouble. The fact that he should not have "trespassed" and the further fact that had he not violated his obligation to respect the right of the property owner, there never could have been any trouble, are not always kept clearly in mind.

A few months ago an Appellate Court sustained a judgment for \$2,000 in favor of a man who was walking along a cross-path under a viaduct where railroad employees were working on the bridge. These employees lifted a guard rail up, shouted "Look out below," and dropped the piece of timber. It struck and injured a trespasser. The Court held that it was for a jury to decide whether the railroad was negligent in dropping this heavy object without exercising more care. The pathway under the bridge had been used by many people in the past even though it was entirely on private property.

Unfortunately, courts are becoming more and more liberal in their attitude toward trespassers who are injured and now nearly every case becomes a "question of fact for the jury." Judgments running into many thousands are upheld because the evidence is said to show that "the trespasser was willfully and wantonly injured." A trespasser was on a train or on a right-of-way, unlawfully; he was indifferent to his own safety and, therefore, became injured; yet under these decisions it is held that we have made his status lawful because, in the view of the court and jury, under the facts

and circumstances of the particular case, some railroad employee did a little more, or did a little less, than the court or jury thought was proper and lawful. Consequently, the railroad companies are required to pay out not only the actual damages which a jury decides should be awarded, but in many cases a large additional amount as punitive or exemplary damages.

When the public, functioning through its legislative bodies and its courts, does not accept a proper respect for the rights and obligations which I have mentioned it has not met its responsibility, in my judgment. Rather it has issued a left-handed invitation to trespass and the invitation is being accepted.

Just a year ago we had a train wreck which caused the death of two of the train crew, injured a third, derailed and smashed up eleven loaded freight cars. Three girls who lived nearby were returning home from church one Sunday morning. One of them put a spike lengthwise on the rail, and a few minutes later a big freight train was derailed, two men killed and thousands of dollars of property damaged and destroyed.

As we think about what we might ask the public to do, we should never lose sight of the basic philosophy of rights and obligations. A knowledge of how another country looks at these things should be helpful.

In England the law, generally speaking, appears to be the same as in this country regarding railroad trespassers. The trespasser comes on the railroad's property at his own risk; there is no duty on the railroad to look for him, and when his presence is unknown, no duty is owed to him. After he is known to be on the premises, the railroad may not willfully injure him. But, so far as can be judged from the reported cases, there is a vast difference in the relation between the trespasser and the courts. Apparently the trespasser is a defendant in England most of the time, while he is almost always the plaintiff here.

The volume of trespasser litigation which railroads are required to defend in the United States is large, and the judgments in favor of trespassers are frequent and expensive; in England trespasser litigation is practically nonexistent and a judgment in favor of the trespasser is a rarity.

In England the by-laws of a railroad, which apparently resemble the ordinary

rules and regulations in use here, have the force and effect of a statute; therefore, whether the trespasser knows about them or not, the law presumes that he does know and he is bound by them.

Every time that a person trespasses on a railroad right-of-way in England—after he is given a first warning—he is subject to a fine of 40 shillings. He cannot go across except at an authorized crossing. Evidently this law is enforced, and consequently wholesale trespassing is almost unknown there.

The reason for all this may be in the different public attitude existing in England toward railroad companies and property rights at large. In England there is more of an acceptance of an obligation to respect the rights of property.

I spoke about the trespassers who steal rides on freight trains. These are among the largest of the trespasser groups. Our laws prohibit railroads from giving and individuals from accepting free passenger transportation, except in certain circumstances, the largest single exception being railroad employees.

Inadequacy of Law Enforcement as a Solution to the Trespass Problem

By W. I. SPITLER

Chief Special Agent, Chicago, Indianapolis and Louisville Railway, Lafayette, Ind.

In most states a man is not a trespasser on railroad property the first time his unauthorized presence there is discovered. He must be directed to leave and becomes a trespasser only when he has refused to obey that request, or has obeyed it and comes onto the property a second time. The use of undue force on the part of the officer must be avoided, for a battered bum can bring about a sob story in a newspaper and represent a potential law suit. Such suits are expensive to the railroads to defend, and the defense is too often unsuccessful—not because of weak defense but because of the sympathetic attitude of the public toward trespassers upon railroad property. That responsibility, the risk of personal harm, and the possibility of retributive action on the part of the trespasser, such as cutting an air hose or throwing stones, restrains other

If these trespassers instead of seeking a ride on a freight train presented themselves at a railroad ticket office and asked for tickets it would be unlawful to furnish the tickets, even if the railroads desired to do so and, of course, they would not desire to give away the only thing they manufacture; namely, transportation. But for some reason peculiar to American psychology in some instances the activities of law enforcing officers encourage rather than discourage trespassers riding on freight trains. You are familiar with the practice of local police officers "rounding up" undesirable transients, escorting them to the railroad right-of-way at a time when a freight train is due to depart, and suggesting that they "get out of town."

While from the standpoint of a particular community we cannot deny that the ridding of the community of questionable characters is desirable, a real appreciation by law enforcing officers of the rights and obligations of a railroad should result in the local law enforcing agencies choosing some other method of ridding the community of these undesirables.

employees from taking an active part in attempting to control people who trespass.

Most laws prohibiting train riding state that the offender must be seen getting on or off of a moving train or car. When some unauthorized person is seen getting onto a passing train, the officer who sees him is confronted by a situation wherein he is damned if he does, and damned if he doesn't. Should he direct the person to get off of the train in motion or attempt to put him off, and should the offending person be injured in the process, the policeman has become the proximate cause of the injury and has created a liability against the company. Should he ignore the offense, he has given tacit consent and thereby created a certain responsibility on the part of the railroad company for the safety of the trespasser.

To handle such a situation properly, the

officer, himself, must get on the moving train and ride until it stops or until the trespasser gets off before making the arrest. Even then, the offender, seeing the officer and sensing the situation, may run over the cars or try to get off and in so doing suffer an injury. In such a case he would plead that the threatening appearance and actions of the officer made him fear bodily harm and thereby try to make the officer the proximate cause of the injury. Not very good legal grounds, to be sure, but having a certain appeal to the sympathies of a jury.

The professional bum, or transient, as sociologists euphemistically call him, is not a great menace to safety or to the property of the railroads. He is merely a person too defeated by life or too indolent to want the responsibility for the care of any personal property. He does, however, make a screen for the activities of the professional box car robber. The officer may run him off of the property, but frequently the town marshal herds him back, with orders to get on the train and get out of town. The most effective way to discourage his presence is to give the railroad a reputation for making it hard for him. For the word passes from jungle to jungle that this road is easy and that road is tough. To create such a reputation, all employees must cooperate with the protective department and not abet the bum. I do not mean by physical violence. Just a constant prodding each time he is seen on the property so that his rest and his reveries are disturbed and he can find no peace of mind on that railroad.

The presence of the Jukes and Kalikac families in the neighborhood of railroads is the source of our greatest trouble. It is on our properties that the multitudinous offspring of these omnipresent families grow up to a fecund breeding age in the firm belief that railroad tracks and yards are their natural sources of fun, coal, scrap metal and targets upon which to try out their throwing arms. The laws of our land and the interpretations placed upon those laws encourage them in that belief. They swarm upon us, and the responsibility for their safety is largely ours. Nor can the railroad officer by his lonely efforts protect these sociological weeds from injury. Other than hound dogs and jalopies, these people have no property, and they see no reason for respecting that of others. The tendency of the times is to build up that disrespect in their

minds and to encourage them to be professional poor folk and pampered wards of a beneficent government.

The generally accepted method of handling these young trespassers by railroad protective forces is first to apprehend a few of them. That sounds simple, but any policeman can tell you that it requires considerable guile and patience. Speed and agility are all on the side of the trespassers, and any kid can find cover in any house along the tracks. One lucky day, the officer captures a squirming and profane boy, demands to know his name, address and school, and as many other names as can be wormed out of the lad. With this list the officer calls at a variety of places, including some vacant lots, and asks for people named on the list. In those instances where the names and addresses match, the weary officer leaves a warning, sometimes verbal, sometimes written, and sometimes both. In some homes he meets with a kindly and co-operative spirit on the part of the parents, but not always. If he can prove damage to the company property done by the child and collect the value thereof from the father, he has accomplished a miracle. The father takes charge of the discipline and in those circles spanking is not a lost art. In no case shall the railroad policeman administer a needed spanking, however, even though the parents invite him to do so—and that invitation has been extended upon occasion.

The school plays a big role in preventing such trespass and, in many cases, the most important role. Through the teaching of safety and self respect in the schools, many children have been taught to stay away from railroads. School is not always in session, however, and prowling groups of boys may forget those lessons during vacation. Each group has a leader, and the wise officer wins the influence of that leader in keeping alive the safety rules taught in schools. Varying degrees of cooperation between railroad policemen and school authorities are in existence. Some roads maintain officers who speak at school assemblies with gratifying results.

The important thing is to keep trespassing upon railroad property from becoming a game between the boys and the railroad officer, in which the boys have all the advantage. Some roads furnish idle ground of their own as play grounds for the children.

where that is possible, making an agreement that if the children are permitted to play there they will stay away from the tracks and buildings. Legal departments may raise a question of liability, but on the whole the risk is less than when the boys prowl the property. In some cities, honor groups such as Junior G-men, Junior Firemen and bicycle clubs are organized, where the privilege of wearing a badge is accorded the individual for respecting the law. After all, our juvenile trespass problem is a result of unoccupied boyhood. Anything the public does to control these young lads helps us, and anything we do helps the public. I prefer the modern approach which inspires the boy to be good rather than the old method of making it amusing to the boy to be mischievous.

Of course there will be a few who will respond to none of these influences. Father Flannagan says there is no such thing as a bad boy; I believe he knows more about the subject than anyone else for he has devoted a lifetime and splendid talents to the work of interesting boys in constructive effort. There is, however, but one Father Flannagan, and we less talented persons attempting to cope with the problem are certain to find a small percentage of boys who must be made wards of juvenile courts. This is a last resort and should be done as much to protect the boy from becoming a criminal as to protect railroad property. You have all heard the movement in Buffalo described at other meetings. It is certainly a splendid effort and shows what can be accomplished by enlisting the active interest of a large number of people.

A situation in Denver shows how such a thorough and systematic application of principles can succeed. In August, 1938, one road in that city handled 387 juvenile cases. By this plan of warnings, appeals to parents

and to schools, and finally to juvenile courts, by maintaining card files of all offenders and following through on each case, they have now reduced the number of juveniles handled to some 50 or 60 per month. That is a notable reduction, but the problem is still alive.

Railroad protective forces must have the help of other employees. Members of other departments must help by giving information of trespassing to the police officer and refrain from supplying the trespasser with information about the police. In the past, some employees have been sympathetic to the trespasser, though not fighting on his side. At times I have felt like calling some of them fifth columnists because of the nature of their activities. I do not ask that other employees handle situations on their own initiative, but I do ask that they give the police departments intelligent information and assist with moral support in every way possible. Roadway departments are requested to keep fences in repair, material collected at places where they are not an invitation to the public to help themselves, and to eliminate attractive nuisances to children wherever possible. Yardmasters are asked to store cars in more protected spots wherever possible. Company coal and idle cars are so frequently placed where they will be convenient for coal and brass thieves and in such far removed locations that it is a physical impossibility for the protective departments to watch them.

All employees should cooperate to give the road a reputation for not permitting trespassing. Much trespassing is done by force of habit. We require the help of parents, schools and all civic authorities. The test of the successful railroad policeman lies in his ability to secure all this co-operation, rather than in his toughness and belligerency.

How to Enlist the Support of School Children in Accident Prevention

By LIEUT. HARRY E. MEYERS

Joliet Fire Department, Joliet, Ill.

I have been affiliated with safety work continuously since 1938 and have received splendid cooperation from the city administration, grade and high schools, churches,

civic clubs and various lodges. So far during this year, we have lectured to over 25,000 adults and children and we have appeared before 206 civic clubs, including P.

T. A. organizations, and 150 school organizations.

However, I believe that safety education must receive its start in the home. Excluding the professional hobo, I do not believe that people trespass with the intention of doing wrong; they trespass in an effort to see and learn for themselves. I, myself, have driven twenty miles many times during the summer months just to watch the Zephyr go speeding along the rails.

During my lectures in the schools on the subject of safety along the railroad right-of-way, boys would come to me and tell me that they were not trespassing just because they wanted to do something that was forbidden them, but that they merely wanted to see the Zephyrs or other streamliners. I believe the younger generation is looking for enlightenment. Laws can be legislated but without interpretative lectures and the support and good will of the public, they will be of no avail.

There are about 15,000 children in the city I am proud to represent. In the spring of 1933, our traffic accident situation in the City of Joliet had reached a new high. Because of this, something had to be done to protect the lives of our children. The idea came to me that since we have Boy Scouts and various school organizations for children, we should also have a Junior Firemen Council for the purpose of instructing our boys on safety. This would also be a step toward the promotion of fire prevention.

The response to this idea was instantaneous and the Junior Firemen Council was soon organized. The members are between

the ages of 9 and 17, and in order to be eligible must come recommended by their teacher. This, of course, tends to promote better scholarship and industry on the part of the child as well as good conduct. Each member is given a red and white uniform and a badge. One night each week, weather permitting, the Junior Firemen hold a meeting at which time safety in the home, in the school and on the streets is discussed. Avid enthusiasm was displayed and a few years after its organization, the membership totaled over 3,500. Other cities learned of this new movement and similar councils were organized.

The Junior Firemen help to reduce loss due to fires by cooperating with the local fire department. They also promote general safety. Most of the members are Safety Patrol boys whose duty it is to escort children across streets at busy intersections. Good fellowship is promoted by holding picnics, shows, lectures and programs.

In 1936, the Joliet Community Safety Council was organized and it was my privilege to be chairman. Since then, we have given a series of weekly radio talks. Due to our untiring efforts, we have not had a child fatality for the past one and one-half years. We, the citizens of Joliet, feel very proud of this record and are striving to maintain it in the future.

I firmly believe that with the proper cooperation of the various school, civic and industrial organizations, we can make every child safety-conscious and thereby promote greater safety within our cities.

The Railroads' Anti-Trespass Program

By JOE E. MASKELL

Passenger Conductor, Chicago, Burlington & Quincy Railroad, Beardstown, Ill.

I want to take you back to your school days—imagine yourself back in a grade school room, and I will give to you just what I have given to thousands of pupils in the past two years.

Boys and girls, we have come to ask you to help us railroad men solve a very serious problem—we need help to prevent people from getting hurt. This really puts us thinking, doesn't it? Right at this moment you are wondering to yourselves, "How can

we boys and girls be of any assistance to you railroad men?"

Being a railroad man myself, I can make this point very easy to understand for I am speaking to you from years of experience.

Every year many hundreds of people are killed or injured while on railroad property and hundreds of these are young boys and girls like yourselves. On the Burlington Railroad alone in the past few months, a number of folks lost their lives and many

others were injured because they failed to realize the danger of walking on railroad tracks or being in railroad yards.

None of you boys and girls want to be hurt, nor do you want to hurt anyone else or see them hurt; but I want to tell you how some young folks were hurt while they were on Burlington railroad property.

A little boy 6 years old had been sent on an errand to the grocery store; on his way home, reaching the railroad track, he sat down on the rail probably to rest. The little fellow failed to notice a fast passenger train approaching and before the engineer could bring his train to a stop the boy was killed.

Some time ago at a small town on our own division, a group of small boys were playing in the railroad yard. They climbed to the top of some box cars and were running over the tops of them—one of them fell between the cars, his head struck the drawbars and he was seriously injured.

Years ago, while I was in charge of a train between Centralia and Beardstown, a group of young boys attempted to hop the train to take a short ride. One of them fell under the wheels and lost a leg. I felt so sorry for him as time passed. I would watch him when passing through that town. He was a cripple for life—no longer could he enjoy playing baseball, football, basketball or tennis as his playmates did—he had to be content to sit on the sidelines and watch others enjoy themselves. Wasn't this a terrible price to pay for a short ride?

A short distance from where I live on another railroad last summer, two little girls, three and five years old, were on their way to a store and on reaching the railroad a freight train was stopped on the crossing. Instead of waiting until the train pulled over the crossing, as they should, they attempted to crawl under the train to the opposite side. While they were doing this, the train started and the younger of the two was killed.

A mother and her two small children were killed a short time ago while attempting to walk across a railroad bridge. They probably thought they could cross the bridge before a train arrived, which was the wrong thing to do for trains and engines can be expected on railroad tracks at any time and it is very hard sometimes to tell how fast they are moving.

So won't you please remember this and never play or walk on railroad property? If

you have any friends who do this, ask them not to do it. If you have to cross a railroad always be sure to stop, look both ways, listen and do not cross until you know the way is clear. Never step on top of the rail for when they are wet, icy or frosty one might be injured in falling; and remember in stepping over the rail to step well over it, for on the inside of each rail there is a three-inch opening which must be there for the flange of the car wheels to travel through. The reason I ask you to step well over the rail is to guard against the danger of getting the heel of your shoe caught between the rail and the crossing plank.

Only a short time ago this very thing happened to a little girl near where I live. A train was approaching, but fortunately a man heard her cries; he rushed to her aid and saved her life.

Never crawl under crossing gates that are down for they have been lowered to protect you. Never run to get over a crossing ahead of a train for you might stumble and fall. Always remember if you have to run to get across, you haven't time to cross safely.

Never take a short cut across a railroad yard or tracks. So many times engines are switching cars to different tracks you might step out of the way of one and into the path of another. Remember, danger is always lurking there and where you may least expect it. Never play around the railroad stock pens or molest the gates; they are kept hooked back to insure safety to the trainmen who might have work to perform at that point.

Oftimes I see boys and girls standing on overhead bridges to watch trains pass under; this too is dangerous. Many times I have noticed them throw objects down onto the train; please do not do this; you are liable to injure someone.

To place even the smallest objects on railroad rails is very dangerous not alone to the one doing it, but it might be the cause of hurting and even killing a lot of people. We have a great many motor cars on the railroads which are being used in line of duty by our officers, supervisors and track men; so never, no never, place anything on the rails for you might be the cause of injuring someone. If you hear or know of anyone who does this, won't you please get word quickly to a railroad man, your parents or

someone else? This will give us an opportunity to explain to them, as I have to you, how dangerous it is to place any object on the rails and you will be helping us to prevent what might otherwise prove to be a serious accident.

A short time ago, as we were leaving a station, a boy about 10 years old placed a stone in his slingshot and shot at the train, missing a window by about three inches. Now if the stone had struck the window, it would have been broken and passengers probably injured. So never throw or shoot at the trains.

We said at the beginning we didn't want to get hurt nor hurt anyone; so can't you understand now how easily you can help us to prevent people from getting hurt? I would like to know how many of you are really going to help us by promising us you

are not going to play on railroad property, or in the railroad yards.

We want to thank you for your attention and we will appreciate your help so much in preventing people from getting hurt.

* * *

It is of course understood in speaking to a group of high school students, one must come up to their level. We talk to them on the dangers of trespassing, also careful driving, going into the grade crossing situation thoroughly, explaining to them the different signals to be found at our railroad crossings and how the electrical signals operate. I relate to them some of my experiences in regard to grade crossing accidents, in which I have been involved through no fault of my own, and how easily grade crossing accidents can be avoided if only drivers will accept our signals.

How the Public and Authorities Can Aid in the Railroad Safety Program

By ELIZABETH BALES

Assistant Director of Colorado Safety Council, Denver, Colo.

The urge to wander unrestricted is elemental and all of the signs waiting in the paint shop and a doubled number of enforcement officers cannot curb it without the cooperation of the public.

The public demand for more and better traffic signs and control, the increase in railroad crossing signals, the hundreds of thousands of dollars spent on underpasses may increase safety, but they also relieve the individual of the necessity for considering his own protection. One look at the traffic fatality record will show how little attention is paid to signs by motorists. If every request for critical speed signs were acted upon our land would bristle like a porcupine. In the minds of many people a sign is a panacea and will automatically correct trespassing, speeding and right of way violations.

The average American is apathetic toward conditions unless he is directly challenged or his emotions aroused. He little realizes that a large slice of his insurance is invested in railroad bonds. What affects the railroads affects him, though indirectly. Payment for trespassing fatalities is a raid on the treas-

ury and for humanitarian reasons and to keep intact that vague something called good will, is assessed as a matter of course. The strong have always cared for the weak and in the minds of too many people the railroads stand for wealth and strength.

There are ways to get to the public through aroused emotion, which in the last analysis is just a new application of modern advertising. Entertain Mr. Public with the hope that some education and information will stay with him. A railroad show on the air never fails to bring comment from youngsters. There is something arresting in the sound of a train whistle that gets all of us. It is equally effective over the air.

It is entirely possible that the same methods that are being used to correct attitudes in the motorist will be effective in controlling the trespasser. After all, the traffic problem and the trespass problem are blood brothers. In both situations we have fool proof equipment balanced with the frailties of human beings. The irresponsible high school boy with a folded handkerchief in his pocket who expresses himself through speeding and impudent driving is very like

the boy who uses his sleeve. They both defy authority; but scrape off the top layer and they look just alike. They both have a natural response to entertainment.

Radio entertainments . . . rip snorting, slam banging dramatizations, designed to appeal to the imaginations of all listeners are being aired in our state once a week. They are written with an eye to the basic causes for accidents. Irresponsibility, drinking and driving, bad temper, and trespassing have been painted in lurid colors. The gray is highlighted with a small amount of gore for emphasis.

The railroad man is fortunate to belong to one of the glamour professions. In the eyes of the average small boy he is a hero. Not when he places himself on the boy's level, for instance while chasing him through the yards, but when as an engineer riding high in his cab or sitting behind a desk with a train model before him. We play up that glamour in our shows, believe me.

Let me go on to another type of educational entertainment. The marionette show has a basic appeal. In Colorado a troupe of safety marionettes will go on tour this fall. The company will include a railroad engineer, a courtesy patrolman, a city policeman, and a mother and child. The first drama will be on trespassing and will be presented before school groups. The things that are seen are more easily remembered and visual aids are an accepted part of education.

Gangs have been a part of boy life from the year one. Organized gangs for good citizenship are newer. The Colorado Safety Council has played on this tendency in the bicycle clubs that are in full swing in our state. Thirty thousand boys and girls have pledged themselves to good citizenship on the streets and in the schoolrooms. The foundation of these clubs is knowledge of law and conformation to the rules of the road. Ownership of a bicycle is not a prerequisite and any child is admitted who passes an examination on his fitness to operate a bicycle and his proper conduct.

Parades of decorated wheels and the receipt of a diploma for passing certain tests keep interest alive. Sponsorship is delegated to service organizations in each community. The V. F. W., the Wiseman's Club, the Junior Chamber of Commerce, and others are encouraging a spirit of rivalry between

towns. The goal of the Colorado Safety Council is to have every child in Colorado as a member by the end of 1941.

The Junior Police Band and Association is another organization of which we are proud. Some of the band members are smaller than their instruments but they can swing a march tune equal to Sousa's band. Some of the members have undoubtedly been kept from corrective institutions by the helping hand of the "cop on the beat" who has steered the boys into this gang of good citizens. There is no class distinction. The boy from capitol hill is accepted to comradeship without question. Sgt. Nevin, who is director, has had a great deal of experience with boys. His first contact with trespassers was in the railroad yards in Denver.

The trespassing problem in Denver had grown acute and in the juvenile court Judge Stanley Johnson was alarmed. He called in railroad agents and city police to consider what might be done. Sgt. Nevin expressed his interest and was assigned to the court to concentrate on trespassing. He and Judge Johnson worked out the following plan with the railroads.

As a boy was caught trespassing he was not booked through the regular channels but his offense was listed on a slip of paper with his name and address, his age, his school, and the names of his parents. The parents were sent a letter asking them to appear with the boy or girl for questioning. Sometimes more than 60 boys and girls were crowded into the courtroom at the Friday sessions. If they did not appear a radio car was sent for them. The interviews were private and each case was considered separately.

Most of the parents were anxious to see that their children did the right things. It was impressed upon them that the first case was not an official booking, but a repetition would bring a detention home commitment. A boy who had lost his leg while crawling under a freight car, often sat in on the interviews. The conversations between the boy who had been injured and the child who might be were a powerful influence for good. Though in our state the crime of trespassing automatically calls for a delinquent classification, the method used of making the first offense unofficial kept these young people from starting a criminal record. Many cities have a Crime Prevention Bureau and

a juvenile division. In such cities such a plan is worth considering. We do know that it worked in Denver.

These are examples of what is being done. The possibilities are limitless. In every one of these organizations there is room for the representatives of the railroads. The time has come for the railroads to reach out and let the scrawny little trespasser know railroaders as men, and for you railroad men to know the trespasser for the scared, bewildered and often vicious creature that he is. Only then can you hope to make an impression on the trespass problem.

The railroads can give a helping hand to those people who are backing playgrounds beyond the tracks. When a boy's eyes are turned away from the tracks to a basketball field or a ball park that he has helped to build, though the material has been stolen from the road for the purpose, the tres-

passer is less likely to use the tracks as a playground.

Bands and clubs to provide constructive work and materials with which to build will cost much less in the long run than payment for deaths that occur on railroad right of way.

When the motorist has a valid reason for conforming to regulations and the trespasser has been given a new respect for government and industry through understanding, killing without hatred will be stopped. It may be that the breakdown of our social structure has advanced too far to be corrected now.

It may be that increasing dependency on the strong by the weak will devour all of us. I hope not. In the meantime every possible method that we can devise should be used to build decent and law abiding citizens. It is a social problem not a police problem and should be attacked from that premise.

ADJOURNMENT

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TUESDAY AFTERNOON SESSION

October 8, 1940

The opening session was called to order by the General Chairman, E. A. Roberts, District Engineering Manager, American Mutual Liability Insurance Company, Atlanta, Ga., who presided. The Chairman briefly commented upon activities of the Sec-

tion during the past year, and mentioned the work of many Standing Committees.

Officers of the Section for the coming year were formally elected, as listed elsewhere in this record. The Chairman then introduced the first speaker.

Methods of Developing a Competitive Safety Program

By PHIL J. MONROE

Mooresville Cotton Mills, Mooresville, N. C.

The methods I am going to tell you about have been used successfully in our plant. This plant is the type that started out as a small unit, and, in expanding, new buildings were built and consequently are scattered over a large area. We employ approximately 1,500 employees. It is a complete plant from the picker room to the sanforized product.

We had no specific program in our plant when I was put in charge, and we were having injuries every day. The general manager instructed me to use every method I could think of to educate our employees to understand that a safe worker is a good worker, and to sell safety to them so they would see the benefits to themselves as a result of having no injuries. To do this I solicited the aid of the North Carolina Industrial Commission.

One of the first things the Commission did was to send one of their representatives

to our plant to conduct classes in First Aid. We asked for volunteers and had enough for two large classes. These men and women were given certificates, and were put in charge of the first aid cabinets. Their certificates were in force for two years, and after that time it was necessary to re-take the course to renew them. This time we gave those who had made the most progress in their safety program the choice of class they would like to attend; thereby showing them they were being given special consideration in appreciation of their assistance.

At one of the statewide safety conferences held by the Industrial Commission, one of the speakers called for a discussion after his talk, and we got the idea of having a "Safety Slogan Contest" in our plant. We distributed literature to the effect that we would give a \$10 prize for the best safety

slogan pertaining specifically to our plant, and \$5 for the next best. We were pleasantly surprised at the fine response. The judges chose the slogan "More Safety for Moor Workers" for the first prize.

At the beginning of our safety drive we had attractive bulletin boards put up in each department. These are all-purpose bulletin boards, but we see that notable safety posters are displayed at all times and are changed frequently.

To arouse a competitive spirit, we knew we would have to have some method to show the employees how they were progressing. We designed twelve small signs (one for each department) which had an attractive display of our new slogan and also the lettering:

"This department has worked
 days without a lost
 time accident."

We designated the secretary of the safety committee to see that these signs were changed each day. If no accidents had happened he added a day, and if they had a lost time accident, it was necessary to start over. As interest began to grow, we thought it would be a good time to offer another prize.

This time I contacted the manager of one of the theatres in Mooresville, and we worked out a plan, whereby, for a small amount of money, he offered us tickets to give to each employee in a department that would go a month without a lost-time accident. Along with this we got a short picture dealing with different phases of safety and first aid. We made this offer to our workers for three consecutive months. We found this created more interest than any of our other contests since each individual received a certain benefit. Trophies and cash awards have a certain appeal, but with the theatre ticket, each member profited as much from his efforts as another.

Some time ago there was a serious accident in our weave room. One of the loom fixers reported to our head loom fixer that one of the belts was off the pulley and he wanted to go to the basement to put it back on. The head loom fixer told him to wait about ten minutes until he could go to the supply room and he would go with him. He waited about five minutes and decided he would go alone. When he got down there, instead of stopping the motor, he proceeded

to put the belt on with the pulley running. The belt caught his hand and jerked him into the wheel and tore his arm off. It was a miracle he was not killed.

This led me to look up any plant rules that we might have. I found that we had 10 rules or suggestions to lead our personnel along safe paths. They were far too inadequate; so we decided it would be profitable to draw up a complete set of rules and suggestions and see to it that each worker knew them.

I asked the superintendent of each department to submit any rules they thought necessary to have in their department. These rules were printed in a little book which we made attractive, and placed in the hands of each worker. When a new employee is signed up by the personnel department, he is given one of them and is instructed as to its purpose.

After these booklets had been in their hands for several days, I posted a notice on the bulletin boards to the effect that someone was coming through the mill to test them on a group of the rules, and if they could give them from memory and had their book with them, they would be given fifty cents. (More-or-less on the order of a man on the street broadcast). I gave them a week to learn the rules, and one morning I set out with my fifty-cent pieces. It was surprising how many had learned the rules. Of course, I could not ask them all, however, I tried to ask as many as time would permit. I gave away about \$25, and we feel it was well worth the money. These rules have been one of our best safety assets.

I have been in charge of the safety program for five years, and it has been my endeavor to have something new every three months to further our safety educational program. I have found the workers react very favorably to contests, and at present we are ranking high in the Statewide Textile Safety Contest.

The last form of competition we have tried is in the form of five electric signs about 3x4 feet in size. Their two face sides are glass and there are three sticks of neon on the inside to light them. The twelve departments of the mill are listed. It is ruled off according to months with a line also for last year's totals. Each month the number of accidents a department has is listed. These signs are placed at the most

conspicuous places. All lettering is on the inside except the figures which are put on each month; this makes it possible to scrape them off at the end of the year, and start over. If for any reason we fail to get the month's record up on time, the employees begin to ask how they are getting along. We have had only one lost-time accident since last December.

Just one word more about our educational program. We have safety meetings at least once a month in each department of the mill. These meetings include the superintendent of the department and his overseers and second hands and others if he sees fit. They discuss all hazards that need eliminating and any other data that will be helpful. They report any minor or major accidents that have occurred during the month prior to the meeting and have the injured

attend the meeting so he can explain the accident fully. Periodically the general manager and the superintendents meet to discuss our safety work. Each problem is gone over thoroughly, and every one in an official capacity in our organization cooperates fully in this work.

As a result of this program we have reduced our lost-time accidents from 29 through September 1939 to 1 through September 1940. We have also cut to a minimum our minor accidents that do not cause lost-time, but require a physician's attention. Our insurance rate has been lowered to such a degree that I hear very little about it from the treasurer. While educating our workers to be safety conscious both the workers and the mill have gained both materially and financially which, after all, is our ultimate goal.

A Competitive Safety Program that Is Working

By RALPH I. STURTEVANT

Manager, Shelton Looms, Rocky Mount, N. C.

Several years ago I was transferred from New Jersey to our plant in Rocky Mount, N. C. My superiors brought to my attention the fact that the safety record of this plant was far from being an enviable one and asked that I take steps to improve it. This poor safety record was a surprise to me as our southern plant was by far the most modern and up-to-date plant of our complete chain. The looms and machinery were of the most modern type, being amply guarded and protected by safety appliances.

The plant's records indicated, however, that there had been a number of injuries, many of them resulting in lost time. In most of the recent injuries there seemed no particular cause other than carelessness, either on the part of the injured employee or his fellow-worker. I found a number of cases where an employee did not report an accident until infection had set in, and there were no details as to how the injury occurred because the employee could not recall exactly what had taken place.

The plant's safety program consisted of tacking up safety posters and the giving of safety talks approximately once a month, mostly by representatives of our insurance carriers. I was led to believe that most of

the foremen and employees considered themselves safety-minded and that the safety talks were boring. None of them, not even the foremen, seemed to understand that safety was an important and vital part of their job.

I decided that the best thing we could do would be to start from scratch, to issue instructions outlining the policy that I wished carried out, much in the same manner as you would do when instituting a new manufacturing policy or procedure. I called a special meeting of the foremen for the express purpose of informing them that in addition to their regular manufacturing responsibilities they would be responsible to me for carrying out the new policies in regard to safety practices. I had published on the bulletin board a notice informing all employees that effective at once every employee was to report all injuries, whether scratch, cut or bruise, regardless of how slight, to their foreman for first-aid treatment. I also invited the employees to offer any suggestion that they might have for reducing accidents or improving working conditions and hazards.

The plant at this time employed approximately 125 people and we did not have a

nurse, all the first-aid work being handled by the foremen. All accidents of a serious or would-be serious nature that took place I had written up in detail, omitting the injured employee's name (although this was always known by the other employees), explaining how and why the accident occurred and pointing out how the injured employee might have avoided the accident.

We followed this system for approximately six months, and although we did not suffer a lost-time accident during the period, we still had a number of accidents which were due entirely to carelessness. There were still some cases where an employee sustained a small scratch which he thought insignificant and did not report it, and two or three days later turned up with an infected wound.

During this period my foremen and a number of the employees had become quite interested in our drive for a better safety record and I believed the time ripe for the launching of a safety contest. I had read a great deal about different types of safety contests, but had not been able to find one that I thought would create the interest I desired on the part of my employees. One day I overheard conversation regarding the relative merits of the Duke and Carolina football teams that developed into such an argument that it gave me an idea. I figured that if I could divert some of the feeling and interest my employees had for football into safety channels I would have a most successful safety program.

Therefore, I instructed the safety committee to pick eight men from among the employees whom they believed to be safety-minded and who, in their opinion, would make good leaders in a competitive safety contest. We then divided the employees of the mill into eight equal groups, assigning a group to each of the eight men selected by the safety committee for leaders. I put in a hat the names of eight colleges, including Duke and Carolina, and had each leader draw from the hat the name that would be assigned to his group.

We then laid out a schedule of games between the various teams, each game lasting for the period of one week. The scoring was recorded as follows: One point to be scored against a team for each injury reported by one of its members. If the

injury called for a doctor's attention three points were charged against the team, and if the injury resulted in lost time five points were charged against the team.

This contest started off rather mildly but due to the fact that any team would give its right arm to wallop Duke or Carolina interest sort of "perked up" a bit. The different team captains started making personal contacts with the various members of their teams, requesting them to be careful so that they either could defeat the particular team they were playing or so that they would not be defeated themselves. This contest ran for ten weeks and so far as interest in safety is concerned I got a full 100 per cent support from practically every employee.

As a matter of fact I created more interest than I really desired, for in a number of cases the fact that this was a safety contest was overlooked and any means was used to win. When the contest was over a number of reports were passed in to the effect that certain ones had sustained minor injuries and had not reported them because if they had done so their team would have lost that particular game. As there were no rules to govern these complaints this contest ended in more or less of a compromise among the first three or four leading teams, with the understanding that from the experience gained we would set up a new set of rules and start a new contest.

At a meeting held for this purpose we decided to hold a contest based upon baseball games instead of football games, with the same eight teams participating, using the following rules:

1. All contest teams are to follow Piedmont League Baseball Schedule.
2. Report of any scratch, bruise or laceration to be scored as one point.
3. Report of any scratch, bruise or laceration requiring doctor's care shall score three points.
4. The team scoring the least number of points in each day's game shall be the winner.
5. Failure of any participant to report an injury one hour after the occurrence of accident shall be counted as a forfeit of that day's game. (Should an injury occur shortly before close of shift it will also be counted a forfeit if it is not reported before close of shift.)

6. In case of a tie game in the mill contest the winner of the game will be decided by the corresponding Piedmont League game of that day.

7. No game will be played on Saturday or Sunday regardless of Piedmont League Schedule.

8. In case no game is scheduled in Piedmont League no game will be played in mill contest.

9. If a double header is played in Piedmont League the teams in contest will play for two points. Should contest teams tie the outcome of League game is to decide the winner.

10. Regardless of whether teams are scheduled to play, a record will be kept of all points scored against each team. To each member of the team compiling the smallest score will be given a monthly prize of a coca cola.

11. The contest will last for duration of regular Piedmont League Schedule. (This does not include play-off games at end of season).

12. The teams in first and second place in the standing (based upon percentage) at the close of season will win barbecue supper.

This contest developed a keen rivalry among all the teams and enabled the Caromount Division to build up a most enviable safety record. Approximately two years ago operations were sharply increased in

my plant and because of more pressing work I did what a great many other mills have done, that is put aside and in a sense ignored safety in favor of what I at that time thought was more pressing and important. I will be frank and admit that this was a mistake.

I found out within a very short time that you cannot stop your safety programs and at the same time increase your personnel from approximately 150 people to 350 people and obtain a good safety record. In a very few months my severity rate had increased two-fold and I found that as I had neglected my interest in safety work the men under me had done the same thing. In a manner of speaking I was back to practically the same point that I had started from approximately two years before.

This time, however, I was confronted with another problem; due to the increased amount of work that our plant was now doing a corresponding increase in my time for supervision was necessary. I found that I could not devote anywhere near the time to safety promotion that I had prior to the increase in personnel. After studying the situation I recommended that a nurse be installed in our plant in order that I could resume the contests that because of lack of time, I had stopped. My recommendation was approved and approximately one year ago we installed a nurse in our plant not only to give first-aid but to carry on and promote safety contests.

THURSDAY AFTERNOON SESSION

October 10, 1940

Textile Safety Through the Plant Nurse

By FRANCES BETHUNE

Plant Nurse, Firestone Cotton Mills, Inc., Gastonia, N. C.

Given a management thoroughly in sympathy with her job and being blessed with enthusiasm and interest in her work, together with sound technical training, there is no limit to the ways in which an industrial nurse can be of help to a textile plant's safety program.

Each time an employee contacts the nurse an opportunity presents itself for her to gain his confidence and create good will, which is the first step in selling him on any program she may be interested in for his welfare and safety. If the employee is reporting to the dispensary with a newly re-

ceived injury, it is of prime importance that the nurse show a genuine interest by giving him adequate care, by taking a complete history of how and where the accident happened, and by giving him specific instructions as to further treatment.

He will leave the dispensary with the thought in mind, "That nurse knows her business."

If an employee stops at the first aid room for treatment of minor ailments, such as a headache for which he requests a "couple of aspirin," or perhaps a dose of soda to relieve indigestion, the nurse by giving him a cordial welcome and taking an interest in his simple ailment may discover the cause of his trouble, or encourage him to see his family physician and receive an early diagnosis of some trouble that may within a short time become serious and greatly impair his health. Most industrial nurses could tell you of numerous cases where the employee did not realize he was headed for trouble when he told the story of some simple ailment, while the nurse, being trained to recognize early symptoms, saw the danger and was able to warn him in sufficient time to arrest his case and bring about a complete recovery.

On the other hand, the employee will some time go to the nurse with the story of severe gastric disturbance and he will express a fear of going to the doctor, for he is afraid to find out what is wrong. Perhaps the nurse can suggest a change in diet that will clear the trouble up shortly and at the same time make a safer worker by removing the dread from his mind, making him more comfortable and at the same time building up the feeling of good will between the worker and the nurse.

The nurse has a 24-hour job where plant safety is concerned. This is especially true where the folks who operate the mill machinery live in a village adjacent to the plant. In this situation the nurse receives innumerable opportunities to be of service, create good will, and gain the confidence of the employees. Once the people figure the nurse is "all right" they take it for granted that she is a nurse, diagnostician, osteopath, pharmacist, in fact they consider her a specialist along most any medical line. This is true, especially if the questions they ask are taken into consideration. All of this gives the nurse a chance to educate the peo-

ple with regard to proper diet, sleep, and clothing. It presents her with chances galore to obtain the good will of the plant employees.

In plants where the management maintains clean, healthful conditions (and the management which is interested in promoting safety does this), the nurse can further the safety program greatly by her efforts with regard to the personal cleanliness of the employees. She can be of great assistance to the various production departments in their efforts at good housekeeping and orderliness.

Where women are employed it is often easier for the nurse to suggest the proper type of clothing than it is for a department foreman to do it. If she feels it is necessary, the nurse may instruct the employees on personal cleanliness both on the job and off it. Proper clothing on the job and cleanliness are first class aids to safety.

The nurse may not be of a mechanical turn of mind and may not have even a speaking acquaintance with the intricacies of the various and sundry machines in the plant and yet be of considerable assistance to the management in helping to maintain the machinery in a safe operating condition. She asks each injured employee how he obtained his injury. If the employee's version involves the point of operation; if he says a nut or a bolt was missing, or a washer dropped off, or a collar slipped on a shaft, she notes this. Then she reports this condition to the proper authority. The matter is carefully checked; if the employee's statement is correct, the particular machine is repaired before it is started again. All other machines of the same type or kind are inspected at once to prevent recurrence of the same type of injury.

On the other hand, if the nurse learns from the employee that some action of his resulted in the injury, she notes the fact. She reports to the department foreman what she has learned. He analyzes the situation and is thus able to take steps to prevent other accidents of a similar nature.

In a good many plants the nurse is custodian of the safety bulletin boards. She changes the posters and keeps the various department safety records up to date. In plants where a safety committee functions she attends and takes part in the meetings. She is often the main spring in the plant safety program.

In order to furnish the nurse with new ideas and additional facts or information about safety, the nurse is often encouraged to become affiliated with the local or district safety councils. The meetings of these organizations indicate what other people are doing to solve problems similar to her's. She meets people whom she would not otherwise contact and from them assimilates ideas which she may later be able to put to good use. These outside safety activities furnish her with ammunition to use in connection with her part in increasing or maintaining the effectiveness of the safety program in her own plant. Through nurses' societies and associations she keeps her professional knowledge up to date.

The nurse maintains contact with the city, county and state health departments and works in conjunction with these agencies. By making use of the various services which they provide she keeps posted at all times as to the best methods of promoting public health.

In North Carolina the Department of Industrial Hygiene does a great deal of work

along preventive lines and is truly a boon to a plant nurse and to a plant which is genuinely interested in maintaining healthful working conditions for its employees. This department studies occupational diseases and hazards and develops methods of their prevention. This department also issues information from time to time regarding correct clothing and diet. The plant nurse, by working hand in hand with members of this department, is enabled to reduce many types of accident hazard to a minimum.

Textile safety through the plant nurse may be considered from another angle, that of dollars and cents. From the employee's standpoint it may be said that he receives prompt treatment at the time of the accident and adequate and considerate treatment during convalescence. Chance of infection is reduced to a minimum and the employee is back on his job in the least possible time, often with no lost time. The employee has lost little or no money in wages, and conversely the management, through its insurance carrier, has saved the services of a skilled employee and kept its insurance charges at a low rate.

Eliminating the Causes of Textile Accidents

By JOHN J. BURGER

Secretary, Safety Committee, W. I. Dickey & Sons, Inc., Oella, Md.

I would like to take you with me on a hypothetical trip through our mill so that you can see just what procedure and methods are being used. It is a woolen mill that we are viewing, but the safety ideas are applicable to any textile plant.

We will follow the same route as the material, that is, from raw stock to finished goods. Our first stop is in the yard at the loading platform. Here we meet Donald, and ask him what methods he is using to eliminate the causes of accidents. His answer is direct and to the point. "Good Housekeeping is the solution to 90 per cent of the problem," he says.

Looking around we note that raw stock and machine parts received that day have been placed in an orderly manner on the platform awaiting delivery to the warehouse within the next hour. Donald points to the protecting rail around the coal pit, and the orderly stack of bagged waste on the other

side of the clean, well kept yard. We also see a separate shed marked, ACIDS—DANGEROUS, a simple method for isolating a hazardous material. We notice that the men are all wearing the proper type safety shoes and gloves as they go about the work of trucking material from the freight car onto the platform. As we leave Donald, we notice his accident record board which reads: "This Department has gone 420 days without a lost time accident." Donald has really driven home the lesson of good housekeeping and personal protection.

Our next stop is in the dye house, which is presided over by Otis, who has come up from the ranks and knows dyeing and its hazards. Replying to our question, his answer is: "Advance planning and personal protection for my men." He points out that proper production requires advance planning and safety is no exception to this idea. Teaching men to have the proper respect

for the hazards of their jobs goes a long way toward the promotion of safety. Advance planning teaches them what equipment to have in order, and what protective clothing to wear. We see the men wearing goggles and rubber gloves and aprons as they feed acid to the dye bath. They are also wearing the proper type shoes for the job. Otis tells us that there have been accidents in dye houses where men were burned when splashed with hot water or acid, but since his men have been taught to realize the danger involved, accident causes of this type have been eliminated.

Back strains also were quite prevalent until classes in the proper methods of lifting were conducted. The men now know that the correct way to lift, is to keep the back vertical, lifting with the strong muscles of the legs, and not putting the strain on the weak muscles in the small of the back. They also know that there is a limit to the amount anyone can lift; too much weight causes muscle strain.

Advance planning by the foreman and his men has taught them the danger and the corrective methods to employ.

Our next stop is in the mixing and picking department, where we meet Bill. Bill is a Scotchman, and keenly appreciates the value of a man who still has the use of both hands and all ten fingers, because the picker room is a dangerous place in which to work.

Bill is busy right now, which gives us a chance to look around before he joins us. We notice his safety record on the wall stating that the "Department has gone 325 days without a lost time accident." Right above it we see the bronze plaque presented to the department for having the best safety record in the mill for the past year—without any kind of an accident.

We conclude that Bill must have some patent method to produce such excellent results. Asking Bill for the answer, he replies: "Every morning before starting work, I call my men together and say to them: 'Remember, our safety record, keep it clear today.'" Bill tells us that his method is to constantly remind his men that safety is a vital and important part of their everyday work routine. He has instilled in his men a wonderful sense of safety consciousness, that certainly has produced excellent results. By his personal actions and habits, Bill is demonstrating daily to his men that his atti-

tude toward accident prevention is wholehearted and sincere, and he expects all of his men to follow his example.

Going upstairs, brings us to the carding department where we find Joe, who is an oldtimer in the carding game. He tells us that education in his opinion is the best preventive method. Joe explains that due to the peculiar construction of a woolen card, it is very difficult to guard the machine adequately. Therefore emphasis should be placed on the education and training of the workers, and not on the guarding of the cards. After the men have been thoroughly trained they will automatically do the safe and right thing. Man failure will be much less than if they did not have the benefit of this training. Pressing Joe for more details of his educational methods, he tells us that it consists of four steps.

Four Steps in Safety

1st step, is telling the man how to do the job in the safe way and in simple language. Telling him very slowly, so he can grasp the idea, and repeating the instruction over and over again if necessary.

2nd step, is to *show* him how to do the job in the safe way. He retains knowledge better if he *sees* as well as hears how the job should be done.

3rd step, is to test him out, letting him go on his own under the overseer's watchful eye.

4th step, is to check him, to be sure he understands, and is following the instructions as given. The point is stressed, that safety is as important a factor as production and quality.

As we leave the carding department, we see large signs hanging from the ceiling warning the men not to place their hands on any moving machine part. Joe is using the signs as an added precaution.

We now enter the spinning room where Harold gives us his views on the subject. A little psychology, plus the reporting of all minor injuries, seems to be this man's method to eliminate the causes of accidents. In the past, the department has had to contend with lost time accidents due to infection. Several cases where workers were troubled with splinters and cuts, but did not think it necessary to report their injury. Since then,

all the wooden wagons and trucks have been replaced with metal wagons and the cause of accidents in this respect has been eliminated. Furthermore, all minor injuries are now being reported immediately and given first aid.

We observe that all the girls are wearing neat work uniforms. When we ask Harold how he accomplished this, he tells us that the use of a little psychology illustrating how the wearing of a work uniform gives a girl a neat appearance, did the trick. A photograph of one of the best looking girls in the room in an out of date dress and another photograph showing her in a neat uniform of pastel shade, has proved to be the answer to the problem of getting girls to wear the uniform.

Weave Room Methods

Our next stop is in the weave room, where we meet Jack, the overseer of weaving, who tells us: "Well guarded machinery and good housekeeping are my methods." Looking around we see that all the looms have individual motor drives, the gears on the motors being completely covered. It is impossible for any one to get clothes or fingers caught. The shuttle guard on each loom is also in good order, so that if a shuttle does fly out its danger will be greatly minimized.

We also note the complete absence of bobbins on the floor. Jack tells us he accomplished this by personally picking up a bobbin, now and then, and without a look or a word of reproach, handing the bobbin to the weaver. An illustration of the power of suggestion. Thus we see the elimination of the causes of falls, strains and bruises.

As we leave, we see the trucks and boxes of filling yarn in orderly arrangement on the spare floor, leaving the main aisle open for the trucking of the woven cloth out of the department.

Our last stop is in the maintenance department, where we meet Howard, the master mechanic. This man is an engineer. He says: "Engineering is my natural and best method to use." In the past the maintenance department was troubled with accidents because of poorly guarded saws, emery wheels, etc. Since these machines have been properly guarded these accident causes are elimi-

nated. We observe the circular saw and see the proper guard for both flat and tilted tables. Also the emery wheel is equipped with a shield, and goggles are provided for the use of the men. The balance of the machines are equally well guarded. Howard tells us that since the machines have been taken care of the men have developed a more progressive attitude toward safety. Engineering, having eliminated the causes, has in turn created a favorable psychological effect on the worker. There hasn't been a serious lost time accident in this department for a long time.

Management's Part

Now, let us step into the office for a minute or two and see what method the management is using in doing its part. We find that management is the spark and motivating force behind all the different methods we have observed in our trip through the mill. It has accepted, and is meeting the responsibility of providing a clean work place and safe machinery. It is completely sold upon the necessity of approving expenditures for guards and equipment.

There have been accidents where the cause has been a lack of knowledge on the part of the worker. The management is overcoming this by conducting safety meetings, so that operating dangers may be discussed and corrective practices and methods instituted.

Departmental safety meetings are being held, and on company time, to supersede the previous general meeting. The idea being to decentralize the safety activities and responsibility and give every one in the department an opportunity to express his views on the subject. The group thus has the chance of analyzing and improving the safe practices of the department. It also has the responsibility of developing new regulations. Some of these methods, while perhaps indirect, have been valuable in the training and development of orderly-mindedness of the employees.

Finally, by the personal appearance of the owners and superintendent at the departmental safety meetings, the management indicates its sincerity and gives its approval to the methods employed to eliminate the causes of accidents.

Accident Prevention Through First Aid

By RAMONE S. EATON

Assistant Director, First Aid and Life Saving, American National Red Cross, Washington, D. C.

There is much talk in this country today of preparedness for any eventuality. In this connection National Unity and National Safety become almost synonymous terms with National Defense. Certainly, it would be not unfair to state that no group of citizens of the United States is more conscious of the true meaning of these terms, as they apply to the welfare of our nation, than you who have a responsibility for the day-by-day safety of our people.

On every hand we see all parts of our nation becoming unified in the task of mobilizing moral, economic and material resources. Industry, labor, education, medicine, journalism, Government, the armed forces—every phase of national life—has geared its momentum to the transcendent need of unified endeavor. And standing as a great sentinel of light on the international horizon and a bulwark of strength at home is the American Red Cross. Because of the long-time, carefully planned development of its peacetime program, the Red Cross stands prepared with services geared to fit the pattern of need of all forces.

Practically every Red Cross service has some bearing on the preparations now being made for our National Defense, and these services also are capable of being expanded further for actual war conditions if this becomes necessary.

As we study this large question of Red Cross Preparedness for National Defense, it is apparent that Red Cross First Aid training is to play a major part in all that is done. Particularly we must begin now to expand services to industrial groups if we are to aid in offsetting the increased frequency and severity of accidents because of the speed with which industry must enlarge for defense production. You are well acquainted with the aspects of this situation from the safety engineer's view, so I will confine my presentation to that phase of accident prevention which is accomplished through first aid training. Fortunately, in Red Cross, we have had a long experience in this phase of industrial safety, dating back to 1909 when Dr. M. J. Shields began

first aid instruction in the coal mine areas of Pennsylvania.

Through the years, industry has learned to recognize the value of first aid training and to look to the American Red Cross for authoritative guidance in this field. Unfortunately, at times, there has been a failure to recognize the dual role of first aid in industrial safety planning. Accident prevention through first aid training is accomplished, not only as a secondary act following the accident, to prevent death or increased severity of injury, but as a first effort in the actual prevention of the accident. It is extremely important that this dual role of first aid be recognized if full utilization is to be made of this type of training in a program of safety education, and if we are to do our maximum job of quickly assimilating this great mass of new workers, often unskilled in safe practices, into a normal industrial safety program.

To assist in this effort, which is common to most industry today, I would like to show: first, how important first aid training is to any well-planned safety program; second, some of the actual results in decreased accident frequency and severity rates when first aid is included in the safety program; and as a conclusion, what your Red Cross is prepared to do on this problem, making first aid training available to men and women in industrial occupations, whether it be normal peacetime work, or that geared to defense planning or actual war.

We frequently speak of the three E's of Engineering, Enforcement, and Education in highway safety planning, and I believe that we can well adopt and use them here today in attempting to plan for a lessened accident rate in the textile industry. Engineering has played its part in design of building and machine, in designing mechanical safeguards for everything from floors and stairways to machinery. Engineering, without enforcement of regulations for use of equipment and machines, and good daily habits and practices about the plant premises, could play but a small part in preventing accidental injury and death. These two

together can do much; but without education, which means appreciation and understanding, no safety program can hope to function to a successful end.

Education is the link that binds all parts of the program together, and with it comes that undefinable, and poorly named intangible, which we call a "safety consciousness." No matter what the type of program I feel safe in saying that until the individual worker feels a sense of responsibility for the safety and well-being of his fellow man, no safety effort will be truly successful. Only when a worker is "accident conscious" will this responsibility be fully accepted and some effort be made by him to prevent the mistake, false step or careless act which means hurt for himself or, more often, someone else. It is this factor which causes such startling changes in accident rates when first aid training is introduced into an otherwise good safety plan. Nothing in the mind of the average man or woman will emphasize the tragic results of accidents more than a knowledge of the horrible injuries and the methods of death, which are their results.

First Aid training, then, gives us two avenues of attack on an accident problem in a plant. First Aid care rendered at the scene of an accident, which might entail no more than proper transportation of an injured person, may mean decreased severity of the injury or even the saving of life. To assure this proper care, there should be universal training of employees, because where on the plant property the grim reaper will strike no one can know. Every employee must be trained to respond to the unforeseen emergency. Though a plant may have the finest of emergency rooms, nurses and a staff of doctors on duty at all hours, a simple injury might become serious and even cause death because of the improper handling of the injured victim by well-meaning, but untrained fellow employees, ignorant of what to do in an accident emergency. First Aid training dispels such ignorance and the helplessness and confusion which follows in its wake. The person trained in first aid knows what to do, and, more important, in some situations, what not to do until the doctor arrives or the victim is properly transported to the emergency room or hospital.

Today in industry there is as much concern for the health and safety of the worker

off the job as on. Whatever advantages there are in first aid training in the plant are but increased many times in the more terrifying accidents on our highways and the lesser-known accident situation in the home. In giving your employees the opportunity of knowing first aid you are equipping them for a safety job after the whistle blows. Your job, then, is not alone a safety job; you are improving the social and economic position of the man or woman, for accidents are not costly alone in human suffering and death, but in money and disruption of normal living as well.

As valuable as first aid training may be in providing emergency care for the injured, this is of secondary importance in the broad humanitarian view, when such training is properly evaluated as a means of preventing accidents. Increasingly we are receiving reports from industry, large and small, showing how first aid instruction has been followed by a lessening of lost time due to accidents and, further, that first aid trained employees are meeting with far fewer accidents, at work, on the highway and at home, than those who have not had the benefit of such instruction.

There are good reasons for this: first, accident prevention is admittedly the primary aim of every Red Cross First Aid course, and instruction is largely directed to that end, planned where possible, for the group under instruction; second, First Aid instruction carries with it a visualization of causes and consequences of accidents which develop an "accident awareness" which is so necessary to the acceptance of an "accident responsibility." While this last is a term not generally in use, I believe it can be adopted to good advantage in safety education. Being impressed with the possibility of grave results from even minor injuries and the consequences of more serious ones, the employee is a more willing recipient of all phases of the safety program. In dealing with imaginary accident situations he finds himself thinking in terms of accident causes and prevention in a positive way.

A recent letter from the safety engineer of the Elk Tanning Company at Ridway, Pennsylvania, is most enlightening. He tells us that in the last year before including first aid instruction in their safety program, the frequency rate per million hours worked was 146.5 and the severity rate 32.2. This

severity against lost time shows that 31,860 days of lost time were charged against the record. The total cost for medical and compensation during the year was \$31,903.88. During the next several years their entire logging crew completed a minimum of the Standard First Aid course. The 1939 report shows the following: a frequency of 58 accidents per million hours worked and a severity rate of 1.13. This severity rate shows only 208 days lost time against 31,860 in 1930 and a cost of only \$1,942.00.

A similar showing was made in the mill operation following First Aid training. In 1930 the frequency rate was 144.5 with a severity of 7.3. As of June 1940, these employees have worked 400 days without a lost time accident. He further states, "The company as a whole shows similar reductions in accidents, and we firmly believe that the teaching of First Aid was the foremost factor in bringing about these reductions."

A report from a member of our staff tells of a visit to the Foran-Wooden mills at Passaic, New Jersey. He was told by the safety department that their records showed a decrease in lost time accidents of 45 per cent since starting First Aid training.

A very interesting report from the Republic Steel Company at Buffalo, New York, shows a little different approach, but is most emphatic in its implications. In this instance 350 men were selected for training. Not one man in this group has suffered a lost time accident since the Standard First Aid course was given. At the time of this report, these men had gone for almost three years without an accident.

The following quotation is taken from a letter received from E. M. Belcher, Director of the Insurance Division of the Texas State Highway Department at Austin, Texas:

"First Aid training in the Department was introduced simultaneously with a general comprehensive program on January 1, 1938. We consider the First Aid training to be the basis of the general program. Just what part First Aid training had in the reduction of accidents would be impossible to say, but we do know that such training has incalculable values.

"During the month of January, 1938, the first month of the program, we had one accident reported state-wide for each 3,085 man hours work. In December, 1938, twelfth month of the program, we had one accident

reported for each 15,000.09 man hours work. For the entire twelve months of 1938 we had one lost time accident for each 28,140 man hours work. For the first six months of 1939, being the thirteenth to the eighteenth months inclusive since the inauguration of the program, we had one lost time accident reported for each 46,243.9 man hours work. These figures we believe, will give you a good idea of the effectiveness of our program."

The Red Cross trained, during 1939, over 350,000 persons in First Aid. This work was carried on by 21,610 instructors operating through local Red Cross chapters. At the present time there are 3,700 Red Cross chapters covering every city and county in the United States. These chapters stand ready to serve you in planning first aid training in your industry. The Red Cross plan of operation is to train and qualify instructors in your own organization to carry on your instruction program. The training is brought to the men selected from your plant by Doctors and Lay members of our National Staff. The Red Cross courses consist of a Standard Course of twenty hours and an Advanced Course of ten hours which is generally given some time following the completion of the Standard Course. These two courses may be given for certification only by qualified instructors who are medical doctors or laymen who have completed the Instructor's Course of thirty hours.

To secure the services of the Red Cross in this work you should get in touch with your local Red Cross chapter which will aid you in every way possible and communicate your needs to the Area Offices or to National Headquarters. If you have trouble securing the needed assistance, you may write direct to our Area offices at 1709 Washington Avenue, St. Louis, Missouri; Civic Auditorium, Larkin and Grove Streets, San Francisco, California; or to National Headquarters, American Red Cross, 17th and D Streets, N.W., Washington, D. C.

I urge that you investigate the possibilities of this service in your community. In many instances you will find active, well organized First Aid programs in operation. In others yours may be the spark to inaugurate a much needed service in your city or town. In any case, you can know that your Red Cross stands ready to serve you in this work as it stands prepared to serve the entire nation in any hour of emergency or need.

Safety Successes in the Textile Industry Are Recognized

By S. C. HICKOK

Employment Manager, Pacific Mills, Print Works Division, Lawrence, Mass.

Safety success has been very slow to be recognized in the Textile Industry, and there are still many mills, both North and South, which go on the old theory that no matter what you do there will be about so many accidents, and money spent on a safety campaign is little short of wasted. Such concerns, however, are now very much in the minority, I am glad to say.

There are many obvious places where safety success in the Textile Industry are recognized. The thought had occurred to me—why not ask some of these people for a statement and get their reactions at first hand?

First, I wanted to know what my own company thought about our safety efforts, so I wrote the general superintendent of the Print Works, our selling house in New York, and our publicity agents. The results were spontaneous and I think most interesting. Here is the word received from our general superintendent:

The General Superintendent

"Of course, any textile company recognizes with pleasure a consistent reduction of accidents in its plant, but in our own case at the Pacific Print Works in Lawrence, we have a special reason due to the phenomenal reduction in accidents since 1936, which showed 62 lost time accidents, to 1939, when we had only 3, with a stretch of 2,003,000 hours without an accident.

"This pleases us first from a practical mill point of view, as the reduced premiums are helping reduce the cost of finishing our cloth—a saving of nearly \$5,000 on our premium is like finding a golden nugget in these highly competitive times. Secondly, we are pleased because of the splendid reaction of our employees to our safety campaign. They are constantly becoming more and more safety minded, and are working the safe way because they realize that when a worker gets hurt he loses more than anyone else, in time, money, pain, and perhaps loss of earning capacity.

"Therefore, the bond between the worker and the management may be happily strengthened by the safety education the

management supplies, for both are working to the same end—fewer accidents.

"I have not scratched the surface in the various angles that might be brought out showing how safety success is recognized by the management, but these two points seem to be highlights."

I agree that the surface was not scratched. I think you will agree that a mill like ours with a reputation for Safety, will be a cleaner mill than the average. It will also be guarded from a mechanical point of view in every way possible and, therefore, the employees will take a greater pride in keeping their production as near 100 per cent in quality and quantity than in a less careful mill.

Next, from our selling organization I received the following:

The Selling Organization

"Efficiency and sincerity in manufacturing form the necessary background for successful selling. A product is only as good as the raw materials and skill which go into it; and these intangible ingredients are as important as any other basic material.

"One very important measure of the sincerity of a manufacturer and of the efficiency of his plant is the safety record which he compiles. For a good safety record bespeaks care in manufacturing, interest in employee welfare, ability to secure cooperation as between labor and management, pride in performance and esprit de corps throughout an entire organization.

"With the knowledge that these invaluable Safety Factors exist at the plant, the sales department can work with greater confidence and greater enthusiasm; the advertising department can do its job with increased assurance that the company is the kind that will back up every justifiable claim that it makes for the product."

In connection with this we had several fashion editors, very important people in their line of work, visit our Print Works with our public relations counsel a few months ago, and it was interesting to me that while they were extremely interested in

our processes and in our finished products, both their beauty and variety, that as they saw various safety information in the plant they started asking questions about safety and upon hearing of our record established in 1939, they were just as much interested in this phase as they were in the mill production.

The next statement came from our insurance company:

From the Insurance Company

"The Liberty Mutual Insurance Company has always recognized the economic waste, to say nothing of the suffering, incident to accidents. We believe that it is one of our important functions as an insurance company to assist our policyholders to reduce this waste and suffering. For the most part, the managements of our policyholders' companies recognize that accidents are a form of inefficiency and poor management and cooperate with us to the fullest extent in plans and work to minimize accidents. Through this cooperation many splendid records of accident reduction have been made which, in turn, has produced for managements savings in lowered insurance costs which can be classified as direct, and other savings such as keeping field men on the job, lack of disruption of production, the prevention of spoilage of material, etc., which can be classified as indirect savings.

"The success of this work depends upon securing the cooperation of many people, including the rank and file of employees. We believe that when the supervision and the employees of a plan have made progress that it is good business for recognition to be given to the progress which has been made. To assist our policyholders, we have a system of awards for outstanding accomplishments in accident prevention. When we awarded the Pacific Mills Print Works Division a bronze tablet last December for having completed 2,000,000 man hours without having a lost time accident and your cooperating by holding a luncheon for executives and overseers to memorialize the occasion, it was not only for the purpose of giving recognition for work which was done well, but also for the purpose of stimulating all concerned to continue the good work and strive for a betterment of the present record.

"In 1918 there were 19,640 machine accidents tabulated by the Massachusetts Indus-

trial Accidents Board. In 1938, there were 4,201 such accidents. The machine guarding efforts have unquestionably paid big dividends.

"I might mention one other point. In the early days, the insurance companies led many employers to believe that they themselves could prevent accidents for the employers like the Irishman played the violin by main strength. It soon developed that without the cooperation of managements, it was difficult to make satisfactory progress. During the past ten years, the progressive insurance companies have developed a plan to assist their policyholders in making loss prevention an integral part of management and better results are being obtained."

We now come to the recognition of safety success by our own community, and it seemed to me that the Mayor was the best fitted to give an opinion. The City of Lawrence, Mass., has a population of some 85,000, of whom nearly 18,000 are employed in various textile mills when things are going well; therefore, the Mayor of such a town should be well qualified to give an opinion on this subject. Mayor Griffin is a young man; a keen business man; and I knew that his views would be interesting.

The Mayor of Lawrence

"Safety consciousness in industrial operations is just as important to our city as safety with motor and pedestrian traffic, although all too often this is lost on our citizens not directly connected with our mills.

"The backbone of the community is its host of mill workers, and when we of the city government see the management of the mills starting safety campaigns and through these and other safety mediums consistently reducing the accident records until they arrive at outstanding successes as many of our mills have done, there is a feeling with me of gratitude, for I recognize this safety success, first in lessened pain and agony to the workers themselves, and more consistent pay for the benefit of their families; secondly, I recognize it from the practical view of my job as Mayor, for with greatly lessened accidents among our residents, the drain on the City Treasury for needy families is lessened.

"I am proud to note the increasing safety records that our Lawrence Mills are producing. They have certainly kept abreast of the

times in the installation of safety devices, and in making their employees safety conscious."

The Mayor covered the vital points. I think, however, there is one small angle he might have mentioned, in the fact that the worker is much more contented in a plant with an outstanding record for safety, and a contented worker is usually a more contented citizen.

From the Governor of Massachusetts came the following statement:

Message from the Governor

"Textile mills are one of our very important industrial groups in Massachusetts. It is a reasonably safe industry for the worker, occupying ninth place in 20 manufacturing groups, on the basis of accident frequency and severity last year. This still leaves an opportunity, however, for further plant safety work."

The Governor of our state is a very busy man, and I appreciated very much that he took the time to send me even this short statement. Let me try to amplify it a little. Ninth place in 20 manufacturing groups is not good and not bad—but the base rate for finishing plants in Massachusetts in 1937 was \$1.62 per \$100 payroll. Through the better experience of this group as a whole, the base rate for the State in 1940 was \$1.26 per \$100 payroll—nearly 25 per cent reduction, which is certainly encouraging, and I believe that the safety work in all of our finishing plants is being given more and more consideration.

I know that the state also takes a real interest in accidents through its Labor and Industries Board. Our local representative never fails to look into any serious accident and he has been equally interested when we have made long records of man hours worked without loss of time.

The state angle, however, as stated, becomes more a record of statistics than one in which the human element is uppermost.

The most important people who recognize the success of safety in the textile industry, I have saved until last. These are the employees themselves. I had a contest at our plant and offered a cash prize for the three best answers to this question. The results were interesting and most successful. For the purpose of this paper I am giving the best combined ideas of the three winners as I see them.

The Employee's Point of View

"As an employee of the Pacific Mills Print Works, I realize that the success in safety of this mill applies and means more to me than to any other person, department, or community. It is a very vital factor in my life and in the lives of my family. From the mill point of view, an accident while unfortunate, can be paid for with cash and that is the end of it. But when I have an accident, it may mean my very life. Every time I take a chance with safety I'm gambling, and if I gamble too often, I'm bound to lose, by the law of averages.

"Suppose I only get a minor injury and am home only two or three days. I've lost more than I can afford because my wages are not large enough to miss even that short time without feeling it. Then, there is the physical pain I must endure. If I lose a hand or an arm, a leg or an eye, I not only have the pain to bear and money to lose, but I have permanently decreased my earning power with its effect on my family and my own mental anguish.

"No sir, I think the finest thing my employers have ever done for me and all my fellow employees is to try to make us safety conscious and to practice safe methods in everything we do. With posters, contests, literature, and safety measures of all kinds constantly before us, it makes for a better feeling between the bosses and employees, and makes us feel that they have a real interest in our physical well being as well as for the product we produce."

ADJOURNMENT

Wood Products Section

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News Letter Editor—CHARLES H. JONES, Bituminous Casualty Corp., Chicago, Ill.
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 *J. H. LEE, Liberty Mutual Insurance Co., Rockford, Ill.
 *WALTER S. PAINE, Actua Casualty & Surety Co., Hartford, Conn.
 *J. A. PURDY, Michigan Mutual Liability Co., Detroit, Mich.
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Committee on Cooperation with Trade Associations, Chairman—D. J. MURRAY, The Huber Manufacturing Co., Marion, Ohio.

Members at Large—

*F. W. BRAUN, Employers Mutuals, Wausau, Wis.

R. F. CALDWELL, Moore & Merklein, Inc., Shreveport, La.

*E. ROSS FARRA, Grand Rapids Safety Council, Grand Rapids, Mich.

*HARRY GUILBERT, The Pullman Co., Chicago, Ill.

*ROLAND JONES, The Surty Manufacturing Co., Chicago, Ill.

*HARRY J. KELLEY, American Seating Co., Grand Rapids, Mich.

*J. H. LEE, Liberty Mutual Insurance Co., Rockford, Ill.

*WALTER S. PAINE, Aetna Casualty & Surety Co., Hartford, Conn.

*J. A. PURDY, Michigan Mutual Liability Co., Detroit, Mich.

*G. E. SANFORD, General Electric Co., Schenectady, N. Y.

*H. E. SEELY, The Brunswick-Balke-Collender Co., Chicago, Ill.

*Past General Chairman

MONDAY AFTERNOON SESSION

October 7, 1940

The opening session was called to order by the General Chairman, J. C. Wilson, Vice-President, Lumbermens Mutual Casualty Company, Chicago, who presided. In his opening remarks the Chairman outlined briefly certain activities of the Section during

the past year, and mentioned the work of various Standing Committees.

Officers of the Section for the coming year were elected, as given elsewhere in this record. The Chairman then introduced the first speaker.

Safety in Lumber Remanufacturing Operations

A Panel Discussion

The members of the Panel were as follows:

George Gibson, *Leader*, Wood-Machine Department, The Pullman Company, Chicago.

S. J. Owen, Jr., Engineer, Bureau of Prisons, Department of Justice, Washington, D. C.

V. I. Calkins, American Seating Company, Grand Rapids, Mich.

K. N. Searles, General Safety Supervisor, American Car & Foundry Co., New York City.

O. M. Swanson, Personnel and Safety Director, Joslyn Manufacturing and Supply Company, Chicago.

(The following record of these discussions is provided by M. C. Goodspeed, General Electric Company, Erie, Pa., Secretary of the Wood Products Section):

Question 1. What type of hand protection is suitable for men handling lumber? Why?

This question was first discussed by Mr. Calkin. He suggested that pads, leather or canvas, with either a thumb hole or both thumb and finger holes, were in general the

best type of protection. These pads can be swung out of the way leaving the bare hands for special work much easier than can gloves be taken off and on. It was pointed out in the general discussion that several types of these pads can be purchased and have been found very satisfactory. It was also pointed out that old inner tubes cut to proper size and with thumb holes make very satisfactory pads.

Question 2. Is there any personal protective equipment that will protect abdominal injury due to kick-backs?

Discussion led by Mr. Calkin. There is no definitely satisfactory personal protective equipment against kick-backs. For some work heavy leather aprons are desirable. In the discussion it was pointed out that a metal reinforced apron type of protection is used for some work. It was also very definitely emphasized by several speakers that in case of an accident of this type regardless of the apparent amount of injury, the victim should be hospitalized and held for observation at least twenty-four hours, and if the physician has any real suspicion of internal injury an immediate operation is desirable. Fatal results after injuries of the above type have been materially reduced by immediate exploratory operation.

Question 3. Are goggles essential for machine operators and others in the wood-room? Why?

This question was discussed at considerable length. It was the consensus of opinion that face protection has not been used as much as it should be; that the hazard of flying parts, both splinters and dust, in wood operations is greater than generally appreciated. Proper face protection should be much more general and more rigidly enforced.

Question 4. What kinds of wood will cause trouble from dermatitis?

Question 5. What can be done to minimize the dermatitis problem?

There was considerable difference of opinion as to the kinds of wood or rather the type of dermatitis that appears when handling wood. It was agreed that probably other causes are frequent and the wood gets the blame. Attention was called to the paper which was presented on this subject and published in the proceedings of the 26th Congress, Vol. I, pp. 71-76, by Schwartz.

Question 6. What conditions cause exhaust systems to break down or to operate inefficiently?

Discussion of this question brought out three definite points of interest:

(a) The exhaust system to be effective must be properly designed. Too frequently this is done by inexperienced workers and the system is never efficiently operated.

(b) Systems correctly designed and installed for a definite job frequently have additional equipment added to them which they are not suited for and hence from then on they are inefficient due to improper conditions.

(c) Proper maintenance including cleaning out and method of operation is absolutely necessary.

Question 7. Can circular saws be operated safely after being drilled to stop cracks?

Question 8. Does improper sharpening cause saws and knives to operate unsafely? Why? How?

This matter of drilling circular saws to stop cracks was rather briefly discussed. Some say "Yes" and some say "No." The type of saw, method of operation, material, depth of cut and other factors all enter into a decision. This subject was fully presented in a paper that was published in the transactions of the 28th Congress, Vol. I, pp. 696-703, by A. L. Uhl. It is agreed that improper sharpening and the operation of dull tools is a hazard. There are no tools more susceptible to abuse from the above causes than are woodworking tools.

Question 9. What type of hammer can be used most safely for driving nails?

The type of hammer for driving nails seems to be a matter of personal opinion without any general agreement. The job and local conditions and what the man was "used to" seem to be determining factors. In connection with this discussion, the hazard of flying nails and the necessity of wearing eye protection wherever nailing is being done and in the immediate vicinity (20 or 30 ft. radius) was discussed. The flying nail is a hazard not only to the nailer but also to anyone in his vicinity. Some companies are enforcing the use of eye protection by everyone in these areas at all times. Increasing this practice was urged.

Question 10. What is the best procedure for providing first-aid to injured workers?

The question of first aid procedure brought a very general discussion with no general agreement because there are so many factors to be considered, both local conditions and State laws. It was agreed definitely that the best possible first aid equipment and personnel should be provided. Re-

garding the personnel, it was agreed that the more persons who could be equipped with a Red Cross First Aid training, the fewer number of accidents would occur and the better care accident victims would receive. Many companies are providing first aid instruction for employees. This does not in any way supplant but rather only supplements the regular doctor, nurse, dispensary or field first aid organization.

WEDNESDAY AFTERNOON SESSION

October 9, 1940

Joint Session with the Paper and Pulp Section

The full report of this session will be found on page 569 of this volume.

ADJOURNMENT

Safety Exposition Exhibitors

EXHIBITION HALL—STEVENS HOTEL

Alphabetical List of Exhibitors of Industrial Safety Equipment

- Ajax Hand Brake Co., Chicago, Ill.**
Hand Brakes for Railroad Freight Equipment.
- Aluminum Ladder Co., Tarentum, Pa.**
Aluminum Ladders, Scaffolds and Gangways.
- American Abrasive Metals Co., Irvington, N. J.**
Safety Flooring, Treads, Stair Treads, Abrasive Paint.
- American-LaFrance-Foamite Corp., Elmira, N. Y.**
Fire Protection Equipment.
- American Optical Co., Southbridge, Mass.**
Head and Eye Protection Products, Safety Clothing.
- Arntzen, Inc., Chicago, Ill.**
Emergency Ambulances and Stretcher Equipment.
- Bausch & Lomb Optical Co., Rochester, N. Y.**
Safety Goggles and Safety Lenses.
- Bear Manufacturing Co., Rock Island, Ill.**
Motor Vehicle Inspection and Correction Equipment.
- The Boyer-Campbell Co., Detroit, Mich.**
Industrial Safety Equipment.
- The Bridgeport Device Co., Bridgeport, Conn.**
Gray Tom Traction Splints.
- Stewart R. Browne Manufacturing Co., New York, N. Y.**
Safety and Special Purpose Lights and Lamps.
- Brown Shoe Co., St. Louis, Mo.**
Industrial Safety Shoes.
- R. H. Buhrke Co., Chicago, Ill.**
Safety Equipment for Construction and Maintenance.
- Burroughs Wellcome & Co. (U.S.A.) Inc., New York, N. Y.**
First Aid Kits and Medical Equipment.
- Cambridge Rubber Co., Cambridge, Mass.**
Safety Soles for Shoes.
- Chicago Eye Shield Co., Chicago, Ill.**
Head and Eye Protection Equipment.
- H. Childs & Co., Inc., Pittsburgh, Pa.**
Industrial Safety Shoes.
- The Cleveland Overall Co., Cleveland, Ohio.**
Safe Industrial Work Clothing and Uniforms.
- Columbus McKinnon Chain Corp., Tonawanda, N. Y.**
Alloy Steel Sling Chains and Safety Hoists.
- Continental Casualty Co., Chicago, Ill.**
Industrial and Automotive Accident Prevention Service.
- M. E. Cunningham Co., Pittsburgh, Pa.**
Safety Steel Stamps and Tools.

Davis Emergency Equipment Co., Inc., New York, N. Y.

First Aid and Industrial Safety Equipment.

Dockson Corp., Detroit, Mich.

Head and Eye Protection Equipment.

The C. B. Dolge Co., Westport, Conn.

Floor Finishes, Disinfectants, and Hand Soaps.

Dugas Engineering Corp., Chicago, Ill.

Fire Extinguishing Equipment.

Duo-Safety Ladder Corp., Oshkosh, Wis.

Safety and Fire Ladders.

Eagle Signal Corp., Moline, Ill.

Traffic Signals and Controllers.

Eastman Kodak Co., Rochester, N. Y.

Cameras and Photographic Equipment.

Elliott Service Co., New York, N. Y.

Promotion of Safety and Efficiency.

Employers Mutual Liability Insurance Co., Wausau, Wis.

Workmen's Compensation, Fire and Casualty Insurance.

Fairway Laboratories, Inc., St. Louis, Mo.

Salt Tablets and Dispensers.

Finnell System, Inc., Elkhart, Ind.

Electric Floor Maintenance Equipment and Compounds.

Franklin Research Co., Philadelphia, Pa.

Floor Maintenance Materials.

The General Fire Truck Corp., Detroit, Mich.

Fire Extinguishers and Allied Products.

Great Stuff Products Co., Inc., West New York, N. J.

Industrial Hand Soaps, Protective Creams, Dispensers.

Harley Davidson Motor Co., Milwaukee, Wis.

Police Motorcycles and Related Equipment.

Henney Motor Co., Freeport, Ill.

Ambulances and Specialized Motor Vehicles.

Hild Floor Machine Co., Chicago, Ill.

Industrial Floor Cleaning Equipment.

Holcomb Safety Garment Co., Chicago, Ill.

Protective Clothing.

Hoof Products Co., Chicago, Ill.

Motor Vehicle Speed Control Governor and Brake Eyes.

Hynson, Westcott & Dunning, Inc., Baltimore, Md.

Mercurochrome First Aid Antiseptic, Thiamic Lozenges.

Indian Motorcycle Co., Springfield, Mass.

Police Motorcycles and Equipment.

Industrial Gloves Co., Danville, Ill.

Industrial Safety Clothing.

International Business Machines Corp., New York, N. Y.

Electric Accounting Machines, Time Recording Devices.

International Chain and Manufacturing Co., York, Pa.

Lug-Reinforced Tire Chains.

International Shoe Co., St. Louis, Mo.

Hy-Test Safety Shoes.

Justrite Manufacturing Co., Chicago, Ill.

Safety Cans and Fittings, Electric Safety Lanterns.

Karel First Aid Supply Co., Chicago, Ill.

Industrial First Aid Supplies, Hospital Equipment.

Keystone View Co., Meadville, Pa.

Visual Safety Tests.

Walter Kidde & Co., Inc., New York, N. Y.

Fire Extinguishing Equipment.

The Kimball Safety Products Co., Cleveland, Ohio.

Safety Clothing and Industrial Goggles.

The Kneisley Electric Co., Toledo, Ohio.

Traffic Signals.

The Thomas Laughlin Co., Portland, Maine.

Wire Rope Fittings, Drop Forgings, and Chain Fittings.

Walter G. Legge, Inc., New York, N. Y.

Floor Polishes and General Floor Maintenance Compounds.

Lehigh Safety Shoe Co., Allentown, Pa.

Leather and Rubber Safety Shoes.

Lightfoot Schultz Co., New York, N. Y.

Toilet Soaps for Industrial Washroom Use.

The Lima Cord Sole and Heel Co., Lima, Ohio.

Non-Slip Soles and Heels.

Lumbermen's Mutual Casualty Co., Chicago, Ill.

Automobile, Compensation and General Casualty Insurance.

Macwhythe Wire Rope Co., Kenosha, Wis.

Wire Rope, Braided Wire Rope Slings, and Allied Products.

The Martindale Electric Co., Cleveland, Ohio.

Stretcher Cots, Safety Road Signs, Respirators for Non-Toxic Dusts.

Masury-Young Co., Boston, Mass.

Materials for Finishing and Maintaining Safe Floors.

Thom McAn Safety Shoe Co., New York, N. Y.

Thom McAn Safety Shoes.

B. F. McDonald Co., Los Angeles, Cal.

Industrial Safety Equipment.

Medical Specialties Co., Indianapolis, Ind.

Harper Drunkometer.

Metropolitan Life Insurance Co., New York, N. Y.

Life, Health, Accident, Pension and Group Insurance.

Milburn Co., Detroit, Mich.

Protective Creams for Prevention of Occupational Skin Diseases.

Mine Safety Appliances Co., Pittsburgh, Pa.

Safety Appliances and First Aid Materials.

National Conservation Bureau, New York, N. Y.

Safety Education, Traffic Enforcement and Industrial Material.

National Safety Council, Inc., Chicago, Ill.

Posters, Bureau of Information, Research and Education Division.

National Society for the Prevention of Blindness, New York, N. Y.

Services and Education Materials on Preventing Industrial Eye Injuries.

G. H. Packwood Manufacturing Co., St. Louis, Mo.

Safety Hand Soaps for Industrial Plant Use.

Panther-Panco Rubber Co., Inc., Chelsea, Mass.
 Safety Soles and Heels.
The Patent Scaffolding Co., Chicago, Ill.
 Safety Ladders and Scaffolds.
Phenex Products, Inc., Wilmette, Ill.
 Antiseptics and Germicides for First Aid Use.
The Phister Manufacturing Co., Cincinnati, Ohio.
 Fire Extinguishers and Allied Equipment.
Protectoseal Co., Chicago, Ill.
 Safety Cans, Drum and Barrel Fittings.
Pulmosan Safety Equipment Corp., Brooklyn, N. Y.
 Industrial Safety Products.
Pyrene Manufacturing Co., Newark, N. J.
 Fire Protection Equipment.

Reece Wooden Sole Shoe Co., Columbus, Neb.
 Wooden Sole Safety Shoes, Boots and Sandals.
Rose Manufacturing Co., Denver, Colo.
 Industrial Safety Products.
Ruemelin Manufacturing Co., Milwaukee, Wis.
 Welding Fume Collectors, Exhaust Fans, Cloth Type Dust Collectors.

Safety Clothing and Equipment Co., Cleveland, Ohio.
 Industrial Safety Clothing, Equipment and Supplies.
Safety Engineering, Alfred M. Best & Co., Inc., New York, N. Y.
 "Safety Engineering," Insurance Publications and Reports.
Safety First Shoe Co., Holliston, Mass.
 Safety Shoes.
Safway Steel Scaffolding Co., Milwaukee, Wis.
 Safway Steel Scaffolding Equipment.
W. H. Salisbury & Co., Chicago, Ill.
 Linemen's Rubber Protective Devices.
Sangamo Electric Co., Springfield, Ill.
 Tachographs and Safety Flashers.
The Sanitary Institute of America, Chicago, Ill.
 Sterilized Industrial Wiping Cloths.
Sarra, Inc., Chicago, Ill.
 Slide Films, Photosound.
E. D. Sawyer, Chicago, Ill.
 Yielding Cable Barrier Gates.
A. Schrader's Son, Brooklyn, N. Y.
 Pneumatic Power Press Safety Control Devices.
Sellstrom Manufacturing Co., Chicago, Ill.
 Industrial Safeguards for Head and Eye Protection.
Shell Oil Co., Inc., St. Louis, Mo.
 Oil Producers and Refiners.
Sheperd Safety Shoe Corp., Chicago, Ill.
 Safety Shoes.
A. Smith & Son, Inc., Philadelphia, Pa.
 Reeves Stretchers and Canvas Specialties.
The Spencer Turbine Co., Hartford, Conn.
 Industrial Vacuum Cleaners and Dust Collection Equipment.
Standard Safety Equipment Co., Chicago, Ill.
 Industrial Safety Equipment.
Steel Scaffolding Co., Inc., Evansville, Ind.
 Steel Scaffolds, Trestles, and Accessories.

Stonehouse Signs, Inc., Denver, Colo.
 Accident Prevention Signs and Tags.
The Strauss Co., Pittsburgh, Pa.
 Safety Hats and Safety Belts.
Sugar Beet Products Co., Saginaw W. S., Mich.
 Industrial Skin Cleansers.
The Surty Manufacturing Co., Inc., Chicago, Ill.
 Point of Operation Machine Guards.

Talking Sales Pictures, Inc., Chicago, Ill.
 Film Strips, Slide Films, Sound Movies.
Traffic Eye, Inc., Indianapolis, Ind.
 Vehicle Speed Control Devices.
Trimont Manufacturing Co., Roxbury (Boston), Mass.
 Safety Steel Pipe Tools.

U. S. Hoffman Machinery Corp., New York, N. Y.
 Portable or Permanent Piped Vacuum Cleaning Systems.
U. S. Junior Chamber of Commerce, Chicago, Ill.
 Educational Campaign for Traffic Safety Lighting.

Wahlert Products Corp., Brooklyn, N. Y.
 Industrial Safety and Fire Protection Equipment.
Weaver Manufacturing Co., Springfield, Ill.
 Automotive Testing Equipment.
Welsbach Traffic Signal Co., Chicago, Ill.
 Power and Battery Operated Flashing Traffic Signals.
West Disinfecting Co., Long Island City, N. Y.
 Products for the Promotion of Industrial Sanitation.
Wiesman Manufacturing Co., Dayton, Ohio.
 Power Press Guards and Guide Pin Covers.
Williams Jewelry and Manufacturing Co., Chicago, Ill.
 Safety Trophies, Awards, Safety and Service Emblems.
Willson Products, Inc., Reading, Pa.
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Gentlemen:

The Transactions of the 29th National Safety Congress and Exposition, held in Chicago last year, immediately reflect one of the best Congresses in the Council's history.

Here are countless ideas and suggestions from a record number of sessions representative of many organizations; practical

